Report of the Review Group on the Ambulance Service

December, 1993

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Introduction

Background

This Report sets out a strategy for dealing with the major policy issues which have arisen in the Ambulance Service and which have not, to date, been addressed in a comprehensive way by the Health Services.

The Ambulance Service, together with the Gardaí and Local Authority Services (in particular the Fire Service) forms a valued and integral part of the emergency services. Traditional policy in the delivery of emergency assistance has been to use the Ambulance Service as an extension of the Hospital Service and the objective has always been to get the patient into hospital as quickly as possible so that advanced medical treatment can be provided by a medical practitioner.

Ambulance personnel are currently trained to ensure as far as possible that patients are kept alive and stabilised until they receive advanced medical treatment in hospital. International practice appears to be moving in the direction of having a greater degree of emergency medical services available in the pre-hospital setting. This is a health function, provided for in the 1970 Health Act and as such is fully and firmly within the general ambit of the Health Services. The nature and extent of such services and their implications for the current Ambulance Service therefore needed to be identified in the Irish context by the Department of Health in conjunction with the Health Boards.

Membership and Terms of Reference of the Review Group on the Ambulance Service

The Review Group on the Ambulance Service was established in October, 1991 by the Minister for Health, and comprised representatives of the Department of Health, and of the Chief Executive Officers of the Health Boards.

Review Group Membership

Mr F Ahern (Chairman), Principal Officer, Department of Health
Mr P Robinson, Deputy Chief Executive Officer, Mid-Western Health Board
Mr M Ward, Deputy Chief Executive Officer, North Western Health Board
Dr J Devlin, Medical Officer, Department of Health
Capt. B Phelan, Chief Ambulance Officer, Southern Health Board
Mr J Cregan, Assistant Principal Officer, Department of Health
Mr M McDonald, Higher Executive Officer, Department of Health
Mr L O'Reilly (Secretary), Higher Executive Officer, Department of Health

General Terms of Reference

To draw up a clear statement on the nature and level of service required from the future Ambulance Service, on a national basis.

Working Groups

The Review Group considered that particular attention should be given to policy issues in the following areas:

(i) organisation, management and training of the Ambulance Service

(ii) pre-hospital emergency cardiac care

(iii) ambulance communications

(iv) provision of Ambulance Services in the Dublin area.

Four working groups were subsequently established to Report to the Review Group on these areas.

* * * *

Organisation, Management and Training Working Group Membership

Mr M Ward (Chairman), Deputy Chief Executive Officer, North Western Health Board
Mr D Scully, Programme Manager, North Eastern Health Board
Mr J Cregan, Assistant Principal Officer, Department of Health
Mr M McDonald, Higher Executive Officer, Department of Health
Mr M Hyland, Assistant Principal Officer, Department of Finance
Mr J Foy, Chief Ambulance Officer, Western Health Board
Mr L Nolan, Chief Ambulance Officer, South-Eastern Health Board
Dr J Tracey, Consultant Anaesthetist, Beaumont Hospital, Dublin 9
Dr D Barton, Accident and Emergency Consultant, James Connolly Memorial Hospital, Blanchardstown
Mr S O'Connor, Senior Executive Officer, Eastern Health Board
Dr J Dowling, The Medical Centre, Dungloe, Co Donegal
Mrs S Wall, Unit Nursing Officer, Accident and Emergency Department, Cork Regional Hospital
Mr R Bonar, Training and Administrative Officer, National Ambulance Training School
Mr D Thomas (Secretary), Higher Executive Officer, Department of Health

Terms of Reference — Organisation, Management and Training Working Group

1. To review the ambulance and patient transport systems currently provided by the Health Boards.

2. To define the role of the Ambulance Service and to examine recent medical developments with regard to how they will impact on the Ambulance Service, with a view to determining its future role.

3. To determine the appropriate training requirements that will allow for the organisation and management of the Ambulance Service in the most efficient and effective way.

* * * *

Cardiac Care Working Group Membership

Dr J Devlin (Chairman), Medical Officer, Department of Health
Mr P O'Byrne, Assistant Principal Officer, Department of Health
Capt. B Phelan, Chief Ambulance Officer, Southern Health Board
Mr S Duffy, Ambulance Officer, North Western Health Board
Mr B Power, Training Instructor, National Ambulance Training School
Dr M Walsh, Consultant Cardiologist, St James's Hospital, Dublin
Mr S O'Brien, Programme Manager, Eastern Health Board
Comdt. PA Gillick, Chief Fire Officer, Dublin Fire Brigade
Prof. G Bury, Professor of General Practice, University College, Dublin
Sr A Kennedy, Coronary Care Unit, Waterford Regional Hospital
Mr L O'Reilly (Secretary), Higher Executive Officer, Department of Health

Terms of Reference — Cardiac Care Working Group

1. To review international literature and to evaluate options in emergency pre-hospital cardiac care.

2. To review the current emergency pre-hospital cardiac services in Ireland.

3. To review and consider the question of a general public education and bystander Cardiopulmonary Resuscitation programme.

4. To make recommendations regarding a national policy for emergency pre-hospital cardiac care.

5. To propose a strategy for the implementation of this policy having regard to the general economic situation and need to obtain optimum value in the investment of scarce resources.

* * * *

Communications Working Group — Membership

Mr P Robinson (Chairman), Deputy Chief Executive Officer, Mid-Western Health Board
Mr B Lenehan, Principal Officer, Department of Finance
Mr P Carey, Staff Engineer, Department of Transport, Energy and Communications
Mr B Tuohy, Fire Adviser, Department of the Environment*
Mr W Higgins, Engineering Adviser, Department of Health
Mr P O'Byrne, Assistant Principal Officer, Department of Health
Capt. B Phelan, Chief Ambulance Officer, Southern Health Board
Mr J Byrne, Chief Ambulance Officer, Mid-Western Health Board
Mr T Brady, Chief Ambulance Officer, Eastern Health Board
Mr B Colleary, Technical Services Officer, Midland Health Board
Mr F Goodman (Secretary), Higher Executive Officer, Department of Health

Terms of Reference — Communications Working Group

1. (a) To review present communications systems within the Ambulance Service and Health Services generally.

   (b) To identify improvements required at both regional and national levels.

   (c) To examine developments in communications for emergency services both in Ireland and elsewhere.

2. To evaluate various alternatives and to recommend to the Steering Group an appropriate communications system to meet the needs of the Ambulance Service (including needs anticipated in a major emergency) in the most efficient and cost-effective manner.

3. To consider whether the communication needs of other Health Services (especially mobile community-based services e.g. Public Health Nurses, Community Psychiatric Nurses, General Practitioners) can be incorporated in ambulance communications systems at an economic cost.

4. To consider whether links with communications systems of other emergency services (Gardaí, Fire) are desirable, feasible and economic.

5. To propose a strategy for implementation having regard to the general economic situation and need to obtain optimum value in the investment of scarce resources.

* * * *

*Mr Tuohy was appointed to a new post and was replaced during the course of the review by Mr S Hogan, Fire Adviser, Department of the Environment.

Dublin Ambulance Service Working Group — Membership

Mr F Ahern (Chairman), Principal Officer, Department of Health
Mr H Malone, Principal Officer, Department of the Environment
Mr W Soffe, Assistant City Manager, Dublin Corporation
Mr J Cregan, Assistant Principal Officer, Department of Health
Mr S Hogan, Fire Adviser, Department of the Environment
Comdt. P A Gillick, Chief Fire Officer, Dublin Fire Brigade
Mr J Wright, Principal Officer, Engineering Department, Dublin Corporation
Mr S O'Brien, Programme Manager, Eastern Health Board
Mr T Brady, Chief Ambulance Officer, Eastern Health Board
Mr M Gallagher, Finance Officer, Eastern Health Board
Mr P Conaty, Ambulance Officer, North Eastern Health Board
Mr D Thomas (Secretary), Higher Executive Officer, Department of Health

Terms of Reference — Dublin Ambulance Service Working Group

The contractual arrangements and relationships which should apply between the Eastern Health Board and the various parties concerned with the provision of Ambulance Services in the Dublin area.

* * * *

Secretarial Arrangements

Secretarial services were provided by staff from the Secondary Care Division, Department of Health. The Review Group greatly appreciates the excellent and diligent work carried out on its behalf by Mr Larry O'Reilly, Higher Executive Officer, Secretary to the Review Group on the Ambulance Service and to the Cardiac Care Working Group. The Review Group also wishes to acknowledge the valued assistance of Mr Fergal Goodman, Higher Executive Officer, Secretary to the Communications Working Group, and of Mr David Thomas, Higher Executive Officer, Secretary to the Organisation, Management and Training Working Group and to the Dublin Ambulance Service Working Group. The Group also wishes to thank Ms Susan Cahill and Ms Caroline Field for their patience and precision in typing the many drafts of the Reports of the Review Group and its Working Groups.

Acknowledgements

A list of the written submissions by organisations and individuals, which were made to the Review Group on the Ambulance Service is set out at **Appendix A.**

A list of those who made oral submissions to the Group is set out at **Appendix B.**

A list of the fact-finding visits undertaken by members of the Group is set out at **Appendix C.**

The Group acknowledges the help, advice and support received from all parties who contributed to the preparation of this Report, especially Mr David Carrington, formerly the Director of Training and Development, Scottish Ambulance Service and recently appointed the Director of Ambulance Services, North West London, who travelled from Scotland to meet with the Group.

The Group also wishes to thank the World Health Organisation for the provision of research fellowships on Ambulance Services in Sweden, the Netherlands and the United Kingdom. The Chairman of the Group wishes to acknowledge, in particular, the help received from the following people:

Dr B Biber, Ostra Sjukhuset, Gothenburg, Sweden.
Dr S Holmberg, Sahlgrenska Sjukhuset, Gothenburg, Sweden.
Dr RRR Huijsman-Rubingh, Dutch Ministry of Welfare, Health and Cultural Affairs, The Hague, The Netherlands.
Dr J De Boer, Dutch Ministry of Welfare, Health and Cultural Affairs, The Hague, The Netherlands
Mr G De Gel, Director, Central Emergency Communications Centre, Rotterdam-Rijnmond, The Netherlands.
Prof. FLPA Rutten, Director, Accident and Emergency Department, Rotterdam University Hospital, The Netherlands.
Mr CML Blaas, Director of Operational Services, VZA Ambulance Service, Amsterdam, The Netherlands
Mr GN Van Der Heide, Co-ordinator, Central Ambulance Emergency Communications Centre, Amsterdam, The Netherlands.
Mr J Schraa, Director, ZTM Ambulance Service, Groningen, The Netherlands.
Mr K Spreen, Co-ordinator, Emergency Control Centre, Drente, The Netherlands.
Mr A Hopkins, Deputy Chief Metropolitan Ambulance Officer, South Yorkshire Ambulance Service, Rotherham, England.
Mr S Uttley, General Manager, Greater Manchester Ambulance Service, Bury, England.
Prof. D Yates, Accident and Emergency Department, Hope Hospital, Eccles Old Road, Salford, England.

Summary of Recommendations

Chapter 2 — PRESENT ORGANISATION OF THE IRISH AMBULANCE SERVICE

1. The Group recommends that, on occasions when voluntary agencies are providing a back-up role for the Ambulance Service, it is essential that they should function under the direction and control of the Health Board's Chief Ambulance Officer. *(Chapter 2, Section 8)*.

2. The Group recommends that, on those occasions when the Civil Defence Ambulance Service supports the Health Boards' pre-hospital care services, the Civil Defence Ambulance Service should work under the direction of the Chief Ambulance Officer of the relevant Health Board. *(Chapter 2, Section 9)*.

3. The Group recommends that, when private ambulance services are used by any of the statutory health agencies, these services should be subject to the same training, equipping and certification requirements as laid down by the National Ambulance Advisory Council, which apply to the statutory Ambulance Service. *(Chapter 2, Section 10)*.

Chapter 3 — PRE-HOSPITAL EMERGENCY MEDICAL CARE

4. The Group recommends that the regular monitoring of ambulance response times should facilitate an assessment of the adequacy of the resources available to ambulance bases in relation to the areas and population served. This monitoring function should be undertaken by the National Ambulance Advisory Council. *(Chapter 3, Section 7)*.

5. The Group recommends that a standardised patient report form should be introduced, and that its use should be mandatory for all Emergency Ambulance Services. The correct method of completing this form should be covered in the induction/basic and refresher/development training programmes. *(Chapter 3, Section 8)*.

6. The Group recommends the adoption of the "chain of survival" as a core principle with regard to the provision of a national pre-hospital emergency cardiac care service. *(Chapter 4, Section 5)*.

7. The Group recommends that a public awareness campaign should be developed to educate the public to recognise the symptoms of cardiac arrest and when and how to call the Ambulance Service. Voluntary agencies, such as the Irish Heart Foundation, which has considerable expertise in organising public awareness campaigns, should be given responsibility for the development of these campaigns nationally. The Department of Health and the Health Boards, in association with these voluntary agencies, should develop a strategy for providing these public awareness campaigns. *(Chapter 4, Section 5)*.

8. The Group recommends that bystander Cardiopulmonary Resuscitation should be widely available throughout Ireland. This will enable the first and second links in the "chain of survival" — early access to the emergency care system and early CPR — to be provided promptly. *(Chapter 4, Section 5)*.

9. The Group recommends that public education and bystander Cardiopulmonary Resuscitation programmes should be established and should include the recognition of early indicators of heart attack and cardiac arrest. Participants should also be trained to alert the emergency medical care system at the earliest opportunity. *(Chapter 4, Section 5)*.

10. Because early Cardiopulmonary Resuscitation forms a vital link in the "chain of survival", the Group recommends that voluntary agencies such as the Irish Heart Foundation, which has considerable expertise in CPR techniques, should be involved in the development of CPR programmes and the setting of standards. The Department of Health and the Health Boards, in association with these voluntary agencies, should develop a strategy for providing these community programmes. *(Chapter 4, Section 5)*.

11. The Group recommends that, where either an individual or an organisation provides a defibrillation service, a system of regulation should be introduced to ensure that proper training, supervision and certification are also provided. *(Chapter 4, Section 5)*.

12. The Group recommends that every emergency ambulance should be equipped with a defibrillator. *(Chapter 4, Section 5)*.

13. The Group recommends that the defibrillation equipment in emergency ambulances should be of the advisory external defibrillator (AED) type. Equipment used by the Ambulance Service in different Health Board areas should, as far as possible, be compatible. *(Chapter 4, Section 5)*.

14. The Group recommends that it should be a priority to adequately train as many emergency ambulance personnel in the use of defibrillation equipment in as short a time as possible so that the greatest number of lives may be saved. *(Chapter 4, Section 5)*.

15. The Group recommends that Emergency Ambulance Services should conduct an ongoing audit of their service such as activation and response times and patient outcome data. In every situation where a defibrillator is used, the audit should include time to defibrillation, review of the patient report form, E.C.G. recordings and patient outcome to hospital discharge. There should be direct medical input into this audit process at local level. *(Chapter 4, Section 5)*.

16. The Group recommends that a pilot project be established which will evaluate the use of advisory defibrillators in a number of general practices in areas where emergency ambulances are not immediately available. *(Chapter 4, Section 5)*.

17. The Group recommends that, where mobile CCU/ICU services are already established, they should be fully integrated with the response by the existing Emergency Ambulance Service. The results from the operation of the existing doctor-staffed Mobile Coronary Care Units (MCCU's) should be evaluated and an assessment made regarding the effectiveness and efficiency of such Units. Resources should be made available to perform this evaluation which should form the basis for recommendations by the National Ambulance Advisory Council on the future role of this service. *(Chapter 4, Section 6)*.

18. The Group recommends that hospitals should introduce arrangements to facilitate the "fast-tracking" of emergency cardiac patients into their Coronary Care Units. *(Chapter 4, Section 7)*.

19. The Group recognises that early thrombolysis is effective in reducing mortality in patients with myocardial infarction and recommends that every effort must be made to administer these drugs, preferably within six hours of the onset of chest pain, in order to maximise benefit. *(Chapter 4, Section 7)*.

20. The Group recommends that hospitals should develop appropriate protocols with regard to thrombolysis and other therapies for the treatment of cardiac arrest and heart attack. Co-ordination between pre-hospital (including General Practitioners) and hospital services should be improved and if research continues to demonstrate clear benefits in delivering thrombolysis in the pre-hospital setting, appropriate protocols should be developed. *(Chapter 4, Section 7)*.

Chapter 5 — THE ROLE OF THE AMBULANCE SERVICE AS PART OF THE HEALTH BOARDS' RESPONSE TO MAJOR EMERGENCIES

21. In order to assist the Health Boards' Ambulance Service in carrying out its responsibilities under the Major Emergency Plan, the Group recommends that the following areas need continuous assessment and development:—

    (a) Standard operational procedures and training which can support both the Board's own operations, and incidents which involve mutual support across Health Board boundaries. *(Chapter 5, Section 3)*.

    (b) Regular and realistic exercises involving the other emergency services as well as Civil Defence and voluntary organisations. *(Chapter 5, Section 3)*.

(c) Standard equipment which can operate in field conditions including such items as lightweight stretchers, body pouches, power generators, protective clothing and communications systems. *(Chapter 5, Section 3)*.

(d) Mobile control and equipment vehicles which can support the Health Services' response at the accident scene. *(Chapter 5, Section 3)*.

(e) Links between voluntary organisations, Civil Defence and the statutory Ambulance Service should, where possible, be strengthened, especially in the areas of training and emergency planning. *(Chapter 5, Section 3)*.

Chapter 6 — PATIENT TRANSPORT ARRANGEMENTS

22. The Group recommends that, for many elements of the routine patient transport service, hired transport may be more economical than operating a minibus at a centre for a limited five-day service. Economic considerations should dictate when hired transport should be utilised. However, it is accepted that the small number of emergency and urgent calls to some rural ambulance bases may not justify the separation of functions. *(Chapter 6, Section 1)*.

23. The Group recommends that the cost of transport for hospital discharges, day hospitals, day centres, training centres and special schools should be borne by the health agency concerned and should not be charged to the individual patient on whose behalf the service is provided. *(Chapter 6, Section 1)*.

24. The Group recommends that the National Ambulance Advisory Council should have responsibility for determining ambulance vehicle specification and for the preparation and examination of tenders. The Council should work closely with the Health Boards' National Value for Money Committee which has the responsibility for tendering/negotiating prices on behalf of all Health Boards. *(Chapter 6, Section 2)*.

25. The Group recommends that an efficient fleet management system, incorporating a formal vehicle replacement policy, should be developed by each Health Board. *(Chapter 6, Section 3)*.

26. The Group recommends that proposals for the transport of critically ill patients should be evaluated by the Department of Health together with the Intensive Care Society of Ireland, the Faculty of Paediatrics of the Royal College of Physicians and any other interested parties with a view to assessing the effectiveness and efficiency of establishing a specialised transport service for the critically ill. *(Chapter 6, Section 4)*.

27. The Group recommends that each emergency ambulance should be equipped to a level to be specified by the National Ambulance Advisory Council and that there should be both a stock and maintenance check on the equipment in each emergency ambulance, on a weekly basis. Such specifications should be in conformity with any recognised European Standards for ambulance vehicles and equipment. *(Chapter 6, Section 5)*.

28. The Group, in formulating its Report, has taken cognisance of the need for all its recommendations to comply with any ambulance standards that might eventually be approved by CEN and issued by way of EC Directive. *(Chapter 6, Section 6)*.

29. The Group recommends that the Air Corps should continue to endeavour to respond to requests for its Air Ambulance Service, within the time and resources available. *(Chapter 6, Section 8)*.

30. The Group recommends that organ retrieval missions should be regarded as part of the regular Air Ambulance requirements of the Health Services and consequently should be taken into account in the planning and equipping of Air Ambulance Services (including provision for fixed-wing aircraft to allow for night-time/bad weather flying). *(Chapter 6, Section 8)*.

31. The Group recommends that a Standing Committee should be established under the aegis of the Departments of Defence and Health which would:—

    (a) regularly review the operation of Air Ambulance Services

    (b) ensure appropriate medical input and advice

    (c) specify protocols in order to obtain maximum cost benefits and ensure the appropriate use of aircraft.

    (d) consider the adequacy of resources for Air Ambulance missions and jointly put forward any proposals for the improvement of the Air Ambulance Service. *(Chapter 6, Section 8)*.

32. The Group recommends that the question of having dedicated and purpose-equipped Air Ambulance aircraft should be considered within the context of the Standing Committee of the Departments of Defence and Health. *(Chapter 6, Section 8)*.

33. The Group recommends that the expansion of the Air Ambulance Service to include a patient retrieval service for critically ill patients should be examined as a priority. The provision or availability of helicopter landing pads in hospitals should also be assessed as part of this examination. *(Chapter 6, Section 8)*.

34. The Group recommends that suitable Air Corps personnel who work in the Search and Rescue (SAR) Service should receive pre-hospital care training up to and including the level of the proposed advanced training programme for ambulance personnel. *(Chapter 6, Section 8)*.

Chapter 7 — COMMUNICATION NEEDS OF THE AMBULANCE AND OTHER HEALTH SERVICES

35. The Group recommends that integrated Command and Control systems should be provided for emergency, urgent and routine services, as separate systems would be neither economic nor practical. *(Chapter 7, Section 7)*.

36. Since Command and Control Centres will play a key role in activating the response to major emergencies, the Group recommends that facilities for such an activation system be provided as an integral part of the communications network. *(Chapter 7, Section 8)*.

37. The Group recommends that provision be made for incorporating the needs of other Health Service requirements into the ambulance communications system as the most effective and efficient way of providing communications facilities for all Health Services. *(Chapter 7, Section 10)*.

38. The Group recommends that consideration be given at Health Board level to the question of how best communications systems can be developed to meet the joint needs of Health Boards and voluntary ambulance services and on the training of voluntary personnel in the use of communications systems. *(Chapter 7, Section 11)*.

39. The Group recommends that where voluntary or private ambulance services are supporting the statutory Ambulance Service in any capacity, they must be subject to the same standards and operational protocols regarding the use of their communication systems as the statutory services. *(Chapter 7, Section 11)*.

Chapter 8 — OPERATIONAL REQUIREMENTS FOR AMBULANCE COMMUNICATIONS SYSTEMS

40. The Group recommends that the communications systems for the Ambulance Service should meet the following general requirements:—

(i) Both line and radio systems will be required. However, because of the emergency and mobile nature of the work, radio will be the primary means of communication.

(ii) Radio systems should be compatible nationally in order to facilitate movement of ambulances between Health Board areas. This implies standardisation of frequency bands, channels, modulation and signalling systems.

(iii) Radio systems should have good regional coverage and be capable of operation in the all informed mode.

(iv) As far as possible both line and radio must be dedicated, private systems, not subject to open public access and overloading.

(v) Systems should have built-in redundancy and emergency back-up power supplies.

(vi) Communication systems should provide for the following:

(a) Access by the public

(b) Reception, processing and logging of calls

(c) Alerting and dispatch of ambulances or other appropriate response

(d) Communication with and between mobile units

(e) Communication between ambulance and hospital (Accident and Emergency Department)

(f) Communication between ambulance and hospital (Coronary Care Unit)

(g) Communication with other ambulance Command and Control Centres

(h) Communication with other emergency services

(i) Communication with hospitals and other health agencies

(j) Communication with and between staff while away from vehicles *(Chapter 8, Section 1)*.

41. The Group recommends that Health Boards should give consideration to the introduction of a Medical Priority Dispatch System (MPDS) in order to assist in the provision of a rapid and appropriate ambulance response to emergency calls. *(Chapter 8, Section 3)*.

42. In order to facilitate the provision of this MPDS service, the Group recommends that the National Ambulance Advisory Council should develop a training programme for controllers. Entry to this programme should be confined to suitably trained ambulance personnel. *(Chapter 8, Section 3)*.

43. The Group recommends that the practice of having only one controller on duty in an Ambulance Command and Control Centre should be phased out. *(Chapter 8, Section 3)*.

44. The Group recommends that each Health Board should have a contingency plan to ensure that if its ambulance Command and Control Centre is rendered inoperable, emergency calls would continue to be answered and ambulances controlled by an alternative Command and Control Centre. *(Chapter 8, Section 11)*.

Chapter 9 — COMMAND AND CONTROL CENTRES

45. The Group recommends that hospital-based ambulance communications facilities should be phased out as soon as practicable and operations transferred to Command and Control Centres which meet the criteria outlined in this Report. *(Chapter 9, Section 1)*.

46. The Group recommends that, where either the Fire Service or the Ambulance Service proposes to upgrade its communications system, discussions should take place to ascertain whether a joint venture might be possible. *(Chapter 9, Section 4)*.

47. The Group recommends that the Fire and Ambulance communications systems should remain separate, but elements such as remote sites (including buildings, emergency power, masts) and systems for alarm monitoring and paging would be shared, and where co-operation in relation to standardisation of maps and information technology is possible, this should continue to operate between the emergency services wherever feasible. *(Chapter 9, Section 4)*.

48. The Group recommends that, having regard to all the factors involved, the proposal for eight Central Command and Control Centres would fully meet the operational criteria outlined in this Report and is therefore the best option for the Ambulance and other Health Services. A modest investment in provision of staff and upgrading of equipment would enable designated Command and Control Centres to meet all of the operational criteria required. *(Chapter 9, Section 6)*.

49. The Group recommends that there should be one Central Command and Control Centre for each Health Board to meet fully the operational requirements for Ambulance and other Health Services. *(Chapter 9, Section 6)*.

50. The Group recommends that Health Boards which have not already developed a Central Command and Control Centre should do so as quickly as possible, if necessary on a phased basis and having regard to the recommendation made in this Report regarding consultation with the Fire Service. *(Chapter 9, Section 6)*.

Chapter 10 — DEVELOPMENT OF SYSTEMS TECHNOLOGY

51. The Group recommends that the Department of Health establish an expert technical group in order to conduct a detailed technical study of all aspects of the Mid Band/Low Band option for the upgrading of radio communications and to make a recommendation to the Department of Health as to the most appropriate system for the Health Services. *(Chapter 10, Section 1)*.

52. The Group recommends that, as part of the upgrading of communications systems, a development programme be established for the hilltop sites to improve access, buildings, services and masts. There should be a co-ordinated approach in consultation with the other emergency service users. *(Chapter 10, Section 1)*.

53. The Group recommends that, when communications equipment purchases are being considered, the potential for joint purchases be examined by the Health Boards and the Department of Health through the National Value For Money Steering Group. *(Chapter 10, Section 2)*.

54. The Group recommends that, having regard to the very significant costs associated with the acquisition and operation of Geographical Information Systems, each Health Board should, in consultation with the Department of Health, assess the likely costs and benefits to its operations of introducing such systems, before making a decision on the matter. *(Chapter 10, Section 4)*.

Chapter 11 — PROVISION OF AMBULANCE SERVICES IN THE DUBLIN AREA

The Group's recommendations for an agreed framework which should govern the provision of Ambulance Services in the Dublin area are contained in Chapter 11.

Chapter 12 — TRAINING REQUIREMENTS FOR AMBULANCE PERSONNEL

55. The Group recommends that, for recruitment to the Ambulance Service, educational standards should be such as to allow new entrants to progress successfully through all stages of the training programme. *(Chapter 12, Section 3).*

56. The Group recommends that new entrants should undergo a two-stage training programme. *(Chapter 12, Section 3).*

57. The Group recommends that all current qualified ambulance personnel should undergo a six-week refresher/development course. All personnel who successfully complete this six-week course should then undergo assessment to determine their suitability to proceed to the advanced training programme. *(Chapter 12, Section 3).*

58. The Group recommends that a paramedic pilot project be established and that an evaluation programme be conducted on the effectiveness of a paramedic service in Ireland. The future development of paramedic services in Ireland should be considered in the light of the results of this evaluation programme. *(Chapter 12, Section 4).*

59. The Group recommends that, when a general improvement in training has been achieved, the question of further improvements in advanced training should be examined by the National Ambulance Advisory Council. The Group recommends that the national priority should be to provide a significant improvement in the quality of the training provided for current ambulance personnel across the eight Health Boards on a national basis. *(Chapter 12, Section 4).*

60. The Group recommends that the advanced training programme should be available only to ambulance personnel involved in accident and emergency work on a regular basis. This will help to ensure that the best return will be obtained from any additional resources that may be provided for enhanced training in the Ambulance Service. *(Chapter 12, Section 6).*

61. The Group recommends that appropriate members of staff working in hospital Accident and Emergency Departments should receive Advanced Life Support (ALS) training. *(Chapter 12, Section 7).*

62. The Group recommends that Chief Ambulance Officers and Ambulance Officers should receive appropriate management training. *(Chapter 13, Section 2).*

63. The Group recommends that Health Boards should review their requirements for ambulance supervisory and command and control staff, by reference to the Group's overall recommendations for a more structured and homogenous Ambulance Service as contained in this Report. *(Chapter 13, Section 3).*

64. The Group recommends that each emergency ambulance should be staffed by two trained ambulance personnel, with at least one having successfully completed the advanced training programme. Both should have current Class D1 driving licences. *(Chapter 13, Section 4).*

65. The Group recommends that, in situations where the current staffing arrangements for ambulances involves nurses being withdrawn from wards, this arrangement should be phased out as soon as possible. *(Chapter 13, Section 5).*

66. The Group recommends that the approach of individual Health Boards to the continued utilisation of the on-call system should be governed by the desirability of achieving a level of response time which is considered adequate, given the logistical and geographical factors involved. *(Chapter 13, Section 5).*

67. The Group recommends that part-time ambulance nurses should be fully integrated into the organisational structure of the Ambulance Service and should be required to undergo the same development and advanced training programmes as other ambulance personnel. *(Chapter 13, Section 5).*

68. The Group recommends that there should be a complete revision of the existing training programme for ambulance personnel and that there should be a major enhancement of the skills and knowledge base in order to ensure a significant improvement in the standard of care provided by the Ambulance Service, on a national basis. *(Chapter 13, Section 6).*

69. The Group recommends that each Health Board should appoint a Medical Adviser to the Ambulance Service in its area. This post should be part-time. *(Chapter 13, Section 6).*

70. The Group recommends that a National Ambulance Advisory Council should be established to replace the existing Ambulance Services Council. The overall objective of the National Ambulance Advisory Council should be to ensure that uniform standards of service operate throughout the country so that the development of the Irish Ambulance Service keeps pace with good international practice. *(Chapter 13, Section 7).*

71. The Group recommends that the most effective arrangement would be for the National Ambulance Advisory Council to be appointed by the Minister for Health and to operate under the aegis of the Department of Health, providing advice to the Minister for Health. *(Chapter 13, Section 7).*

72. The Group recommends that the National Ambulance Advisory Council should have a broader representative base than the existing Council and should have significant medical representation as well as service, educational and management representatives. *(Chapter 13, Section 7).*

73. The Group recommends that the National Ambulance Training School should function separately from the National Ambulance Advisory Council and should be subject to the same evaluation and audit as other aspects of the Ambulance Service. The School should be accountable to the Health Boards and should have a small Management Committee who would be nominated by the Chief Executive Officers of the Health Boards. *(Chapter 13, Section 8).*

74. The Group recommends that each Health Board should draw up a training programme for its ambulance personnel, in line with the standards laid down by the National Ambulance Advisory Council and in consultation with the National Ambulance Training School. The School should organise its training programmes on a three-to-five-year roll-forward basis, through funding contracts with the Health Boards and other agencies using its services. Each Health Board should then provide the National Ambulance Training School with the funds pro-rata for the number of training days provided each year by the School to meet the Board's requirements. *(Chapter 13, Section 8).*

CHAPTER 1

Historical Background

1.1 Origins of the Ambulance Service

The concept of an Ambulance Service as we have come to know it has its origins in war situations where injured soldiers were given relief and brought to military or field hospitals for medical or surgical care.

At the time of the Roman Empire, the Roman army employed a number of men to follow the fighting group and pick up any injured soldiers. These men were paid a reward for every life saved.

During the first Crusade (11th Century) the Knights of St. John provided relief for wounded of both sides at infirmaries housed in tents set up beside the battlefields. These "knights-cum-nurses" received the best training available at that time from Greek and Arab doctors.

The person generally regarded as the founder of the modern Ambulance Service, Baron Dominique Larrey, was the Surgeon-in-Chief of Napoleon's Grand Army. He introduced the concept of ambulances moving out from the field hospital to search for wounded soldiers and provide first aid where these soldiers lay on the ground.

Developments continued during the major wars of the late 18th and early 19th centuries as doctors and nurses began to be specially trained for this type of work and gained greater expertise in patient survival techniques. In 1859, Henry Dumant founded the Red Cross and in 1864 his diplomatic action led to the Geneva Convention, of which Article 6 states that the "wounded and sick shall be picked up and cared for, whatever nation they belong to".

During the Second World War, motorised Ambulance Services began to take on the modern format which is recognisable today. The speed with which survivors could be treated became a significant factor in saving the lives of increasingly larger numbers of wounded soldiers. After World War II, these survival techniques began to be incorporated into the existing pre-hospital services, thus providing a significant

improvement in survival rates. The Korean and Vietnam wars gave further impetus to developments in Basic Life Support techniques, and were assisted by rapid transport developments

1.2 The Irish Ambulance Service

In Ireland, the Ambulance Service has its origins in the transport of sick persons to local infirmaries and workhouses.

During the Jacobite/Williamite conflict at the end of the 17th century, wounded soldiers were brought from Athlone during the siege for treatment at the Royal Hospital Kilmainham in Dublin. This was the last major war in Ireland where large armies fought pitched battles. After this period, Ireland's Ambulance Service became associated with the transport of patients to infirmaries and workhouses rather than dealing with war injuries requiring first-aid and rapid transport.

By the mid-19th Century, it was often left to the area relieving officer to arrange transport for a sick person to the workhouse which was often the only form of patient care available. Such transport was usually by donkey and cart with no special features for handling sick persons.

Towards the end of the 19th Century, horse-drawn ambulances were designed and these became something of an emergency patient transport service. The only real piece of equipment carried, however, was a stretcher.

With the general development of motor-driven vehicles, the speed at which patients could be moved to hospitals improved significantly and earlier treatment of patients, especially accident victims, became possible.

Advancements in medical techniques in the 1940's saw improvements in the survival rate of accident victims according as more highly trained personnel developed better methods of detecting the full extent of injuries. The discovery of new drugs also had an important effect. The hospital service in the 1940's began to provide an improved casualty service which catered for patients with sudden illness who now had access to hospital services much more quickly than in the past. The care of patients whose lives were in danger improved significantly during this period.

Under the 1970 Health Act the provision of Ambulance Services became a matter for each individual Health Board. The Chief Executive Officer of each Health Board was given discretion regarding the nature and extent of the Ambulance Service to be provided in the Health Board's area in accordance with national policies and service priorities.

It is an unfortunate fact of present-day life that with the increased use of motor vehicles and industrial and technological advances, there has been an increase in the incidence of major musculo-skeletal injuries which require pre-hospital intervention and rapid transport to hospital. It is, of course, national policy to reduce such accidents, but it is also important to have services in place to deal with the injured as effectively as possible and to reduce morbidity and mortality.

In approaching its task, therefore, the Review Group was particularly keen to build on the developments of the past 50 years and to ensure that the Irish Ambulance Service of the future will be prepared for the demands of the 21st Century and will bring the full benefits of new procedures, standards and equipment which are currently being developed, to the service of the community.

CHAPTER 2

Present Organisation of the Irish Ambulance Service

2.1 Statutory Basis for the Provision of an Ambulance Service

The statutory basis for the provision of an Ambulance Service is contained in Section 57 of the Health Act, 1970 which provides that:

(1) A Health Board may make arrangements for providing ambulances or other means of transport for the conveyance of patients from places in the Board's functional area to places in or outside that area or from places outside the functional area to places in that area.

(2) In making arrangements under this section, a Health Board shall act in accordance with the directions of the Minister.

2.2 The Function and Role of the Ambulance Service

The primary function of the Ambulance Service is to provide pre-hospital emergency care. The Ambulance Service is an emergency service similar to the Gardaí, and the Fire Service.

The main functions of the Ambulance Service are:—

- The care and transportation of the seriously ill and injured to hospital.
- The care and transportation of the seriously ill and injured between hospitals.
- The provision of the Health Services' primary response in emergencies.

In addition, the Ambulance Service also provides routine transport for patients within the health care sector.

2.3 Organisational Structure of the Ambulance Service

In seven of the eight Health Boards, functional responsibility for the Ambulance Services has been delegated to a designated Chief Ambulance Officer or Ambulance

Officer who reports to the Health Board's Programme Manager with responsibility for general hospital services. In one Health Board, responsibility has been delegated to the Technical Services Officer with each individual hospital's ambulances being under the charge of the Matron of that hospital.

In 1969, the Consultative Council on Ambulance Services was established by the Department of Health as an advisory body on Ambulance Service issues. In 1984, the Consultative Council was replaced by the Ambulance Services Council, which was appointed for a three-year term of office. The Ambulance Services Council was subsequently re-appointed in 1987 and 1990.

In April 1986, the Ambulance Services Council established the National Ambulance Training School on the campus of St. Mary's Hospital, Phoenix Park, Dublin.

2.4 Ambulance Personnel

The number of personnel employed in the statutory Ambulance Service is set out in Table 1.

TABLE 1

Personnel Employed in the Statutory Ambulance Service

Health Board	Total
Eastern	182
Midland	34
Mid-Western	96
North-Eastern	70
North-Western	81
South-Eastern	95
Southern	91
Western	74
Total	723
(Dublin Fire Brigade)	742*

*This figure represents the total complement of Dublin Fire Brigade personnel and includes personnel who are assigned to ambulance duties on a rota basis.

A breakdown of Health Board ambulance personnel numbers is set out in Table 2.

TABLE 2
Health Board Ambulance Personnel

Chief Ambulance Officer	5
Ambulance Officer	2
Support Staff	33
Controllers	46
Drivers/Attendants	529
Nurses†	108
Total	723

†40 nurses are employed on a full-time basis in the Ambulance Service. The remainder are employed either on a part-time or an on-call basis. In addition, in some Health Board areas, nurses are withdrawn from the wards to crew the ambulance when there is an ambulance call. These hospital-based nurses are not included in the above tables.

2.5 Ambulance Fleet

Health Boards operate an emergency ambulance fleet comprising 247 vehicles. In addition, Dublin Fire Brigade operates 11 emergency ambulances. Health Boards operate a further 73 vehicles (estate ambulances and minibuses). There are also 17 mobile control vehicles. A profile of available statutory ambulance resources by Health Board area is set in Table 3.[1]†

TABLE 3

Profile of Available Statutory Ambulance Resources by Health Board Area

Health Board	Emergency Ambulance	Estate Ambulance	Minibus	Mobile Control Vehicle	Total
Eastern	67*	—	27	3	97
Midland	19	4	4	2	29
Mid-Western	25	1	—	3	29
North-Eastern	20	1	9	1	31
North-Western	28	1	2	1	32
South-Eastern	35	3	18	3	59
Southern	30	—	—	1	31
Western	34	3	—	3	40
Total	258	13	60	17	348

*This figure includes 11 Dublin Fire Brigade emergency ambulances.

†This and subsequent references are contained in the list of references to be found at pages 157-161 inclusive.

2.6 Cost of providing statutory Ambulance Service

The current total annual cost of the Ambulance Service provided by the eight Health Boards is estimated to be in the region of £30,000,000.

2.7 Ambulance Service in each Health Board Area

The following is a brief description of the current Ambulance Service in each Health Board area.

(i) Eastern Health Board

The Eastern Health Board is responsible for the Ambulance Service for Counties Dublin, Kildare and Wicklow. The Board provides a total Ambulance Service for County Wicklow and County Kildare and South East Dublin. In the rest of Dublin the Emergency Ambulance Service is provided for the Board by the Dublin Fire Brigade on an agency basis. An Emergency Cardiac Ambulance Service for the whole Dublin area is provided directly by the Eastern Health Board. The Board also provides an extensive minibus service for patients attending clinics, day centres, workshops and special schools. The standard operational crew in the emergency ambulances is two ambulance personnel.

The Eastern Health Board operates 3 ambulance bases/Command and Control Centres in Wicklow (Wicklow Town), Kildare (Naas) and at James's St., Dublin. In addition, the Board has ambulance bases at Loughlinstown, Baltinglass, Athy and Maynooth. Communication facilities are provided at each Command and Control Centre for other Health Services in that area, including a pilot alert system for elderly at risk.

The Command and Control Centre for the Dublin Fire Brigade Ambulance Service is located at Fire Brigade Headquarters in Tara Street and the Fire Service ambulances, which are staffed by two Fire Service personnel, are located at 10 stations throughout the city as follows:

Donnybrook, Dolphin's Barn, Phibsborough, North Strand, Finglas, Kilbarrack, Tallaght, Blanchardstown, Rathfarnham and Tara Street.

(ii) Midland Health Board

The Ambulance Service is provided from 5 bases located at hospitals in Tullamore, Mullingar, Longford, Athlone and Portlaoise. The Service at each base is under the control of the Matron at each of these hospitals. Staffing of the ambulances for emergency calls is provided by an ambulance driver and a nurse from the hospital where the ambulance is based. Transport for day hospitals and clinics is provided by a minibus service.

(iii) Mid-Western Health Board

There are 9 ambulance bases located as follows: Limerick (2), Clare (4), and Tipperary N.R. (3). Control of the Service is provided centrally with all emergency and urgent calls channelled through the Ambulance Command and Control Centre in Limerick. However, routine calls after normal working hours continue to be channelled through the hospital switchboards at the ambulance bases in Clare and North Tipperary. Staffing of the ambulances on each call-out is provided by an ambulance driver and a nurse from the hospital or an on-call ambulance nurse. A transport service is also provided for day services and for external clinics.

(iv) North Eastern Health Board

The Ambulance Service is controlled centrally from the Ambulance Command and Control Centre in Navan with ambulances located at 5 bases in Cavan, Monaghan, Dundalk, Drogheda and Navan. Staffing of each emergency ambulance is provided by an ambulance driver and a hospital nurse. A minibus service is also provided at each ambulance base for routine transport to clinics, day service and special schools/training centres.

(v) North Western Health Board

The Ambulance Service is controlled centrally from an Ambulance Command and Control Centre in Ballyshannon, Co Donegal with ambulances located at 11 bases as follows: Co Donegal (8), Leitrim (2), and Sligo (1). Staffing of the emergency ambulances at the two main centres (Sligo and Letterkenny) is provided by 2 ambulance personnel and staffing of emergency ambulances at the 9 smaller peripheral bases is provided by an ambulance driver and an ambulance nurse. Transport is provided for day services, training centres and external clinics.

(vi) South Eastern Health Board

Control of ambulance operations is provided from four Command and Control Centres (Clonmel, Kilkenny, Waterford and Wexford) during normal working hours Monday to Friday but control reverts to the local hospital at weekends and after 5 p.m. each day. The ambulances are located at 10 bases as follows: Waterford (2), Wexford (4), Tipperary (2), Kilkenny (1) and Carlow (1). Staffing of each ambulance at 6 of the bases is provided by 2 ambulance personnel and staffing of ambulances at the other bases is provided by an ambulance driver and an ambulance nurse. The South-Eastern Health Board also provides an extensive transport service for patients attending clinics, day centres and similar Health Services.

(vii) Southern Health Board

Control of ambulance operations is provided from two Command and Control Centres in Cork City and Tralee with ambulances located at 12 bases in Cork and 6 bases in Kerry. Staffing of the emergency ambulances at the two main centres (Cork and Tralee) is provided by 2 ambulance personnel and staffing of emergency ambulances at the other centres is provided by an ambulance driver and an ambulance nurse. A limited transport service is provided for clinics.

(viii) Western Health Board

There are three Ambulance Command and Control Centres. There is a 24 hour Control Centre in Castlebar, and a daytime Control Centre in Galway and Roscommon, with night cover provided by the hospital concerned. Emergency ambulances are located at 9 bases as follows: Galway (4), Mayo (3) and Roscommon (2). Staffing of the ambulances is provided by an ambulance driver and an attendant. A limited transport service is also provided for patients attending clinics.

2.8 Role of Voluntary Agencies in the Provision of Ambulance Services

Voluntary ambulance services are provided by the Order of Malta, the St John's Ambulance Brigade and the Irish Red Cross. During the course of the Review, both written and oral submissions were received from organisations involved in the provision of voluntary ambulance services. As a result, the extent of the back-up support which these organisations provide for the statutory Service became evident to the Group. This support is particularly important during major crowd events and in the immediate aftermath of major accidents/emergencies. The Group would encourage continued co-operation between the voluntary and statutory agencies and would suggest that, where possible, links between these agencies should be strengthened, especially in the areas of training and emergency planning.

The Group recommends that, on occasions when voluntary agencies are providing a back-up role for the Ambulance Service, it is essential that they should function under the direction and control of the Health Board's Chief Ambulance Officer.

A profile of ambulance resources, by Health Board area, which are provided by other agencies, is set out in Table 4 on page 35.[1]

2.9 Civil Defence

The Group met representatives of Civil Defence during its review. The Group is very aware of the important role played by Civil Defence, especially in major emergency situations.

The Group recommends that, on these occasions when the Civil Defence Ambulance Service supports the Health Boards' pre-hospital care services, the Civil Defence Ambulance Service should work under the direction of the Chief Ambulance Officer of the relevant Health Board.

2.10 Private Ambulance Services

Unlike some other European countries, Ireland has a very small private ambulance service. The majority of the calls which are handled by the private operators involve the inter-hospital transfer of private patients. The private services also respond to a limited number of emergency calls, in the event of callers contacting them directly.

Occasionally, during peak periods, when all emergency ambulances may be temporarily engaged, a Health Board may utilise a private ambulance service in a back-up capacity for a limited period. In addition, a Health Board may call on a

private ambulance service to augment the statutory and voluntary ambulance services in the event of a major emergency.

The Group considers that it is a matter for each Health Board to determine when it is practical, feasible and economical to use a private ambulance service to meet its requirements.

The Group recommends that, when private ambulance services are used by any of the statutory health agencies, these services should be subject to the same training, equipping and certification requirements as laid down by the National Ambulance Advisory Council (see Chapter 13), which apply to the statutory Ambulance Service.

TABLE 4

Non-Health Board Ambulances

Health Board County	Red Cross	Order of Malta	St. John's Ambulance Brigade	Private	Industry	Civil Defence	Defence Forces	Total
Eastern								
Dublin	7	20	7	11	—	3	4	52
Kildare	3	7	—	—	—	1	4	15
Wicklow	4	5	—	—	—	1	—	10
Midland								
Laois	—	3	—	—	—	1	—	4
Longford	—	—	—	—	—	1	—	1
Offaly	—	3	—	—	—	1	—	4
Westmeath	—	2	—	—	—	1	2	5
Mid Western								
Limerick	1	3	2	2	1	2	1	12
Clare	1	1	—	—	1	1	—	4
Tipperary NR	—	5	—	—	—	1	—	6
North East								
Cavan	—	—	—	—	—	1	—	1
Louth	4	4	—	—	—	1	1	10
Meath	4	2	—	—	1	1	1	9
Monaghan	—	—	—	—	—	1	—	1
North West								
Donegal	2	—	—	—	—	1	1	4
Leitrim	—	—	—	—	—	1	—	1
Sligo	—	1	—	—	—	1	—	2
South East								
Carlow	2	1	—	—	—	1	—	4
Kilkenny	—	2	—	—	—	1	—	3
Tipperary SR	2	2	—	—	1	1	—	6
Waterford	4	3	—	—	—	2	—	9
Wexford	1	3	—	—	—	1	—	5
Southern								
Cork	12	8	2	3	9	3	2	39
Kerry	1	2	—	—	—	2	—	5
Western								
Galway	3	8	—	—	—	2	—	13
Mayo	1	10	—	—	—	1	—	12
Roscommon	—	1	—	—	—	1	—	2
Total	52	96	11	16	13	35	16	239

It should be noted that ambulances belonging to the Civil Defence and voluntary agencies are staffed by volunteers and are not generally available, except by prior arrangement or in the event of a major emergency.

Defence Forces Ambulances are not normally available except in the event of major emergencies.

CHAPTER 3

Pre-Hospital Emergency Medical Care

3.1 The Development of Pre-Hospital Emergency Care

Since its early development, the Ambulance Service in Ireland has seen its function as the transport of patients to hospital. For much of this period, the emphasis was mainly on the speed at which the patient was transported to hospital and this was seen as the most important measure of performance by the Ambulance Service.

Relatively recent developments, however, have enabled the Ambulance Service to provide a much more significant level of service at the scene of the incident. The emphasis has, therefore, shifted from the need to administer Basic Life Support to the patient and to effect a speedy transfer to hospital, to one of providing the most appropriate treatment at the scene and transporting the patient to hospital in a stabilised condition with all due speed.

During this period, there has been a growing recognition of the importance of pre-hospital emergency care. There has been a realisation that the quality of the pre-hospital medical care which the patient receives may not only determine survival but also the extent and length of hospital care required and the quality of life after discharge. In this context, therefore, the Ambulance Service has the key role in the provision of pre-hospital emergency medical care.

3.2 Basic Principles in the Provision of Ambulance Services

Availability of Emergency Medical Service (EMS) personnel and equipment should be the first goal and priority of any Emergency Medical Service system. [2]

Treatment of the patient commences upon arrival of the first responder to the emergency call. The education, training, structure, management, co-ordination and communication facilities of the Emergency Medical Services should aim at providing both Basic and Advanced Life Support.

3.3 Basic Life Support

Basic Life Support techniques are already included in the training for existing ambulance personnel and should form part of a continuing education programme for ambulance personnel, with refresher courses at appropriate intervals in order to aid skill retention and to provide updated information on new developments within the area of pre-hospital care. The basic training course should include a module on emergency pre-hospital cardiac care. However, to extend the care provided in the pre-hospital area, it will be necessary for certain ambulance personnel to receive Advanced Life Support training, and the elements of such training are described in the following paragraphs.

3.4 Advanced Life Support

A number of studies have demonstrated the improvement in pre-hospital care with the development of Advanced Life Support (ALS). Aphrahamian, Fortner, Jacobs, Reines, have all reported on the reduction in mortality of trauma victims treated by ALS systems compared to those treated by a Basic Life Support System. [3-6]

Ornato noted a 24% reduction in trauma deaths following the introduction of an emergency medical care system.[7] Cwinn demonstrated the expeditious manner in which BLS and ALS care systems can be delivered at the scene. This study showed that a major advance in the emergency care of the injured person during the past decade was the extension of life-saving manoeuvres from the Accident and Emergency Department to the pre-hospital care arena.[8] For example, the United States National Center for Health Services Research in 1981 reported a 15% increase in admissions and a 10% increase in discharged survivors of cardiac arrest after the implementation of a paramedic service in King County, Washington.[9]

3.5 Training Requirements for Advanced Life Support

Ambulance personnel who successfully complete ALS training should be competent in the following areas:

(i) Airway

They should be able to determine the adequacy of the airway, maintain a clear airway and use advanced airway management techniques. If a traumatic injury is present, it is essential to immobilize the patient, particularly the cervical spine whilst maintaining the airway. Cervical immobilisation devices should be used in conjunction with the existing Stiff-Neck collars.

(ii) Breathing

If breathing is deemed to be inadequate, ventilation should be supported with manual bag-valve-mask reservoir devices capable of delivering 100% oxygen.

(iii) Circulation

The circulatory system should be assessed by clinical examination and measurements taken of pulse and blood pressure. External haemorrhage should be controlled by

pressure dressings whilst fractures are splinted, if indicated, with traction splints to aid anatomical alignment to prevent further injury. Analgesia, if indicated, should be provided.

(iv) Cardiopulmonary Resuscitation

Personnel should be capable of performing Advanced Cardiac Life Support (ACLS) (see Chapter 4) including the management of life-threatening arrhythmias. In addition, they should be proficient in the management of congestive heart failure with acute pulmonary oedema and cardiogenic shock. See Chapter 4 and **Appendix D**.

(v) Specific Conditions

ALS trained ambulance personnel should have the ability to manage the following conditions:

Respiratory:
Respiratory distress syndrome
Acute asthma attack
Chronic obstructive pulmonary disease

Medical:
Hypoglycaemia
Hyperglycaemia
Seizures
Status epilepticus
Drug ingestion
Hypothermia
Anaphlyactic shock
CVA (Stroke)
Obstetric/Gynaecological emergencies

Trauma:
Multiple trauma
Hypovolaemic shock
Traumatic arrest
Neurogenic shock
Near drowning
Thermal burns
Chemical exposure
Mass casualty incidents — triage

The paediatric management of the above conditions should also be included as part of an ALS training programme.

Strict medical control is essential in the operation of a pre-hospital care service which contains an ALS component. As pre-hospital care by the Ambulance Service is an extension of the care provided by the Accident & Emergency Department, it is of the

utmost importance that senior medical staff are involved at all levels in the training and education of the ambulance personnel.

3.6 Advanced Emergency Medical Systems

There are many models of care for emergency medical systems. In many developed countries, and in particular in the United States, a two-tier Emergency Medical Service is provided. The first tier is an emergency medical technician defibrillation (EMT-D) service and the second tier is a paramedic service (EMT-P). Pre-hospital Advanced Cardiac Life Support can generally be delivered by either paramedics or by emergency physicians who respond in specially equipped vehicles called mobile coronary care units (MCCU) or mobile intensive care units (MICU). In the United States, paramedics receive 1000-3000 hours of classroom and field instruction and can provide intubation, defibrillation, thrombolysis and intravenous medication. In other countries, ACLS may form part of the first line response such as in Norway and Australia where the population density is low. In whatever manner ACLS is delivered, the aim is to provide ACLS within 20 minutes of the cardiac arrest.

3.7 Activation and Response Times for Emergency Ambulances

Activation Times

Ambulance activation time is the time elapsed from the receipt of an emergency call at the Ambulance Command and Control Centre to the departure of the emergency ambulance from the ambulance base.

The Group considers that the activation times for emergency ambulances are generally within acceptable limits and that there is no undue delay between the receipt of emergency calls by ambulance Command and Control Centres and the dispatch of emergency ambulances to the scene.

Response Times

Ambulance response time is the time elapsed from the departure of the emergency ambulance from the ambulance base to its arrival at the scene.

While emergency ambulance activation times are similar throughout the various Health Boards, the response times vary widely throughout the country due to the disparity in the distances that must be travelled by an ambulance from its base to the scene. The location of emergency ambulance bases should be determined by the need to minimise the response times for the area and population served.

Response times for the Ambulance Service in Ireland have not been reviewed since 1971, when a maximum response time of 30 minutes was recommended following a study by the Organisation Research Unit of the Department of Finance.[10] As services evolve, there is a need for regular review of the response times set, to take account of changes in demography and Health Service provision. A survey by the Group, of response times in all Health Boards during the month of February, 1992, showed that an average response time of 8 minutes in urban areas and 26 minutes in rural areas should be attainable following receipt of an ambulance call.

The Group recommends that the regular monitoring of ambulance response times should facilitate an assessment of the adequacy of the resources available to ambulance bases in relation to the areas and population served. This monitoring function should be undertaken by the National Ambulance Advisory Council.

The lower the population density the greater the difficulty and the greater the resources required to meet these targets. Other factors which may affect the service provision and targets are the quality of the road system and the type of terrain covered.

3.8 Patient Reports — Ambulance Personnel Reporting Procedures

The history relating to an event can provide valuable information to the receiving doctor managing the patient as to the nature of injuries or illnesses. This is best illustrated in the road traffic accident situation where the mechanism of injury such as frontal, side or rear collision can alert the doctor to specific injury patterns. The extent of damage to the vehicle such as deformation of and intrusion to the passenger compartment can give a clue to the velocity of forces involved and severity of the impact. For example: deformation of a steering wheel points to chest injuries and the "bull's-eye" shattering of a windscreen may be evidence of intracranial injuries associated with cervical spine injuries. It is also of advantage to know if the patient has been ejected from the vehicle or if another person has died from the impact. An example of a medical situation would be the time of collapse of a cardiac arrest victim, if it had been witnessed, and if anybody had performed Cardiopulmonary Resuscitation.

No such formal reporting arrangements are currently in place and the information gathered is to a large extent dependent on the ambulance personnel transporting the patient.

Patient Report Form

The Group considers that a patient report form is essential to detail the care provided and enable a means to audit the activities of pre-hospital care personnel. The present lack of such a form makes it extremely difficult to quantify the level of care that exists in the present service. It is considered that the introduction of a standardised patient report form would be particularly beneficial in the context of pre-hospital cardiac care. In the course of various meetings with Ambulance Services, the Group obtained examples of suitable patient report forms. Such forms have several objectives including giving Accident and Emergency Departments vital information on the patient's history and his/her medical condition. These forms also aid skill retention by ambulance personnel and they may have medico-legal significance. They are also important in determining whether cardiac treatment protocols have been adhered to and in assisting the audit process regarding patient outcome data.

The Group recommends that a standardised patient report form should be introduced, and that its use should be mandatory for all Emergency Ambulance Services. The correct method of completing this form should be covered in the induction/basic and refresher/ development training programmes.

A model patient report form is set out at **Appendix E.**

CHAPTER 4

Pre-Hospital Emergency Cardiac Care

4.1 Background

The first cardiac ambulance service was provided by a private ambulance company in Dublin in 1968. In 1979, the Eastern Health Board took over this service on a pilot project basis. Since then, there have been major international developments in the area of emergency pre-hospital cardiac care, arising from the findings of numerous studies. These findings are of particular importance in Ireland which is still in the early stages of developing its pre-hospital emergency cardiac care services.

In addition, the donation by the Irish Heart Foundation of mobile coronary care units to a number of hospitals in recent times and the difficulties encountered in establishing this service have made it necessary to examine and evaluate this development in the context of the future provision of pre-hospital cardiac care.

It was therefore considered important that the entire pre-hospital emergency cardiac care area should be examined in depth to ensure that a fully integrated service could be developed which would provide maximum benefit to the patient in need of this specialised care.

4.2 Cardiac Data obtained from the Ambulance Service Questionnaire

Data extracted from a questionnaire issued by the Group in relation to pre-hospital cardiac care have shown that five Health Board areas provided an ambulance defibrillation service. In one of these areas, the defibrillators were manual and in the other four areas they were semi-automatic. Two Health Board areas had conducted an evaluation of the service provided and by-stander Cardiopulmonary Resuscitation (CPR) was also available in two Health Board areas. In Health Board areas where the patients' outcome had been evaluated, it was encouraging to note that it was possible to provide defibrillation within 5 minutes of the emergency call being made and the majority of these patients survived to reach hospital.

Unfortunately, little information was available on long-term patient outcomes. Overall, the questionnaire has shown that most areas do not yet audit the activities or outcomes of their pre-hospital cardiac care service on a continuous basis.

4.3 The Medical Problem

Ischaemic heart disease is one of the leading causes of death in Western countries. In the U.S.A., cardiovascular disease accounts for just under 1 million deaths per annum and one and a half million patients suffer a myocardial infarction every year.[11] In Ireland, ischaemic heart disease accounts for one in four deaths and Ireland comes close to the top of the international league table in deaths from heart disease.[12]

"Heart attack" or myocardial infarction continues to have a poor prognosis which is largely due to sudden death. Two thirds of deaths due to myocardial infarction occur outside hospital. From every 100 patients with myocardial infarction, 25 die in the community without medical intervention.[13,14] Approximately half of the deaths that occur from a heart attack are within two hours of the onset of symptoms and probably a third are instantaneous. Sudden cardiac death is caused by ventricular fibrillation in the majority of cases and successful defibrillation is required immediately to prevent loss of normal cerebral function. Most patients who suffer a cardiac arrest will have severe coronary disease but not all have evidence of a myocardial infarction. Ventricular fibrillation occurring due to other causes, such as severe trauma, carries a considerably worse prognosis.

4.4 Core Principles

The Group acknowledges that deficiencies exist in the emergency pre-hospital cardiac care service currently provided in Ireland. The Group accepts that a number of core principles should therefore be adopted in relation to the provision of an improved service:—

1. People have a right to expect high quality pre-hospital cardiac care and there should be equality of access to this service for all citizens throughout the country.
2. This service must be provided within the context of an overall pre-hospital emergency care service.
3. A reduction in cardiac morbidity and mortality should occur as a result of the introduction of pre-hospital cardiac care programmes.
4. The principle of the "chain of survival" should be adopted as the model to be followed in emergency pre-hospital cardiac care.

4.5 The "Chain of Survival"

Many countries are now attempting to integrate into pre-hospital care programmes the various aspects that affect the patients' survival. Most programmes are based on improving the links in the "chain of survival" of out-of-hospital cardiac arrest. These are the elements which must be in place in order to optimise the possibility for a patient in cardiac arrest to survive. The components in the "chain of survival" are

(i) early access to emergency medical services,

(ii) early Cardiopulmonary Resuscitation (CPR),

(iii) early defibrillation and

(iv) Advanced Cardiac Life Support (ACLS)

In recent years, there have been major developments in the entire pre-hospital cardiac care area. Several factors are now known to influence survival from out-of-hospital cardiac arrests. These include witnessed cardiac arrests, early telephone notification of the emergency medical services, early initiation of Cardiopulmonary Resuscitation, rapid arrival (within minutes) of emergency personnel equipped with a defibrillator, and possibly early advanced management of the patients airway and intravenous medication. These factors make up the links in the "chain of survival". If all the links in the "chain of survival" are put in place, the chance of a favourable outcome from sudden cardiac arrest is improved significantly.

The Group considers that this approach will make a worthwhile contribution to achieving the aim expressed in the WHO document "Health For All by the Year 2000" that by the year 2000 mortality from diseases of the circulatory system should be reduced in the case of people under 65 years by at least 15%.

The Group recommends the adoption of the "chain of survival" as a core principle with regard to the provision of a national pre-hospital emergency cardiac care service.

As mentioned earlier, there are four key elements in the "chain of survival". The method of service delivery may vary between urban and rural areas. In the following paragraphs, these four elements are examined and recommendations set out in respect of each element.

(i) Early Access to Emergency Medical Services

Early treatment is important whenever a patient suffers a cardiac incident. The spectrum of cardiac disease ranges from cardiac arrest where immediate treatment is necessary to prevent death, to conditions such as a heart attack where although treatment is urgently required, therapies such as thrombolysis (administration of clot-dissolving drugs) are effective even if given several hours afterwards. In this Report the "chain of survival" model refers generally to situations of extreme urgency such as cardiac arrest and a separate section of the Report addresses the issue of thrombolysis. (Chapter 4, Section 7).

Time is a key factor in saving cardiac arrest victims. It is necessary to emphasise the importance of making the patient aware of the need to seek the earliest possible access to emergency cardiac care. In emergency situations such as a cardiac arrest or heart attack, the "chain of survival" begins when the medical emergency is recognised and the emergency services are accessed and activated. Many factors influence this process. These include the patient or a bystander recognising the emergency, the delay in deciding to call for help, time spent locating a telephone, interrogation of the caller by the ambulance controller and the time spent in dispatching an emergency ambulance to the incident.[15] (See Chapter 8).

Many individuals who witness a person collapsing may not recognise the signs of a cardiac arrest and do not comprehend the seriousness of the situation. Valuable time may be lost before a decision is made to call an ambulance. A report on cardiac ambulance services in Dublin[16] has noted that a significant percentage of patients with chest pain make their own way to hospital without notifying the emergency services. This poses problems and emergency treatment such as defibrillation may not be administered. This suggests some lack of public awareness on cardiac arrest and on situations when an ambulance should be called.[17] A recent Irish survey on the general public's knowledge of heart attack symptoms is more reassuring and focuses on areas where knowledge could be improved.[18]

Internationally, education campaigns to strengthen public awareness have resulted in earlier access to emergency medical services.

The Group recommends that a public awareness campaign should be developed to educate the public to recognise the symptoms of cardiac arrest and when and how to call the Ambulance Service. Voluntary agencies, such as the Irish Heart Foundation, which has considerable expertise in organising public awareness campaigns, should be given responsibility for the development of these campaigns nationally. The Department of Health and the Health Boards, in association with these voluntary agencies, should develop a strategy for providing these public awareness campaigns.

(ii) Early Cardiopulmonary Resuscitation (CPR)

The second link of the "chain of survival" is early initiation of basic CPR. The purpose of CPR is to assist pulseless, non-breathing patients in maintaining respiration and circulation until further medical intervention in the form of defibrillation, intubation and medication arrives. To be effective, CPR must be initiated early, within 4 minutes if possible. There is evidence that when bystanders start CPR early, the patient is more likely to be in ventricular fibrillation (a cardiac rhythm that responds well to treatment) when the defibrillation unit arrives. Studies have shown that approximately 70% of patients who received early CPR were in ventricular fibrillation or tachycardia when emergency teams arrived compared to approximately 50% of patients without early CPR.[15] If early effective CPR is initiated, the patient may remain in ventricular fibrillation for up to 12 minutes and after this time the rhythm deteriorates to asystole. Once the patient's rhythm is in asystole, very few patients are successfully resuscitated. Early CPR buys time and increases the likelihood of a successful outcome.

Patient outcome data from community CPR programmes have been extensively reviewed by the American Heart Association and have concluded that survival rates are improved significantly in areas where such programmes exist.[15] They have suggested that if 20% of adults were trained in CPR, morbidity and mortality from out of hospital cardiac arrest would improve significantly. An Irish study has demonstrated, however, that CPR skills are rare amongst the general public.[19]

The Group has reviewed the evidence regarding bystander CPR programmes. A

number of studies have shown bystander-initiated CPR to be of benefit to some victims of cardiac arrest.[20-26] The benefits of bystander-initiated CPR have included improvements in survival and neurologic outcome which depend upon two crucial time intervals namely:

(a) the interval from collapse to the initiation of CPR and

(b) the interval from collapse to defibrillation.

A detailed review by Cummins and Eisenberg[22] has compared the effectiveness of bystander-initiated CPR with CPR begun by the professional first responder team. The main results of this comparison are summarised in **Appendix F** and show significant differences in the numbers of people resuscitated in the two groups.

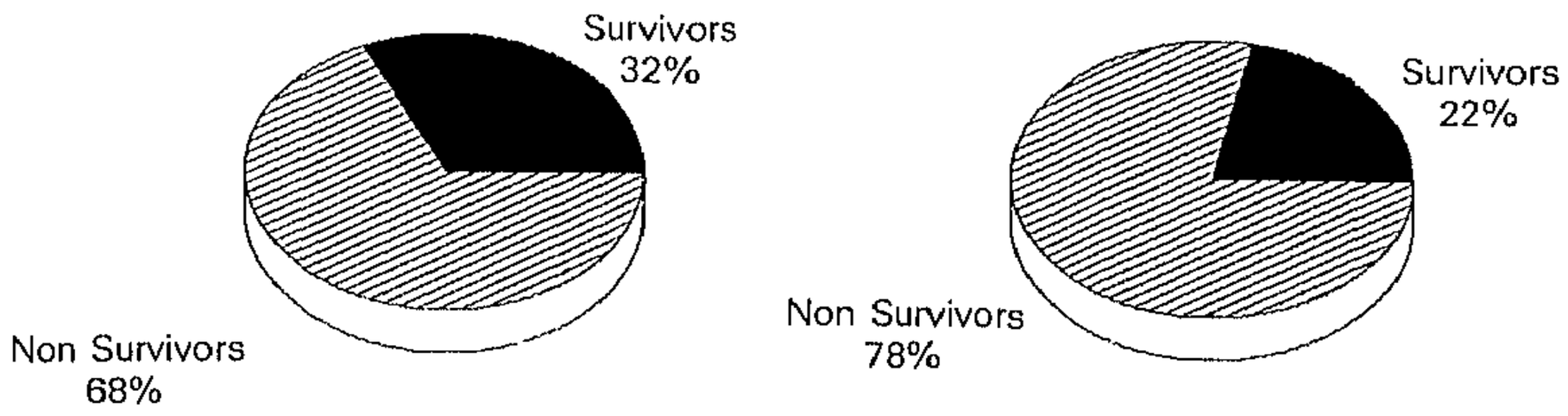
The analysis also showed that those patients receiving CPR had better survival rates than those who did not receive CPR (32% versus 22% survival respectively). The results are illustrated in Figure 1 below. The authors conclude that:

> "The balance of the evidence leans heavily in favour of the concept that early bystander-initiated CPR leads to better survival rates than delayed, emergency medical service (EMS)-initiated CPR."

FIGURE 1

CARDIAC ARREST SURVIVAL

BYSTANDER INITIATED CPR*



*Cardiopulmonary Resuscitation (CPR)

Other studies have looked at improved morbidity after early CPR.[27] These results suggest that, when defibrillation is available shortly after cardiac arrest, CPR may improve ease of resuscitation and neurologic outcome, i.e. survival without subsequent brain damage.

Not all studies show a benefit from bystander CPR.[28,29] This can be explained in some situations where health professionals were able to deliver ACLS very soon after the cardiac arrest, so the benefits from bystander CPR were not clear-cut. CPR skill retention may also have been a factor in this process.

On balance, however, there is considerable evidence to suggest that bystander-initiated CPR improves the outcome of out-of-hospital cardiac arrest when it occurs as part of an effective "chain of survival" programme. CPR buys time and allows definitive treatment to be initiated so that a spontaneous circulation is restored.

The concept of the "chain of survival" which integrates all of the elements of pre-hospital care into a co-ordinated operation should be regarded as the model to be followed by all systems of emergency pre-hospital cardiac care. CPR training for the public, in sufficient numbers to make it likely that a witness to a cardiac arrest possesses basic life-saving skills, is crucial to the success of the concept. The benefits of CPR training programmes are likely to include the following:

1. A reduction in delay times for treatment of acute myocardial infarction (heart attack) and cardiac arrest by educating people about the recognition of important signs and symptoms and by reducing their anxieties about calling for help.
2. The acquisition of CPR teaching skills by members of the public. In order to train the number of people required, the use of volunteers is essential. However, this work should be co-ordinated, structured and evaluated and appropriate targets should exist for these programmes.
3. The provision to the public of an important opportunity to acquire simple health promotional information on cardiac disease and general health matters.

The Group recommends that bystander Cardiopulmonary Resuscitation should be widely available throughout Ireland. This will enable the first and second links in the "chain of survival" — early access to the emergency care system and early CPR — to be provided promptly.

The Group recommends that public education and bystander Cardiopulmonary Resuscitation programmes should be established and should include the recognition of early indicators of heart attack and cardiac arrest. Participants should also be trained to alert the emergency medical care system at the earliest opportunity.

It is recognised that voluntary and community bodies will largely be responsible for implementing the bystander CPR teaching programme.

Because early Cardiopulmonary Resuscitation forms a vital link in the "chain of survival", the Group recommends that voluntary agencies such as the Irish Heart Foundation, which has considerable expertise in CPR techniques, should be involved in the development of CPR programmes and the setting of standards. The Department of Health and the Health Boards, in association with these voluntary agencies, should develop a strategy for providing these community programmes.

This strategy should include the preparation of a detailed protocol, with the assistance of the Department of Health, Health Boards, voluntary bodies and academic centres for the implementation of the programmes. The protocol should identify available

and required financial resources, expertise, equipment and other facilities. The protocol should also target a percentage of the population to be trained in CPR. It is suggested that approximately 10% of the adult population could be trained within a five-year period. Methods of monitoring the training and evaluation of CPR programmes should also be identified.

(iii) Early Defibrillation

(a) Need for Early Defibrillation

Approximately four out of five patients who suffer a cardiac arrest out of hospital experience ventricular fibrillation or tachycardia after collapse. Prompt defibrillation restores a normal spontaneous rhythm in the heart. Many hospital studies have confirmed the value of immediate defibrillation with successful outcome rates approaching 90%.[30,31] In pre-hospital programmes, similar success rates cannot be achieved, largely due to time delays. In early studies, pre-hospital defibrillation was initially confined to paramedic-only programmes in the United States and the time between the patient's collapse and the paramedics arriving averaged more than twelve minutes. Such defibrillation would be more appropriately termed "late defibrillation". It is now recognised that the earlier the defibrillation, the better the chance of success. To be successful, defibrillation should ideally be performed within four minutes of the cardiac arrest. Every minute's delay after this dramatically reduces the chance of a successful outcome.[32-37] In Western countries, various new approaches have been developed to achieve early defibrillation such as:

- Automated external defibrillators (AED's) used by front-line emergency personnel.
- Automated external defibrillators (AED's) used by community responders.
- Home defibrillation programmes for high risk patients.

In whatever setting pre-hospital defibrillation is provided, it is important that its use be closely monitored.

The Group recommends that, where either an individual or an organisation provides a defibrillation service, a system of regulation should be introduced to ensure that proper training, supervision and certification are also provided.

(b) Defibrillation by Emergency Ambulance Personnel

In an attempt to reduce the time to defibrillation, programmes have been developed to allow emergency ambulance personnel to operate defibrillators. Experience from other countries has shown that initial concern about allowing emergency ambulance personnel to operate defibrillators has diminished with the publication of favourable outcome results from such programmes.

One of the tasks of the Group was to evaluate the international literature with respect to early defibrillation. A detailed analysis was undertaken and the results are set out at **Appendix G.** Overall 7% of persons who suffer a cardiac arrest and are resuscitated by emergency ambulance personnel trained in defibrillation survive to hospital discharge.

This figure improves to 9% where the arrest is of cardiac aetiology and 16% where the patient was found to be in ventricular fibrillation initially. The important comparison is between survival rates in communities who either do not have defibrillation programmes or the "before" and "after" survival figures when the programme is initiated. In the detailed analysis the respective survival figures for communities without a defibrillation service were 2%, 2% and 3%. Statistical testing confirmed the improved survival rates using emergency ambulance personnel trained in defibrillation. Patients who suffer a cardiac arrest are four to five times more likely to survive to hospital discharge if they are managed by such a service.[38]

On this basis, the Group recommends that every emergency ambulance should be equipped with a defibrillator.

It was noted that there is some variation in survival rates in programmes where emergency ambulance personnel are trained in defibrillation. Several factors may influence this, the most important being the average time to defibrillation.

Defibrillation should be performed as early as possible, ideally within four minutes for optimal survival; defibrillation within eight minutes results in good survival rates but defibrillation after twelve minutes is unlikely to succeed. In spite of the time limitation, there is evidence from the United States that an emergency ambulance defibrillation service can be effective not only in large communities but also in smaller less densely populated rural communities.[39]

(c) Economic Considerations

The University of York Centre for Health Economics has estimated that for every ambulance staffed around the clock by ambulance personnel with extended training, five lives would be saved per annum.[40] In 1988, it was estimated that in Northern Ireland, additional lives would be saved if a defibrillation and paramedic programme were in place. The average cost of defibrillation training per student was estimated at £186 and for extended training (paramedic) £1,490 per student.[41]

In Sweden, the incidence of cardiac arrest is approximately 100/100,000 population per annum. In 1987, Jakobsson demonstrated that an additional 3.5 lives per 100,000 population per annum would be saved by an ambulance defibrillation service.[34]

The average cost per life saved was $14,700 based on 1986 prices and all costs were taken into account (e.g. the cost of extra hospital admissions etc). In economic terms, a more useful estimation is the marginal cost per life saved due to the introduction of the ambulance defibrillation programme and this amounted to only $1,800 per life.

It is difficult to be exact as to the number of additional lives that could be saved if an emergency ambulance defibrillation service were in place throughout Ireland. Extrapolating on the figures above, it is estimated that this would be in the region of 100 to 130 lives per annum.

(d) Defibrillation Equipment

The principle of early defibrillation is that defibrillation should be provided to the appropriate patients as early as possible. Defibrillators are generally of two main categories, namely manual defibrillators or automated external defibrillators (AED's). There are two types of AED, fully-automated and advisory. AED's are highly accurate and reduce the need for training in the complex skills of rhythm recognition. Sensitivity and specificity rates are approaching 100%.[42-44] Automated external defibrillators also deliver the first shock up to one minute faster than manual defibrillators because of the speed with which these devices can be attached and with which they operate. The operator attaches the defibrillator to the patient's chest and, when activated, the device analyses the rhythm and either delivers a shock (fully automated defibrillator) or advises the operator that a shock is required (advisory defibrillator). Automated external defibrillators (both fully automated and advisory) are now in widespread use throughout the world and the American Heart Association has recommended their use in preference to manual defibrillators.

During the review process, the Group had the opportunity to meet with representatives of the Ambulance Service both in Ireland and abroad to discuss the use of both manual and AED defibrillators. The experience in Northern Ireland (The Eastern Health and Social Services Board) and Scotland (Heartstart Programme) confirmed the efficacy of advisory defibrillators and good outcome data were reported from these centres. An important factor is that advisory defibrillators reduce the amount of time spent on training and are also suited to low volume call areas.

The Group recommends that the defibrillation equipment in emergency ambulances should be of the advisory external defibrillator (AED) type. Equipment used by the Ambulance Service in different Health Board areas should, as far as possible, be compatible.

The Group recommends that it should be a priority to adequately train as many emergency ambulance personnel in the use of defibrillation equipment in as short a time as possible so that the greatest number of lives may be saved.

The Group recommends that Emergency Ambulance Services should conduct ongoing audit of their service such as activation and response times and patient outcome data. In every situation where a defibrillator is used, the audit should include time to defibrillation, review of the patient report form, E.C.G. recordings and patient outcome to hospital discharge. There should be direct medical input into this audit process at local level.

(e) Pre-Hospital Emergency Cardiac Care Training

Pre-hospital emergency cardiac care training should include all responses necessary to deal with sudden and often life-threatening events affecting the cardiovascular and pulmonary systems. Emergency transportation alone, without life support, does not constitute pre-hospital emergency cardiac care. Although transportation is an important aspect of pre-hospital emergency cardiac care, the major emphasis is on

early provision of definitive care when needed (e.g. defibrillation), use of CPR when needed and stabilization of the patient. In addition, more advanced life support procedures may also be required. In order to achieve this definitive care, it is essential that the emergency ambulance personnel who are treating the patient have received the necessary pre-hospital emergency cardiac care training. A proposed structure for a pre-hospital emergency cardiac care training module is set out at **Appendix D**. This should form part of the revised training requirements for ambulance personnel, (see Chapter 12).

(f) Community Defibrillation

Throughout the country, local communities should adopt the principle of early defibrillation, ideally within 4 minutes but up to 8 minutes is an acceptable guideline. It is recognised that this rapid response will be difficult to achieve in rural and remote communities and innovative mechanisms are required to meet these targets. One such way is the performance of first responder defibrillation by local health professionals such as is used by General Practitioners in the Ards Peninsula in Northern Ireland.

The Group recommends that a pilot project be established which will evaluate the use of advisory defibrillators in a number of general practices in areas where emergency ambulances are not immediately available.

The Group envisages that advisory external defibrillators (AED's) should be evaluated in approximately five General Practitioner practices and that the evaluation be performed with the assistance of the Irish College of General Practitioners or another suitable academic body. It would be intended that General Practitioners participating in this programme would receive Advanced Cardiac Life Support (A.C.L.S.) training, in addition to training in defibrillation, and that they would provide a response which is fully integrated with that of the Emergency Ambulance Service.

Other methods of first responder defibrillation should also be evaluated in due course. First responder defibrillation does not necessarily have to be administered by a health professional; what is important is that whoever administers this treatment is properly trained, supervised and certified.

(g) Home Defibrillation

While such programmes can be defined as part of pre-hospital programmes, the identification and management of such high risk patients requires very close links with the Cardiology Department of the hospital. There is ongoing research into the identification of high risk patients and recent techniques, including transtelephonic defibrillation (where the patient's rhythm is transmitted to the hospital and a decision is made whether or not to defibrillate the patient) are being evaluated. These research projects may prove beneficial,[15] and the results should be closely monitored in terms of efficiency and effectiveness by hospitals and Ambulance Services.

(iv) Advanced Cardiac Life Support (ACLS)

While early CPR and early defibrillation are probably the most important links in the "chain of survival", some patients with cardiac arrest require further medical support. Advanced Cardiac Life Support (ACLS) provides the additional knowledge and skills which may be necessary in these circumstances. ACLS includes (1) Basic Life Support (BLS); (2) the use of associated equipment and special techniques for establishing and maintaining effective ventilation and circulation; (3) ECG monitoring and arrhythmia recognition; (4) establishment and maintenance of intravenous (I.V.) access; (5) therapies for emergency treatment of patients with cardiac or respiratory arrests; (6) treatment of patients with suspected acute myocardial infarction (MI).

The key question regarding the effectiveness of Advanced Cardiac Life Support systems is what incremental benefit can be derived from ACLS compared to defibrillation alone. As part of its brief the Group examined the international literature on the effectiveness of the various methods of pre-hospital care delivery by emergency medical services. The results of this analysis are set out at **Appendix H**. The analysis of survival patient data demonstrated that paramedic services were most effective regarding survival after sudden cardiac arrest. The "survival to hospital discharge" figures for total arrests, arrests due to cardiac aetiology and arrests due to ventricular fibrillation are 8%, 14% and 25% respectively.

Corresponding figures for Mobile Coronary Care Units/Mobile Intensive Care Units (MCCU's/MICU's) are 3%, 7% and 29%. Survival data for MICU's is significantly less than that for paramedic services. This situation is explained by the longer activation and response times of the MICU. Some MICU services may not have full-time medical personnel dedicated to it with the result that it takes longer to mobilise such units.

4.6 Emergency Physicians

While survival data may not be at the same level as that with paramedic services, it is recognised that there may be a role for Mobile CCU's/ICU's, especially in rural settings where the population density is low.

The Group recommends that, where these services are already established, they should be fully integrated with the response by the existing Emergency Ambulance Service. The results from the operation of the existing doctor-staffed Mobile Coronary Care Units (MCCU's) should be evaluated and an assessment made regarding the effectiveness and efficiency of such Units. Resources should be made available to perform this evaluation which should form the basis for recommendations by the National Ambulance Advisory Council on the future role of this service.

4.7 Thrombolysis and Acute Myocardial Infarction

Until the development of Coronary Care Units in the 1960's,[45] management of the patient with acute myocardial infarction depended mainly on pain relief, physical and mental rest. The introduction of cardiac massage[46] and defibrillation were to prove major advances. During the 1960's and 1970's much effort went into the development of potent antiarrhythmic agents, to prevent or treat significant ventricular arrhythmias and reduce the chance of sudden death.

In the early 1980's attention switched to attempts to dissolve the clot by thrombolysis. Studies using intravenous thrombolytic agents showed that up to 75% of clots could be dissolved[47-56] in addition to a significant reduction in mortality.

For these reasons, current medical consensus is that patients seen within six hours of the onset of chest pain with ECG evidence of myocardial infarction and without any of the contra-indications should be given thrombolysis.

It is accepted that the earlier the therapy is given the better for immediate results and long-term morbidity. Various strategies are currently being developed to ensure early delivery of thrombolysis. A recent report[57] has suggested that "fast-tracking" of patients through the Accident and Emergency Department is one method of ensuring this. A large European study (EMIP) has confirmed that pre-hospital thrombolysis is both effective and safe when performed in a controlled setting by well trained staff. The results also show that treating heart attacks victims with thrombolytic therapy before they reach hospital, rather than waiting until they arrive, can reduce cardiac deaths by as much as 17%. In this study fully equipped mobile coronary care units with appropriate trained teams were used. The interval from onset of symptoms to administration of thrombolysis was approximately one hour in the pre-hospital setting.

A survey of Irish G.P.s has shown that home management of suspected myocardial infarction is now rare and that most G.P.s are conscious of the need for early thrombolysis.[58] A study from Seattle, the Myocardial Infarction Triage and Intervention Project, (MITI Trial) has shown that pre-hospital thrombolysis could be administered safely and effectively by paramedics[59] and further studies are underway elsewhere, looking at the delivery of pre-hospital thrombolysis by General Practitioners.

The Group considers that further research is needed to determine the most effective and safest way of delivering thrombolysis to all appropriate patients. It may be that solutions will be different in various countries and within countries, whether patients are seen in a rural or urban setting. What is not in any doubt is that thrombolysis has proven to be a major advance in the management of these patients. The earlier the therapy is given the better the outcome. A recent survey of all Coronary Care Units in Ireland showed that the median total delay time (onset of symptoms to admission to CCU) was 5 hours for the country as a whole.[60]

The Group recommends that hospitals should introduce arrangements to facilitate the "fast-tracking" of emergency cardiac patients into their Coronary Care Units.

The Group recognises that early thrombolysis is effective in reducing mortality in patients with myocardial infarction and recommends that every effort must be made to administer these drugs, preferably within six hours of the onset of chest pain, in order to maximise benefit.

The Group recommends that hospitals should develop appropriate protocols with regard to thrombolysis and other therapies for the treatment of cardiac arrest and heart attack. Co-ordination between pre-hospital (including General Practitioners) and hospital services should be improved and if research continues to demonstrate clear benefits in delivering thrombolysis in the pre-hospital setting, appropriate protocols should be developed.

CHAPTER 5

The Role of the Ambulance Service as Part of the Health Boards' Response to Major Emergencies

5.1 Emergency Planning Framework

A major emergency is any event which, usually with little or no warning, causes or threatens death or injury, serious disruption of essential services, or damage to property, beyond the normal capabilities of the Gardaí, Local Authorities (including Fire Services) and Health Services. Examples of such events include fires, explosions, spillages of dangerous substances, and transportation accidents.

The statutory response to major emergencies was defined in 1984 by an Inter-Departmental Committee chaired by the Department of the Taoiseach. This Committee established a framework for a co-ordinated response to major emergencies by the emergency services (Gardaí, Local Authorities, including Fire Services and Health Services).

In order to ensure that the response to a major emergency is prompt, co-ordinated and comprehensive, the framework sets out a uniform approach in relation to those matters which can be standardised nationally including activation, control of operations, allocation of functions and responsibilities between the services. The standard procedures as set out in the framework are incorporated in the plan of each emergency service.

The framework requires that each emergency service be fully conversant with the responsibilities and capabilities of the other emergency services in its functional area and adjoining areas and with their procedures in any emergency situation. Procedures laid down in the plans of each service should also be fully compatible.

The overall emergency response (i.e. the Major Emergency Plan) is therefore the combined plans of the agencies concerned which specify the accepted functions and responsibilities of each service.

5.2 Health Boards' Response to Major Emergencies

Health Boards have been prominent in all aspects of emergency planning and all Health Boards have developed major emergency plans in the context of the national framework. The main responsibilities of the Health Boards in the event of a major emergency are:—

- medical assistance at the site
- assessment of casualties
- ambulance transport
- hospital treatment
- welfare services and counselling
- certification of the dead.

The Health Boards also have statutory responsibilities as competent authorities under the European Communities (Major Hazards of Certain Industrial Activities) Regulations, 1986 (the so-called "Seveso Regulations" in relation to major hazard industries) and the National Radiological Plan.

5.3 The Role of the Ambulance Service in Major Emergencies

The Ambulance Service, as the mobile arm of the Health Boards, has a primary role in the immediate response phase of any major emergency.

The critical functions which the Ambulance Service must fulfil are:

(i) The reception of the initial alert and the transmission of the alert to other Health Services.

(ii) The transportation of equipment and Health Service staff to the scene, triage and provision of emergency pre-hospital care.

(iii) The transportation of casualties from the scene to hospital.

(iv) The provision of on-site and area-wide communication to support the casualty evacuation and the operations of other Health Services.

Detailed emergency plans have been prepared in each Health Board area and are regularly reviewed in conjunction with other emergency services in order to meet the above requirements.

The Group considers that the Ambulance Service must be appropriately trained and equipped in order to fulfil its role in major emergency situations. While the standard training, resources and normal operations of the Ambulance Service will form the basis for its response to major emergencies, provision must be made for extraordinary demands which such emergencies will place on the Service.

In order to assist the Health Boards' Ambulance Service in carrying out its responsibilities under the Major Emergency Plan, the Group therefore recommends that the following areas need continuous assessment and development:—

(a) **Standard operational procedures and training which can support both the Board's own operations, and incidents which involve mutual support across Health Board boundaries.**

(b) **Regular and realistic exercises involving the other emergency services, as well as Civil Defence and voluntary organisations.**

(c) **Standard equipment which can operate in field conditions including such items as lightweight stretchers, body pouches, power generators, protective clothing and communications systems.**

(d) **Mobile control and equipment vehicles which can support the Health Services' response at the accident scene.**

(e) **Links between voluntary organisations, Civil Defence and the statutory Ambulance Service should, where possible, be strengthened, especially in the areas of training and emergency planning.**

CHAPTER 6

Patient Transport Arrangements

6.1 Current Arrangements for Providing Routine Transport

The Group found that there is considerable variation in the extent of the routine transport service serving out-patient clinic attenders in each Health Board, and in the extent of the involvement of the Ambulance Service in providing transport for day hospitals and special schools/training centres. The development of day services in recent years has created extra demands for transport by the Ambulance Service. In some Health Boards, additional expenditure on patient transport services has required economies to be made in other areas of the Ambulance Service budget such as deferment of vehicle replacement.

The Group recommends that, for many elements of the routine patient transport service, hired transport may be more economical than operating a minibus at a centre for a limited five-day service. Economic considerations should dictate when hired transport should be utilised. However, it is accepted that the small number of emergency and urgent calls to some rural ambulance bases may not justify the separation of functions.

The Group recommends that the cost of transport for hospital discharges, day hospitals, day centres, training centres and special schools should be borne by the health agency concerned and should not be charged to the individual patient on whose behalf the service is provided.

6.2 Fleet Management

While the management of the ambulance fleet is the responsibility of each Health Board, advice on ambulance specification and tendering has been provided by the present Ambulance Services Council. The Council has provided an ambulance vehicle specification to conform to the Road Traffic (Construction, Equipment and Use) Regulations 1963 to 1993, to assess new vehicles against the standard required, to keep abreast of international developments, and to prepare and examine tenders.

The Group recommends that the National Ambulance Advisory Council should continue this function and should work closely with the Health Boards' National Value For Money Committee which has the responsibility for tendering/negotiating prices on behalf of all Health Boards.

This arrangement would ensure that the Boards' bulk purchasing potential could be maximised in the prices negotiated for vehicles and equipment.

6.3 Fleet Replacement

Effective utilisation of vehicles require a soundly based replacement policy.

The Group recommends that an efficient fleet management system incorporating a formal vehicle replacement policy, should be developed by each Health Board.

This system would ensure, inter alia, that vehicles would be replaced at the optimum time having regard to factors such as age, mileage, type of use, maintenance costs and the cost of new vehicles.

6.4 Transport of Critically Ill Patients

The Review Group was made aware that one area of concern to health personnel involved in intensive care and the care of neonates was the transfer of critically ill patients from hospitals to centralised special services. As many of these patients are intubated and ventilated, they may be accompanied by an experienced anaesthetist. This can have an impact on a small anaesthetic department in certain hospitals, and can entail the closure of an operating theatre for eight or nine hours.

The bulk of adult patients in this category tend to be referred for CT scan and neurosurgical assessment. It was suggested to the Group that the receiving specialist hospital should have access to the services of a Retrieval Team who would be experienced in the management of severely ill patients, which would assist in stabilising patients and then manage the transfer.[61] One option would be for the provision of a dedicated medical team. Alternatively, staff could operate on an on-call system. For example, a team familiar with the management of neurosurgical (head injury) multiple trauma patients who would travel in a dedicated ambulance would be able to optimise the patient's status prior to transfer and would be the most appropriate for the care of the patient during transfer. It has also been shown that, in the case of neonatal and paediatric transfers it is equally important, where necessary, to have suitably trained specialised teams available.[62, 63, 64]

Care of the critically ill or injured patient during transport plays an important role in the patient's ultimate outcome. Transport can be necessary from the scene of the emergency or accident, between care facilities or interhospital. Whatever the transport situation, it can cause various physiological changes, depending on factors such as patient profile and logistics (for example, space, power supply, available equipment). The team in charge of patient care must therefore be able to ensure proper operation

of the critical care equipment, monitor the patient's physiological data, and render appropriate clinical intervention when necessary.

A main principle in critical care transport is that the level of care during transport should at least approximate to the level of care in a fixed Intensive Care Unit. A review of relevant literature by the Group found that between 24% and 70% of transferred patients were inadequately stabilised prior to transport. Therefore, "transport" protocols used in trauma are evolving to "stabilise and transport" protocols for critical care medicine.[63]

One of the main reasons for transferring critically ill or injured patients is that they are best served by medical care delivery in a setting possessing the necessary range of facilities including monitoring technology, round-the-clock skilled personnel, invasive diagnostic capability, and comprehensive surgical care. A facility without these resources attempting the same level of care may cause delay and inefficiency, resulting in significantly increased cost of treatment and necessarily increased mortality and morbidity.[63]

Internationally, the regionalisation of health care for trauma, premature neonates, and burns patients has become commonplace and the value of a rapid transportation system has been demonstrated in the initial care of traumatically injured patients.[64]

The composition of the medical transfer team is one of the most crucial aspects of critical care transport. The team must be constituted to provide the expertise necessary for safe initial stabilisation of critically ill patients. They must also have the capability for rapid mobilisation to outlying patients and expertise in using sophisticated technical life support systems.[65]

While most critically ill or injured patients would be suitable for transfer by road, when time is vital the use of helicopter services may be appropriate for longer distance transports. However, this method may involve unexpected delays.[65] Potential problems during helicopter transport are at least as great as those of ground transport and the relative costs are very substantial.[66, 67, 68, 69]

Details of how to transport critically ill patients and how to organise a retrieval system have already been published internationally,[70] as have the minimum standards that should apply to such a service.[71] Proposals for the establishment of such a service in Ireland on a formal basis have been submitted to the Group.

The Group recommends that these proposals should be evaluated by the Department of Health together with the Intensive Care Society of Ireland, the Faculty of Paediatrics of the Royal College of Physicians and any other interested parties with a view to assessing the effectiveness and efficiency of establishing a specialised transport service for the critically ill.

6.5 Emergency Ambulance Equipment

The Ambulance Services Council had drawn up a list of equipment which it considered to be essential for all emergency ambulances.

The Group recommends that, each emergency ambulance should be equipped to a level to be specified by the National Ambulance Advisory Council and that there should be both a stock and maintenance check on the equipment in each emergency ambulance, on a weekly basis. Such specifications should be in conformity with any recognised European standards for ambulance vehicles and equipment.

6.6 Development of European Standards in relation to Rescue Systems (Ambulances)

The Review Group, in formulating its Report, has taken cognisance of the organisation and structure of other European Ambulance Services and of the need for its recommendations to comply with standards that might eventually be approved at European level.[72]

The Comité Européen de Normalisation (CEN) is the organisation which has responsibility for the planning, drafting and adoption of European standards in all sectors except electrotechnology (CENELEC) and Telecommunications (ETSI). CEN procedures guarantee respect for the following principles:

(a) Openness and transparency: all interested parties participate in the work programme;

(b) Consensus: standards are developed on the basis of voluntary agreement between the interested parties;

(c) National commitment: formal adoption of European standards is decided by a majority vote of C.E.N. National Members, binding on all of them;

(d) Technical coherence at European and national levels, which ensures continuity for the benefit of users.

The work of CEN is carried out through technical committees. Technical Committee CEN/TC 239 deals with rescue systems (ambulances). Three Working Groups have, to date, been established by CEN/TC 239:—

Working Group 1 — Medical vehicles and their equipment

Working Group 2 — Stretchers and other patient handling equipment

Working Group 3 — First aid materials and emergency medical equipment

These Working Groups are now in the process of preparing draft European standards to cover these three areas. It is the intention that these draft standards should eventually form a recognised European standard, which may also possibly take the form of an EC directive, which would cover all ambulance vehicles, patient handling equipment and first aid and emergency medical equipment used in ambulance vehicles. It is anticipated that work by CEN on these standards will be finalised by mid 1995.

The Group, in formulating its Report, has taken cognisance of the need for all its recommendations to comply with any ambulance standards that might eventually be approved by CEN and issued by way of EC Directive.

6.7 Current Air Ambulance Arrangements

(i) Air Corps

Since 1965, an arrangement has been in place whereby the Air Corps provides Air Ambulance transport to Health Boards for emergency cases. This service is distinct from the emergency Search and Rescue (SAR) Services.

The availability of an Air Corps aircraft depends on military requirements and/or weather conditions prevailing at the time. The service is generally provided in emergencies requiring the removal of badly injured or very ill persons over long distances, particularly where they cannot be safely conveyed by road ambulance. The service is also provided for the removal from islands of persons requiring urgent hospital attention when weather conditions are such as to make boat transport impossible or hazardous to the patient.

In 1992, a total of 137 Air Ambulance missions were carried out by the Air Corps using four different aircraft types and involving 353 hours' flying time.

(ii) Marine Search and Rescue Service

Since August 1991, the Marine Search and Rescue Helicopter Service of the Department of the Marine, which is operated from Shannon Airport for the Irish Marine Emergency Service is also available on an actual fuel cost recovery basis for Air Ambulance transport in cases of emergency, provided (except in life-threatening emergencies) the helicopter is not required to operate outside a radius of 90 statute miles from Shannon Airport. This service has been used infrequently by Health Boards. In addition, the Air Corps operates a Marine Search and Rescue Helicopter Service from Finner Military Camp, Bundoran, County Donegal.

6.8 Future Demands for an Air Ambulance Service

The Group wishes to express its appreciation in regard to the role played by the Air Corps in providing the vital Air Ambulance Service. While the Marine Rescue Services at Shannon or private helicopter services may be availed of from time to time, cost considerations would indicate that the majority of Air Ambulance missions should continue to be undertaken by the Air Corps.

The Group recommends that the Air Corps should continue to endeavour to respond to requests for its Air Ambulance Service, within the time and resources available.

The Group is aware that in recent times there have been additional facets to the Air Ambulance Service provided by the Air Corps, while at the same time, this Service has had to operate under resource constraints. These include night Air Ambulance missions (by Dauphin helicopter and fixed-wing aircraft), the transport of medical teams for organ harvesting purposes, and the transport of patients to the U.K. for organ transplant operations.

It is likely that there will continue to be a demand for organ retrieval missions to be undertaken within the State at relatively short notice.

The Group recommends that organ retrieval missions should be regarded as part of the regular Air Ambulance requirements of the Health Services and consequently should be taken into account in the planning and equipping of Air Ambulance Services (including provision for fixed-wing aircraft to allow for night-time/bad weather flying).

The Group was of the view that the Air Ambulance patient transport system needs clear protocols for operation, call-out and use.

The Group recommends that a Standing Committee should be established under the aegis of the Departments of Defence and Health which would:—

(a) regularly review the operation of Air Ambulance Services

(b) ensure appropriate medical input and advice

(c) specify protocols in order to obtain maximum cost benefits and ensure the appropriate use of aircraft.

(d) consider the adequacy of resources for Air Ambulance missions and jointly put forward any proposals for the improvement of the Air Ambulance Service.

The Group noted that the Air Corps has no aircraft which are specifically designated for Air Ambulance duties. Current aircraft are fitted out to reflect their multi-purpose role.

The Group recommends that the question of having dedicated and purpose-equipped Air Ambulance aircraft should be considered within the context of the Standing Committee of the Departments of Defence and Health.

The Group recommends that the expansion of the Air Ambulance Service to include a patient retrieval service for critically ill patients should be examined as a priority. The provision or availability of helicopter landing pads in hospitals should also be assessed as part of this examination.

The Group also felt that attention should be drawn to the fact that while not considered officially as Air Ambulance work, the SAR service provided by the Air Corps is often concerned with retrieval of critically ill patients, generally without on-the-spot medical supervision. The Group has noted that Air Corps staff receive training at the National Ambulance Training School.

The Group recommends that suitable Air Corps personnel who work in the Search and Rescue (SAR) Service should receive pre-hospital care training up to and including the level of the proposed advanced training programme for ambulance personnel.

CHAPTER 7

Communications Needs of the Ambulance and Other Health Services

7.1 Ambulance Communications

An effective communications system is an essential component in the provision of a modern Ambulance Service. The system must provide for

(i) Access by the public;

(ii) Reception and processing of calls;

(iii) Alerting and dispatching of ambulances or other response;

(iv) Communication with ambulances while mobile;

(v) Communication with hospitals.

Adequate telephone and radio systems are thus essential. Once a call has been received, radio will be the sole means of communication while ambulances are mobile.

The importance of radio communications has long been recognised in the Ambulance Service. The first steps in developing radio communications were taken as early as 1966/67 when Health and Ambulance Services were administered by local health authorities — the County Councils and the unified health authorities in Dublin, Cork, Limerick and Waterford. These developments took place in a largely unco-ordinated and fragmented manner, with services being provided by a large number of authorities on a separate basis.

7.2 Development of Health Board Communications

With the establishment of the Health Boards, and particularly with the appointment of Chief Ambulance Officers or Ambulance Officers in most Health Board areas, a single Ambulance Service was developed by each Health Board, resulting in radio communications being integrated to a much greater degree, not only within individual Health Boards, but throughout the country as a whole. Thus, by the mid-1970's a country-wide radio network had been developed which gave reasonable communications coverage over about 95% of the terrain. However, Health Boards have planned and developed their systems on an individual basis, and the pace of development has not been uniform nationally. Some Health Boards have upgraded, streamlined and improved their communications systems in recent years, while in other areas the systems technology and organisation has seen little change. There is therefore a wide variation in the type, range and level of communications systems, and while all are still meeting basic functional requirements, some need to be upgraded to meet the demands of modern-day Health Services.

7.3 Command and Control Centres

The nucleus of the communications system is the Command and Control Centre, which carries out the basic functions outlined above. At its simplest, this consists of a telephone and a radio unit — usually based in the vicinity of a hospital switchboard. This Command and Control Centre controls the ambulances based at that hospital and will, by and large, operate independently of other ambulance bases.

At the other end of this spectrum is the central Command and Control Centre which controls ambulance and transport services on a regional basis as well as providing other communications facilities for the Health Services. These Command and Control Centres are staffed by trained and dedicated control staff and in addition to the basic functions and equipment, these Centres have automatic voice-logging facilities, communications links with other emergency services and communications links with hospitals in their catchment areas. The most advanced Command and Control Centres have begun to develop Computer-Aided Dispatch systems and Geographical Information Systems, as well as upgrading their radio communications technology.

An outline of the present systems technology, together with the configuration for each Health Board, is set out in **Appendix I.**

A considerable amount of this equipment was installed in the 1970's and now requires replacement, owing to age and obsolescence. The time is thus opportune for a detailed review of communications requirements of the Ambulance Service. The implications of the review for the wider needs of the Health Services are also considered in view of the growing communications demands of modern Health Services, together with the many developing trends which need to be taken into account to improve the delivery and efficiency of health care.

7.4 Inter-Departmental Committee on Communications Facilities for the Emergency Services

In 1988, the Government decided that a Committee, chaired by the Department of Finance and including representatives of the Departments of the Environment, Health, Justice, Defence and Communications, should investigate and report on communications facilities for emergency services.

The Inter-Departmental Committee recommended the establishment of a Standing Committee under the aegis of the Department of Finance to promote and facilitate the co-ordination of communications facilities in the emergency services. The Department of Health and the Ambulance Service are represented on this Standing Committee.

A number of Working Groups have been established to address issues such as Geographical Information Systems, liaison between the emergency services and Telecom Éireann, and general technical issues. Work in these areas is continuing and the Department of Health and the Ambulance Service are also represented on the relevant Working Groups.

The Review Group, during the course of its deliberations and during the drafting of its recommendations on the communications needs of the Ambulance and other Health Services, was conscious of the need to take account of the work being undertaken by the Standing Committee and its various Working Groups.

7.5 Overall Communications Needs of The Health Services

In order to assess the overall communications needs of the Health Services, it is necessary to outline the present requirements in the context of how the service has developed in recent years and also to have regard to future communications demands of the Health Services as a whole, in addition to the future needs of the Ambulance Service.

Communications requirements of the Ambulance and other Health Services have been considered under the following headings:—

- Requests for ambulance service
- Functions of control centres
- Major Emergencies
- Other Health Services Emergencies
- Other Health Services

7.6 Requests for Ambulance Services

Requests for Ambulance Services can be classed as emergency, urgent and other. Emergency and urgent cases are defined as:

(i) All accident and sudden illness patients;

(ii) Maternity patients (except where a clear indication to the contrary is given by a G.P. that, for example, an ambulance is not required until a specified later time);

(iii) Any other type of patient for whom an emergency procedure is necessary. Calls with this priority must be dealt with immediately, even if this results in other work being delayed.

The sequential process of responding to an emergency is shown in Table 5, which relates the different elements of a communications system to the various phases of dealing with an incident. Most requests for emergency services are made via the "999" system and require attendance of the Ambulance Service at the earliest possible time. Urgent calls tend to be made by General Practitioners or hospital personnel and require a similar response. Other calls come from a multiplicity of sources and relate to the routine elements of ambulance work, such as transfer of patients between hospitals, transport of patients to clinics and admission and discharge of incapacitated or handicapped patients. A substantial part of the patient transfer work of many Health Boards involves transport to or from specialist hospitals or in connection with treatment at tertiary referral centres.

(i) Emergency Calls

Responses to a questionnaire on the Ambulance Service carried out by the Group show that, in the year 1991, ambulances responded to approximately 128,000 Emergency calls and approximately 132,000 other calls (which include both urgent and routine requests) — an average of over 700 per day. This information is illustrated in Figure 2 on page 74.

The majority of emergency telephone calls are made by use of the "999" system and can relate to any of the incidents represented in Table 6. These calls are routed to one of twelve Telecom Éireann exchanges which are staffed on a 24-hour basis. Telecom Éireann keeps the arrangements for the handling of emergency calls under review and while there are no proposals at present to alter these, the Group considers it possible that in the longer term there may be some rationalisation of the number of centres handling emergency calls. Any such change would be brought by Telecom Éireann to the attention of the Inter-Departmental Emergency Services/Telecom Éireann Liaison Committee, which was established in 1992.

At present, Telecom Éireann operators can identify the dialling code zone from where emergency calls originate in many, but not all, cases. With this information, it would appear to be a straightforward matter to transfer the call to the appropriate emergency service within that zone. The problem is that dialling code zones do not coincide with Health Board boundaries (nor with those of other emergency services). With the introduction by Telecom Éireann of a new computerised system, most if not all "999" calls will be handled at the local Telecom Éireann emergency centre but in the event of a major incident, when large numbers of calls are received simultaneously, there will be provision for a centre's overflow calls to be networked to other centres, who will be fully equipped to deal with them. Operators answering "999" calls will have full information on the appropriate emergency service numbers and Telecom Éireann

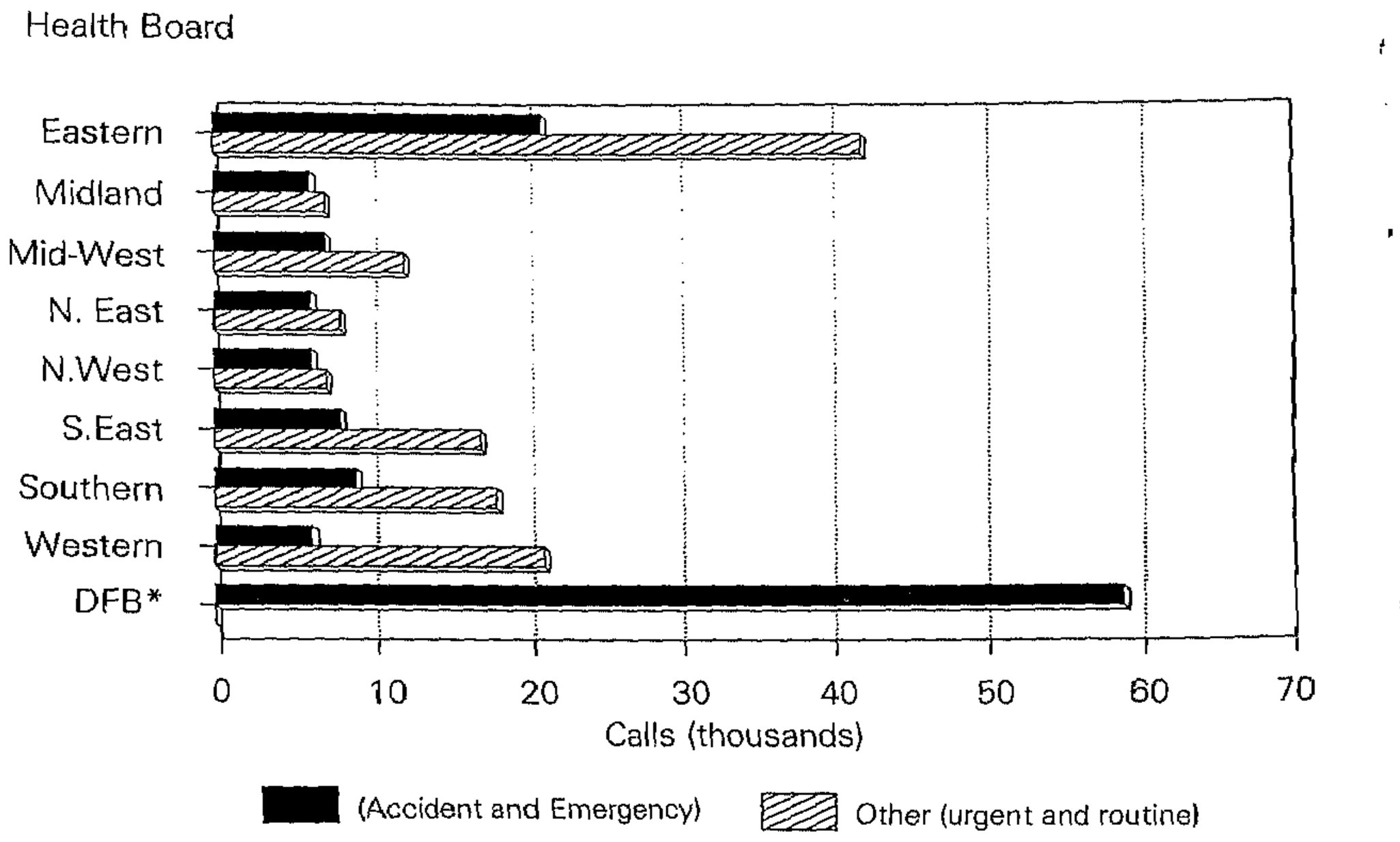
have assured the Group that the quality and security of the service will not be impaired in any way by this arrangement. Nonetheless, in order for such a system to work smoothly, it seems desirable that Telecom Éireann should have a single contact telephone number for each emergency service in respect of each zone (such a number would not, of course, have to be within the Dialling Code Zone).

TABLE 5

Emergency Incident — Sequential Functions

Communications System	Stage of Response	Event	Incident Phase
Incident	0		
	1	Detection	
Alarm System	2	Notification	Citizen Aid
	3	Acceptance	
	4	Advice/ Assessment	
	5	Processing	Call Servicing
Dispatch System	6	Alert	Response
	7	Dispatch Instructions	Activation
	8	Turnout	
Mobile System	9	Arrive Scene	Travel
Portable System			Extrication/ Immediate Care
			Pre-Hospital Care
	10	Depart Scene	Travel
			Basic/Advanced Life Support
Mobile System	11	Arrive Hospital	

FIGURE 2
AMBULANCE CALLS
NUMBER ANSWERED IN 1991



*Dublin Fire Brigade

TABLE 6

Types of Emergency Calls

UNNECESSARY CALLS
Many unnecessary '999' calls e.g. false alarm with good intent
Hoax calls

SPECIAL CASES
Chemical/radioactive incidents
Bomb alerts
Serious Fires
Major incidents
Civil disorders

GYNAECOLOGICAL

MATERNITY

PSYCHIATRIC

TRAUMA
Road traffic accidents (RTA)
Accidents generally (home, industrial, sport etc.)
Trapped individuals
Lacerations, abrasions
Contusions
Fractures
Burns
Serious blood loss
Airway obstruction

SURGICAL EMERGENCIES
Perforated ulcers
Appendicitis
Ruptured spleen
Abdominal pains
Ruptured aortic aneurysm
Epistaxis
Thrombosis
Embolisms

MEDICAL EMERGENCIES
Overdoses (any self-poisoning, including drugs and alcoholic intoxication)
Heart diseases
Myocardial infarction
Epilepsy
Asthma
Diabetes, diabetic coma
Febrile convulsions
Hypothermia
Cerebrovascular accidents
Sudden illness, sudden death,
Cardiac failure, respiratory failure

(ii) Urgent Calls

Urgent calls come mainly from General Practitioners or hospitals via the ordinary telephone system (PSTN) and very often require a response and activation similar to that for emergency calls.

(iii) Routine Calls

The majority of routine calls concern non-emergency patient transport, or the provision of information in response to queries from patients and their relatives. Many Health Boards refer patients to hospitals or clinics outside their regions for specialist services which are not available locally. Much of the planning, organisation and co-ordination of this work is undertaken by the Ambulance Service and requires considerable personnel resources in addition to extensive use of both telephone and radio communications.

It should be noted that many routine calls which are made to the Ambulance Service can be much more time-consuming in terms of resources than calls which are received for Emergency Ambulance Services. This is especially so in the case of queries from patients, clients and relatives. Since these calls which seek information do not represent requests for service provision, they are not included in the total of 260,000 service calls dealt with in 1991 and represent a substantial volume of work which it has not been possible for the Group to quantify.

7.7 Functions of Command and Control Centres

The nucleus of the communications system is the Command and Control Centre. In the context of the future communications demands of the Health Services, the functions which should be carried out by the Command and Control Centre can be summarised as:—

1. Reception and processing of requests for Ambulance Services, including the operation of a Medical Priority Dispatch System. (MPDS)
2. Activation and control of ambulances and/or other vehicles.
3. Managing and controlling communications between the Command and Control Centre, vehicles and hospitals while vehicles are mobile.
4. Telephone assisted Cardiopulmonary Resuscitation (CPR)

In order to perform these functions effectively, a Command and Control Centre should have the following characteristics:—

1. Central and immediate public access to the emergency pre-hospital system.
2. Central control of communications with a single centre assigned responsibility for dispatch and co-ordination of emergency medical vehicles within its area.
3. Prompt central dispatching of appropriate emergency care to the scene of the incident.
4. Appropriately trained personnel.
5. Prompt and appropriate emergency systems capacity.

6. Access to adequate radio channels and telephone lines for a comprehensive pre-hospital emergency medical services system.

It should be noted that the functions of the Command and Control Centre are the same irrespective of whether a call is emergency, urgent or routine, the difference between the various types being in the activation and response times required. This is particularly important in ensuring the optimum use of resources — including personnel, equipment, telephone lines and radio frequencies.

The Group recommends that integrated Command and Control systems should be provided for emergency, urgent and routine services, as separate systems would be neither economic nor practical.

Activities which are ancillary to the functions of Command and Control Centres are record-keeping and scheduling. Logging and recording of emergency calls is necessary for day-to-day management and other purposes. For example, information on precise times of various events can often be sought by the Gardaí or required by Courts or Coroners' inquests. For this reason, many Command and Control Centres — especially where central Command and Control Centres have been developed — have installed voice-logging systems. Similarly, some Centres are developing computerised databases while others are considering Computer-Aided Dispatch (CAD) systems. A Geographical Information System (GIS) is being developed by one Health Board. The possible application of GIS to the work of the Ambulance Service is discussed in Chapter 10.

7.8 Major Emergencies

The primary Health Service response to major emergencies is provided by the Ambulance Service. In addition to the communications systems already outlined, there is a need for a Mobile Command, Control and Communications Vehicle to co-ordinate the Health Services' response on site, to act as the main communications centre between the site, ambulances and hospital and to control the movement of ambulances between the site and hospitals. Communications between Health Services personnel on site will also be important and will require the availability of portable radios. Telephone communications will also be required via the Eircell system and consideration will need to be given to data transmission.

Requirements for equipment and other facilities are set out in Chapter 5 of the Report.

An alert system is required for Chief Ambulance Officers, Ambulance Officers and other senior Health Services personnel who would be involved in the response to a major emergency. Some form of mobile communications (perhaps a paging system) will be a requirement.

Since Command and Control Centres will play a key role in activating the response to major emergencies, the Group recommends that facilities for such an activation system be provided as an integral part of the communications network.

7.9 *Other Health Services Emergencies*

In Health Boards where central Command and Control Centres have been fully or partially introduced, there is a growing tendency to use the facilities for other emergency and urgent Health Services' response and activation, particularly outside of normal office hours and at weekends, on public holidays etc. This is particularly true in the case of Command and Control Centres which serve the larger urban areas. Examples of the type of emergencies dealt with include:—

- alerting Community Welfare Officers to provide assistance to persons or families who have suffered homelessness or other sudden deprivation through fire, accident, etc.
- Contacting Social Workers in relation to child care issues such as abuse, neglect or homelessness — such calls may originate from the Gardaí, General Practitioners and others.
- Activating response to alarm systems for elderly or disabled persons, especially those living alone.
- Contacting Environmental Health Officers in the event of potentially serious environmental health hazards being identified.

7.10 *Other Health Service Requirements*

The potential needs of other areas of the Health Services for mobile communications have not been fully assessed by the Group and therefore it is not possible to indicate the volume of traffic which may arise. However, the general thrust of health policy towards a greater emphasis on primary care and community-based services is likely to generate a demand for mobile communications systems. As the range and number of health workers in the community increases, and as greater numbers of persons remain at home with community support as an alternative to being admitted to institutional care, certain additional demands will arise. Such demands may not necessarily involve the ambulance radio system — Eircell phones, hospital paging systems or other paging systems are options which should also be considered.

The following are some instances of possible communications needs of other Health Services.

(i) General Practitioners

Many General Practitioners have identified a need for message-handling and an ability to contact the Ambulance Service, especially in scattered rural communities where access to public telephones may be difficult. In some areas, e.g. the North-Western Health Board, services have been provided for G.P.s through the ambulance network while in other areas, e.g. the Mid-Western Health Board, groups of General Practitioners have experimented with systems and have had discussions with the Ambulance Service.

(ii) Nurses Working in the Community

The nature of this service makes it probable that these nurses will encounter some cases where urgent consultation with a General Practitioner or where hospitalisation of a patient may be required. This would be particularly so in the case of nurses who

look after elderly patients at evening times and weekends and who may need to contact a General Practitioner or hospital at short notice. Many of these patients live alone and in rural areas they may be a considerable distance from a telephone. Some Home Helps may also need this facility.

(iii) Community Psychiatric Services

The development of community psychiatric services on a sector basis means that an increasing number of staff now work within the community. Nevertheless, there may be some instances where mobile communication with their headquarters or with an acute hospital would be desirable.

(iv) Child Care and Child Abuse

The expanding role of Health Boards in the area of child care and child abuse may make the facility for mobile communication desirable. The provision of emergency services in this area, outside of office hours, may be facilitated by the availability of a mobile communications system.

(v) Hospital Consultants

Some hospital consultants who are "on call" have requested that they be provided with mobile communications, or at least an alerting system, e.g. pager or similar.

(vi) Alarm Systems for the Elderly and the Disabled

A developing communications facility is the provision of alarm systems for elderly and disabled persons, particularly those at risk. The need for such a development is set out in the 1986 report "Communications Networks and The Elderly". Such an alarm system can take the form of an "alert button" located in the home or alternatively worn as a pendant around the neck. In some Health Board areas, pilot alarm systems communicate directly with the Ambulance Command and Control Centre which activates the necessary response on receipt of an alarm. It is proposed to extend this type of alarm to other areas in the country on a phased basis, and with a growing elderly population remaining in their own homes, this could represent a substantial additional workload. While this development increases the workload of the Command and Control Centres, it provides a sense of security for the elderly, the disabled and their relatives, while also reducing the number of visits which health care workers must make for purely surveillance purposes, thus easing the demands on scarce resources.

The Group recommends that provision be made for incorporating the needs of other Health Service requirements into the ambulance communications system as the most effective and efficient way of providing communications facilities for all Health Services.

7.11 *Voluntary Ambulance Services*

The role of the voluntary ambulance services has already been considered in Chapter 2.

The Group recommends that consideration be given at Health Board level to the question of how best communications systems can be developed to meet the joint needs of Health Boards and voluntary ambulance services and on the training of voluntary personnel in the use of communications systems.

The Group recommends that where voluntary or private ambulance services are supporting the statutory Ambulance Service in any capacity, they must be subject to the same standards and operational protocols regarding the use of their communication systems as the statutory services.

CHAPTER 8

Operational Requirements for Ambulance Communications Systems

8.1 **Based on the service needs already outlined, the Group recommends that the communications systems for the Ambulance Service should meet the following general requirements:—**

(i) **Both line and radio systems will be required. However, because of the emergency and mobile nature of the work, radio will be the primary means of communication.**

(ii) **Radio systems should be compatible nationally in order to facilitate movement of ambulances between Health Board areas. This implies standardisation of frequency bands, channels, modulation and signalling systems.**

(iii) **Radio systems should have good regional coverage and be capable of operation in the all informed mode.**

(iv) **As far as possible both line and radio must be dedicated private systems, not subject to open public access and overloading.**

(v) **Systems should have built-in redundancy and emergency back-up power supplies.**

(vi) **Communication systems should provide for the following:**

(a) **Access by the public**

(b) **Reception, processing and logging of calls**

(c) **Alerting and dispatch of ambulances or other appropriate response**

(d) **Communication with and between mobile units**

(e) **Communication between ambulance and hospital (Accident and Emergency Department)**

(f) **Communication between ambulance and hospital (Coronary Care Unit)**

(g) **Communication with other ambulance Command and Control Centres**

(h) **Communication with other emergency services**

(i) **Communication with hospitals and other health agencies**

(j) **Communication with and between staff while away from vehicles**

A more detailed outline of requirements in respect of each of these headings is set out in the following paragraphs.

8.2 Access by the Public

Primary access by the public will be via the "999" telephone system (PSTN and cellular) but normal PSTN access must also be catered for. This will involve dedicated lines from Auto Manual Switching Centres, both PSTN and cellular, to Command and Control Centres.

An adequate number of PSTN trunk lines will also be required for public access other than through the "999" network. Line circuits to Command and Control Centres should be via independent multiple routes.

8.3 Reception, Processing and Logging of Calls

Reception, processing and logging of calls is a function of the Control Centre which requires command, control, communications and information systems, including:

(a) Dedicated private lines and PSTN exchange lines.

(b) Line terminal and switching equipment with priority, timed call holding and queuing facilities.

(c) Voice logging (immediate access and archival) with auto time injection and search facilities on all line and radio circuits.

(d) Radio control and terminal equipment.

In addition, the following systems may be considered necessary, especially in the case of Command and Control Centres which cover major urban areas and/or large geographic areas:—

(a) Computer databases (including Geographical Information Systems) and on-line access to remote data bases.

(b) Computer-Aided Dispatch systems.

Trained staff are required at Command and Control Centres to deal with emergency traffic in accordance with the standards set for reception, prioritising and processing of calls and to deal with all non-emergency traffic, including scheduling. The role of

Command and Control Centre personnel is crucial to the delivery of an effective pre-hospital emergency medical service. The controller is the first person to have contact with a bystander at the scene of a medical emergency. The controller is in a unique position to ensure that the required emergency medical assistance is provided as quickly as possible.

After an emergency caller has been reassured that help is on the way, an important opportunity exists for the controller to provide life support instructions over the telephone. This type of telephone assistance is a key element in the development of a Medical Priority Dispatch System (M.P.D.S.). M.P.D.S. systems have been used for many years in the United States and have the benefits of being more structured, requiring less training, being easier to audit and minimising the stress on the controller.[73] A key function of the system is to prioritise the allocation of ambulance resources to emergency calls for which the response time is crucial to the patient's survival. The development of a Medical Priority Dispatch System is of particular importance in view of the results of studies which suggest that up to 50% of all emergency calls are medically unwarranted.[74, 75, 76]

The Group recommends that Health Boards should give consideration to the introduction of a Medical Priority Dispatch System (MPDS) in order to assist in the provision of a rapid and appropriate ambulance response to emergency calls.

In order to facilitate the provision of this MPDS service, the Group recommends that the National Ambulance Advisory Council should develop a training programme for controllers. Entry to this programme should be confined to suitably trained ambulance personnel.

Staffing in Command and Control Centres will be required on a 24-hour basis all the year round. Staffing levels should be determined by the call-processing time standards and volume of work to be processed. In view of the emergency nature of the service, the Group has identified a need to change the current practice in many Command and Control Centres of having only one controller on duty at certain times. The practice in some Health Board areas of hospital switchboard or nursing staff handling the command and control of ambulances needs to be reviewed for the same reasons as with both types of arrangement there are not always back-up personnel available to deal with a number of emergency calls at once, or to give CPR advice by telephone.

The Group recommends that the practice of having only one controller on duty in an Ambulance Command and Control Centre should be phased out.

The question of providing the staffing levels necessary to achieve this objective should be considered by individual Health Boards in consultation with the Department of Health.

8.4 Alerting and Dispatch of Ambulances or Other Appropriate Response

Equipment and circuits must provide for alerting and dispatching of ambulances which are

(1) At base

(2) Mobile

(3) At remote stations

(4) On-call (crew on call at home)

Ambulances at base are available for immediate dispatch. Those which are already mobile will be alerted and dispatched by radio. Two independent circuits must be provided to alert and dispatch ambulances at remote stations, i.e. mobile radio or radio paging and PSTN. On-call staff would be alerted by PSTN or radio paging.

8.5 Communication with and between Mobile Units

Communication with and between mobile units should be provided by regional radio systems which include the following facilities:

(a) Multiple high sites

(b) Voice and low speed data

(c) Link-fail talk-through

(d) Interface with telephone circuits

(e) Capable of simultaneous voice and data transmission

(f) Switchable talk-through

(g) Selective calling

(h) Sequential tone signalling — with mobile status capability

(i) Automatic site selection

(j) Receiver voting

(k) ECG transmission

It is expected that in general, radio rather than land lines will be used to link high sites and Command and Control Centres. The number of channels required will be dictated by the volume of traffic, subject to a minimum of two channels, including a National Emergency Channel.

8.6 Communication between Ambulance and Hospital (Accident and Emergency Departments)

In many cases, it is important for the ambulance crew to be able to alert the hospital as to the condition of the patient and/or the type of injuries that can be expected to arrive at the Accident and Emergency Department. On receipt of this information the hospital can then make the necessary arrangements and have appropriate staff on standby. One example of the benefits of communication between ambulance and hospital is in road traffic accidents, where a number of people are injured and the first assessment of injuries sustained is made by ambulance personnel who should be able to alert the hospital, and communicate this information. (*See Chapter 3.*)

8.7 Communication between Ambulance and Hospital (Coronary Care Unit)

It has already been recommended (Chapter 4) that hospitals should introduce arrangements to facilitate the "fast-tracking" of emergency cardiac patients into the Coronary Care Units. Where myocardial infarction is diagnosed, patients should be more appropriately referred to the Coronary Care Unit rather than the Accident and Emergency Department. It is accepted that the earlier treatment is administered the better the prognosis for improvement and long-term morbidity. Where communication between ambulance and Coronary Care Unit can assist in this process the facility should be provided. (*See Chapter 3 and Chapter 4.*)

8.8 Communications with other Command and Control Centres and other Emergency Services

Mobile systems should be designed to provide radio communications between contiguous Comand and Control Centres with PSTN as back-up.

Communications with Gardaí and Fire Command and Control Centres will be by dedicated line and/or radio, and with other emergency services by PSTN.

8.9 Communications with Hospitals and other Health Agencies

Radio links will provide communications between ambulances and Accident and Emergency Departments and Coronary Care Units. Other requirements will be met via PSTN. Ambulance Command and Control Centres and systems should provide basic infrastructure for communications (including Alarm Systems) with other groups for example:—

General Practitioners
Community care field staff
High-risk patients and institutions

Such communication should be via a separate radio channel so as not to interfere with emergency traffic.

8.10 Communications with and between Staff while away from Vehicles

There will frequently be a need for staff to be away from their vehicles — for example, while attending a road traffic accident. Communication with and between staff in such situations should be provided by portable radio and radio paging-systems.

Portable radio would operate via the vehicle radio to the Command and Control Centre. Portable radios on a dedicated system are necessary to provide on-site communications for Ambulance and other Health Services' staff at major emergencies or major events. Three common channels would meet this requirement for all Health Boards. Overlay paging on the main radio system would provide an alert system for key Health Service staff.

8.11 Incapacitation of Command and Control Centres

It is important that in the event of a Command and Control Centre becoming incapacitated for any reason (for example, through a fire or storm damage) there be alternative arrangements for answering emergency calls. This might, for example, involve the diversion by Telecom Éireann of calls to a Command and Control Centre in an adjacent Health Board area.

The Group recommends that each Health Board should have a contingency plan to ensure that if its ambulance Command and Control Centre is rendered inoperable, emergency calls would continue to be answered and ambulances controlled by an alternative Command and Control Centre.

8.12 Major Emergency Communications

The requirements already described for fixed, mobile and portable systems will form the basis for emergency communications for both the Ambulance Service and the Health Services generally in the event of a major incident. However some additional facilities will also be required to cater for such occurrences and these must be incorporated in a Mobile Control Vehicle in order to provide on-site communications. These additional facilities include:

(a) Cellular Radio including access overload control

(b) UHF ground communication

(c) Inter-services communications

(d) Mobile repeater stations

(e) Telescopic masts

(f) Generators

8.13 Service Requirements

A summary of Ambulance Service requirements in terms of circuits and channels is set out at **Appendix J.**

CHAPTER 9

Command and Control Centres

9.1 Provision of Command and Control Centres

The key issue in the review of communications systems relates to the number of Command and Control Centres to be provided. The recommendation in this regard will effectively determine staffing numbers, technology to be put in place and overall running costs. It is essential therefore that the option recommended should provide the most cost-effective and efficient solution, not only for the Ambulance Service but for the Health Services as a whole, while also meeting the requirements outlined in Chapter 8.

The functions of Command and Control Centres have already been outlined in Chapter 7. The response to a Review Group questionnaire on the Ambulance Service indicates that there is at present a total of 22 separate Command and Control Centres in use by the eight Health Boards.

Appendix K sets out the present position regarding the number and location of Command and Control Centres by Health Board area.

Appendix L sets out details of population by Health Board area in 1991, the number of ambulance calls answered by Health Board area, including the Dublin Fire Brigade, and the area of each Health Board region.

Appendix M sets out the details of the mileage travelled and the number of patients carried by the Statutory Ambulance Services in 1991.

A minority of Boards still rely on base stations at individual hospitals for mobilisation and control of ambulances based there. These hospital stations are under the control of the hospital Matron rather than of the Ambulance Service. The system of using hospital base stations for ambulance control is considered to be unsatisfactory for the following reasons:—

(a) Emergency calls and mobilisation procedures are dealt with by staff who most likely have received no special training in such procedures. This is especially so at night when many hospital switchboards are not staffed on a full-time basis and rely on nursing or attendant staff to respond to telephone calls, in addition to carrying out their other duties.

(b) Ambulance response to emergency (999) calls may be delayed if the call is not directed to the most appropriate hospital.

(c) There is no overall co-ordination of the service as each hospital deals only with ambulances located at that base; this could be a crucial factor in the event of a major emergency.

(d) A dispersed system of control may lead to inefficient use of resources.

(e) Possible changes in Telecom Éireann procedures for emergency calls, which were outlined in Chapter 7.

(f) Response and activation times are less likely to meet acceptable standards.

Having regard to these deficiencies, the Group recommends that hospital-based ambulance communications facilities should be phased out as soon as practicable and operations transferred to Command and Control Centres which meet the criteria outlined in Chapter 8.

9.2 Optimum Number of Command and Control Centres

The question of the optimum number of Command and Control Centres was considered in detail by the Group. In theory, communications technology would allow one Command and Control Centre to serve the needs of the Ambulance and other Health Services on a national basis. Due regard, however, must be given to such issues as practicality, back-up services, effectiveness and efficiency, and geographic considerations. Technological developments also make it feasible to consider the integration of the communications requirements of all or a number of the organisations providing emergency services.

The Fire Services which are operated and controlled by Local Authorities are the most obvious, but other services could also be involved. Thus, the options considered by the Group were:

(a) The development of combined Command and Control Centres to serve a number of emergency services.

OR

(b) The development of the optimum number of Command and Control Centres to serve Ambulance and other Health Services.

9.3 Combined Command and Control Centres

Combined Command and Control facilities could embrace a number of options, including independently-run Controls on the same site, a common call-answering service (but with separate controllers for the various services) or complete commonality of service. The Group considered three possible options:—

(a) Minimum sharing option

The communications systems would remain separate but elements such as remote sites (including buildings, emergency power and masts, etc.) and systems for alarm monitoring and paging would be shared. Co-operation would also be possible in relation to standardisation of maps and information technology.

(b) Medium sharing option

In addition to sharing the above-mentioned items, this option would include sharing a facility for the reception of calls which would be handled by specially trained staff who would route them to the appropriate service.

(c) Maximum sharing option

In addition to sharing facilities at (a) and (b), control rooms would be located in the same building or in adjoining buildings or emergency centres while private lines, emergency power supplies, control buildings and computer facilities would also be shared.

9.4 Possible Sharing Between Ambulance and Fire Services

The Report of the Inter-Departmental Committee on Communications Facilities for Emergency Services (December 1989) considered that the Fire Service should proceed immediately with its regional-based mobilisation plans, which should be so designed as to take cognisance of existing facilities of the Ambulance Service and the Gardaí, on the basis of the minimum sharing option outlined above. The Fire Service has also decided to develop three Regional Control Centres to serve the entire country. Progress to date in the provision of these facilities has included development of appropriate agreements among fire authorities; project organisation and management structures; procurement of premises; computer-aided mobilisation systems; data to operate the mobilising systems; communications and alerting facilities from Control Centres to fire stations, and staffing arrangements (following agreement reached at the Local Government Staff Negotiations Board).

An Interim Regional Mobilisation Project (Fire Service) is now functioning and serves most of the Munster Region. This has enabled the removal of the long-standing arrangement whereby "999" calls were routed to fire officers' homes. The interim arrangements do not include direct radio communications between the Control Centre and fire appliances in all areas. Construction of a new Control Centre to handle the Eastern Region (including Cavan and Monaghan) is in progress at Townsend Street, Dublin. Development of the three full mobilisation and communications projects has however been taking place in parallel with the interim projects. Full control-to-mobile communications facilities will form part of these projects.

The Group held discussions with representatives of the County and City Managers' Association on the possible sharing of facilities by the Health Boards and the Fire Service.

The following is a summary of the various issues discussed:—

(a) Emergency response is broadly similar for both Fire and Ambulance Services and involves similar action by staff at the Command and Control Centres. However, the non-emergency work of the Ambulance Service requires a very different response to that of the Fire Service and is far more time-consuming, especially in the amount of telephone communication involved. (*See Chapter 7.*) This aspect of the work requires a reasonable knowledge of the Health Services in general. The Group has already recommended that control arrangements should not be introduced which would result in a two-tier ambulance and health communications and control service, i.e. where emergency and urgent work would be controlled from one regional centre and routine work would be handled from another. A two-tier system would, it is certain, result in considerable duplication of Health Boards' resources. Therefore, combined Command and Control Centres, if established, would have to be capable of handling both emergency and non-emergency ambulance work, as well as all other Health Services' communications needs. If common or shared reception applied only to emergency calls, a separate system would have to be devised to deal with urgent calls from General Practitioners and hospitals and also to deal with routine calls and enquiries.

(b) In addition to emergency calls via the "999" system, the Ambulance Service deals with a very substantial number of calls from GPs and hospitals. Many of these calls must be responded to as promptly as "999" calls; indeed many of them represent a greater degree of urgency than the "999" calls, as they are based on firm medical diagnosis of the patient's condition. Direct contact between doctor (GP or hospital-based) and ambulance controller is considered an essential and critical component in providing the appropriate response to such calls. This facility would be difficult to integrate into a multi-service Command and Control Centre.

(c) The fewer the number of Command and Control Centres, the greater reliance there is likely to be on technology — both hardware and software. This, in turn, necessitates adequate back-up procedures in the event of systems failure. A national three-centre arrangement in which the Ambulance Service participated would also mean that, in the event of one Command and Control Centre becoming incapacitated, the additional emergency workload to be assumed by the other Command and Control Centres would be very considerable.

(d) The Ambulance Service operates a generally satisfactory service, with a relatively small number of staff. In some respects (e.g. voice communication between Command and Control Centres and vehicles) it is still in advance of the Fire Service interim projects. Availability of radio communication between the Command and Control Centre and ambulances is essential at all times: in addition, communication is essential between the Command and Control Centre and ambulances travelling outside their areas, e.g to

Dublin or major tertiary referral hospitals. (*See Chapter 8.*) Relatively low-cost upgrading and reorganisation would overcome the present deficiencies in the ambulance communications service, compared with the radical changes being undertaken for the Fire Service.

(e) Health Service delivery is provided within the structure of the eight Health Boards. Each Health Board is charged with the provision of hospital and accident and emergency services etc. within its own area. The overall objective is that each Health Board region should, generally, be self-sufficient and that it should be the exception rather than the rule that people travel outside their own Health Board area for services. As services are integrated and graduate from community level to general hospital level to regional hospital level, within each Health Board area, Ambulance Service delivery should be compatible with the organisation of other elements of the Health Services.

(f) The Health Boards, over recent years, have reorganised the Ambulance Services so that one person, generally the Chief Ambulance Officer or Ambulance Officer, is wholly responsible for the Service on a regional basis. The call-answering services are, on the whole, very satisfactory and the number of complaints is negligible. The Health Boards would be reluctant to return to a situation where responsibility would again be shared between a number of authorities.

(g) Staffing arrangements and rosters at Health Board Ambulance Command and Control Centres differ substantially from those which have been negotiated nationally for the Fire Service.

(h) Services would continue to operate on separate radio channels and therefore investment in new radio equipment to meet the needs of the Ambulance Service would still be required. This expenditure would be greater than that required at (d) preceding (upgrading of existing equipment).

(i) The growing communications needs of the wider Health Services have been outlined earlier. These are both local in nature and are particular to individual Health Boards; as such, they would not be appropriate to a Command and Control Centre serving a number of Health Board areas.

Having regard to all these factors, it was considered that the Group could not recommend the integration of Ambulance and Health Services' Command and Control structures into the three Regional Centres being developed to meet the needs of the Fire Service. However, developments in both Services have not taken place at an even pace throughout the country, and there may well be opportunities for sharing various facilities and services in some areas.

The Group recommends that, where either the Fire Service or the Ambulance Service proposes to upgrade its communications system, discussions should take place to ascertain whether a joint venture might be possible.

The Group recommends that the communications systems should remain separate, but elements such as remote sites (including buildings, emergency power, masts) and systems for alarm monitoring and paging would be shared, and where co-operation in relation to standardisation of maps and information technology is possible, this should continue to operate between the emergency services wherever feasible.

9.5 Optimum Number of Health Service Command and Control Centres

The optimum number of Health Service Command and Control Centres is that which best fulfils the following criteria:—

(a) Meets all the needs of the Ambulance Service (including needs anticipated in a major emergency).

(b) Meets the emergency communication needs of other Health Services.

(c) Can be developed to meet the growing needs of other Health Services for communications' facilities.

(d) Provides for continuity of communications services during implementation.

(e) Can be implemented on a phased basis, having regard to the general economic situation and the need to obtain optimum value for money.

(f) Is effective and efficient.

(g) Can provide a back-up service for emergency calls in the event of power failure or damage to an individual Command and Control Centre.

Meeting the service needs at 1 to 3 above present a number of difficulties. Command and Control Centres must be large enough in terms of staffing and equipment to meet operational requirements. They must also be capable of meeting the particular needs of each individual Health Board. In terms of volume, the major portion of work relates to non-emergency calls (about 60% of the total, and growing). This work is largely "local" in character, is far more time-consuming than emergency calls, requires knowledge of the Health Services in general, together with a considerable local knowledge, and tends to be concentrated around the regional and larger acute hospitals.

These factors, among others, have led to the trend within Health Boards to develop dedicated Ambulance Command and Control Centres initially, and to progress on a phased basis to full central Regional Command and Control. The ambulance bases would continue to be located strategically so as best to serve their catchment areas, and only the Command and Control Centres are centralised.

9.6 Decision Regarding the Number of Command and Control Centres

The Group recommends that, having regard to all the factors involved, the proposal for eight Central Command and Control Centres would fully meet the operational criteria outlined and is therefore the best option for the Ambulance and other Health Services. A modest investment in provision of staff and upgrading of equipment would enable designated Command and Control Centres to meet all of the operational criteria listed above.

The Group recommends that there should be one Central Command and Control Centre for each Health Board, to meet fully the operational requirements already set out for both Ambulance and other Health Services.

The Group recommends that Health Boards which have not already developed a Central Command and Control Centre should do so as quickly as possible, if necessary on a phased basis and having regard to the recommendation made earlier regarding consultation with the Fire Service.

CHAPTER 10

Development of Systems Technology

10.1 The general radio systems at present in use are set out in **Appendix I**, of this Report, while Chapter 8 deals with the Operational Requirements for Communications Systems. **Appendix J** sets out in tabular form the communications circuits and channels required.

In communications, as in many other areas, the pace of technological development over the last decade has been significant and shows no sign of slackening. This presents problems in recommending any major capital investment. The temptation is always to recommend the most up-to-date technology and to seek the best value from among the competing suppliers who can meet this specification.[77] Rather than adopt this approach, the Group has sought to identify the operational requirements for communications for both the Ambulance Service and other Health Services and to recommend the technology which will most effectively and efficiently meet those needs over the next ten years. It would, of course, be important that such technology be capable of expansion, upgrading and improvement in the light of anticipated growth in demand, as outlined previously.

The provision of telephone lines to meet requirements does not present a problem, and the number of lines will depend on the size and activity of individual Command and Control Centres.

The options for upgrading of radio communications are:—

(a) ***Continue AM*** — this is an option only in the short term and could not be considered for the future. The main reason for this is that there are now few manufacturers of AM equipment and most mobile radio users have moved to FM. New developments, including microprocessor control, would therefore be implemented in FM equipment type rather than AM type. The existence of multiple potential suppliers of FM equipment should also lead to more competitive tendering.

The Group has also taken account of the rapid developments in digital technology and in particular digital modulation, which has already replaced analogue modulation (AM and FM) in some systems (e.g. Pan European Cellular Radio, GSM). However, having regard to the limited availability of digital modulation for private mobile radio at present and the urgent need to replace existing ambulance systems, the group considers that a change from AM to FM is more appropriate at this time.

(b) ***Mid Band VHF*** — this option was put forward by the Department of Communications because of the availability of spectrum (channels) in the 138-156 MHz band. Sharing in this band would not involve frequency reversal with the UK and sharing would be with similar emergency services.

Coverage in this band is less than that achievable at 80 MHz for the same output power, and this would probably give rise to the need for more transmitter sites. However, the benefits of Mid Band are that this band would not suffer as much from long-range interference as the 80 MHz band, and a freer availability of channels if there is a demand for an increase in the number of channels for new services, e.g. General Practitioners and community services.

(c) ***Low Band VHF*** — this is the preferred option as it ties in with the upgrading that has already been commenced in a number of Health Boards and preserves the existing ambulance frequencies. The main disadvantage with this band is the restricted number (11) of channels at 25kHz spacing. With interleaving this would allow for 22 channels but this would require a large amount of co-ordination. The spectrum (number of channels) available to the Health Boards is limited and it is doubtful whether this is adequate to meet even a moderate increase in channel requirements. Co-ordination of additional channels, particularly on high sites, with the UK could be difficult and protected channels are needed.

Interference problems experienced in summertime due to long-range propagation in the 80 MHz band will continue.

Currently the Ambulance Service has no defined standard for measurement of mobile radio coverage. It is doubtful, however, that the current systems would meet the field strength levels at the boundaries of their required service areas to meet the CEPT Grade I criteria. If the Grade I standard is required, more transmitters will probably be required in the 80 MHz band. A detailed survey would be required to establish the actual coverage to given criteria from the existing sites. If this should reveal that extensive changes to existing systems are required, a more detailed study of this option and option (b) would be required.

In order to progress this further, the Group recommends that the Department of Health establish an expert technical group in order to conduct a detailed technical study of all aspects of the Mid Band/Low Band option and to make a recommendation to the Department of Health as to the most appropriate system for the Health Services.

The Group recommends that a development programme be established for the hilltop sites to improve access, buildings, services and masts. There should be a co-ordinated approach in consultation with the other emergency service users.

10.2 Equipment Purchase

Whichever frequency band is ultimately selected, all Health Boards must, in the interests of compatibility, use the same band and modulation. It is considered that there is scope for considerable savings if a number of Health Boards, when replacing communications equipment, seek joint tenders from potential suppliers.

The Group recommends that, when equipment purchases are being considered, the potential for joint purchases be examined by the Health Boards and the Department of Health through the National Value For Money Steering Group.

10.3 Geographical Information Systems

The Group has considered the applicability of Geographical Information Systems (GIS) to the work of the Ambulance Service.

A GIS is a computer database which integrates normal (tabular) data with maps (graphic data) in a manner which permits the user to query the database and display the results on a geographic base, using a visual display unit (VDU). For the Health Services generally, there are many possible applications — for example, in the areas of estate management and epidemiology. One Health Board has already developed a GIS system to the commissioning stage for uses of this type. The possible benefits of GIS to the Ambulance Service are chiefly in relation to the following:

- the storage and rapid display of base geographical maps of the road network, townlands, towns, villages and streets of operational areas, to be used in the direction of ambulances from base or while en route to their destination. A location could be displayed on a visual display unit, once the required address details were entered by the control staff;
- the display of the current availability status of each vehicle, by base location;
- the provision of a management information system for post-incident statistical and geographical analysis, and the preparation of emergency plans;
- the drawing-up of optimum routeing for ambulances, particularly when on non-emergency duties and
- the provision of Automatic Vehicle Location (AVL) systems which can track and display the location of each vehicle to the control personnel.

In considering the extent to which the Ambulance Service might benefit from GIS, special regard must be had to (a) the needs of the Service, and (b) the costs involved. The Group is of the view that the needs of the Ambulance Service are best met by the provision of eight Health Service-only Command and Control Centres around the country, as already outlined in Chapter 9.

The Group is satisfied that, in the event of such a centralised Command and Control arrangement, ambulance controllers and ambulance crews would continue to have a thorough knowledge of their operational areas. This stems from the amount of routine transport they carry out in addition to emergency work, giving them a detailed knowledge of their areas. The experience in those Health Boards which already have centralised ambulance command and control has been that no significant problems tend to arise in relation to address location.

GIS is considered to have significant potential in the development of efficient vehicle routeing plans. This could encompass both pre-incident planning for "999" calls and route analysis for non-emergency transport. Given that some 60% of the Ambulance Service's work is on non-emergency duties, it is felt that there is certain to be scope for efficiencies in the scheduling and utilisation of vehicles, as well as in staff and running costs. Such scope will, it is felt, vary from one Health Board area to another.

The use of GIS for automatic vehicle location and as a management tool for other purposes has also been mooted. It is considered that the needs of the Ambulance Service in relation to the first of these are, in general, adequately met by existing arrangements, which permit controllers to interrogate ambulance crews by radio as to their current location and status. Management tasks in which it could assist are:

- identification of high-risk areas for ambulance response, e.g. RTA "blackspots"
- emergency pre-planning for locations such as airports, sea-ports, sports stadia and auditoria
- post-incident analysis.

10.4 Cost of Geographical Information Systems

The likely cost implications of a GIS system for the Ambulance Service have been considered by the Group. The main cost areas would arise under the following headings:

(a) Mapping

(b) Systems software

(c) Hardware and operating systems platforms

(d) Data management system

(e) Recruitment, training and remuneration of staff with appropriate skills and

(f) Provision of periodic updates to maps.

The Group recommends that, having regard to the very significant costs associated with the acquisition and operation of Geographical Information Systems, each Health Board should, in consultation with the Department of Health, assess the likely costs and benefits to its operations of introducing such systems, before making a decision on the matter.

CHAPTER 11

Provision of Ambulance Services in the Dublin Area

11.1 Introduction

With the implementation of the Health Act, 1970, health functions were transferred from the Local Authorities to the newly established Health Boards. This included, for the most part, the Ambulance Service.

In 1978, the Southern Health Board took responsibility for all Ambulance Services within its region when it took over the provision of Ambulance Services in Cork City from Cork Corporation and, in 1983, the Eastern Health Board took over the provision of Ambulance Services in Dun Laoghaire from Dun Laoghaire Corporation. Dublin Corporation Fire Brigade remains the only non-health agency providing statutory Ambulance Services within the State. The Dublin Accident and Emergency Ambulance Service has traditionally been provided by the Dublin Corporation Fire Brigade on an agency basis for the Eastern Health Board. The Eastern Health Board provides a Cardiac Ambulance Service in the Dublin area and also operates an Accident and Emergency Ambulance Service at Loughlinstown Ambulance Base.

11.2 Background to the Present Situation

There has been disagreement for some time between the Eastern Health Board and the Dublin Corporation Fire Brigade on command and control arrangements for ambulance calls made via the "999" emergency service in the Dublin area.

During a 6-week strike in the Dublin Corporation Fire Brigade in 1988, the Eastern Health Board Ambulance Command and Control Centre took charge of the 999 ambulance calls. Following resumption of work, there was disagreement between the Dublin Corporation Fire Brigade and the Eastern Health Board regarding command and control arrangements.

A group was therefore established, headed by an independent Chairman (Professor Eamonn McQuade, University of Limerick) to find a solution but, after a 12-month trial period, where the Eastern Health Board controlled the 999 ambulance calls, with monitoring by the Dublin Corporation Fire Brigade, the arrangements were terminated due to a lack of common ground between the parties. As the result of a Government decision, control of the 999 ambulance calls reverted to Dublin Corporation Fire Brigade and this has remained the position to date.

At the request of Government, Professor David Kennedy was asked to examine the particular problems in Dublin and he recommended, inter alia, that there was a need to draw up a clear statement of the nature and level of the future Ambulance Service required for the Dublin area (including cardiac service). The Review Group on the Ambulance Service considered that particular attention should be given to examining arrangements for the provision of Ambulance Services in the Dublin area and a separate Working Group was established for this purpose.

The Dublin Working Group examined all aspects of the provision of Ambulance Services in Dublin and considered a number of options which were put forward by the different agencies represented on the Working Group.

Having given careful consideration to the various proposals, and recognising that the Eastern Health Board is the statutory authority for the provision of Ambulance Services in the Board's functional area in accordance with Section 57 of the Health Act, 1970, the Review Group recommends that the following framework, which has been agreed by all the parties concerned, should govern the provision of Ambulance Services in the Dublin area:

(i) The Review Group agrees that there should be a long-term involvement by the Dublin Corporation Fire Brigade in the provision of a total Ambulance Service on behalf of the Eastern Health Board. The level and scope of the Service to be provided and the precise basis for determining costs and making payments on foot of such costs, with agreed machinery for resolving any disputes which may arise in these matters, should be defined as part of a contractual arrangement between the Eastern Health Board and Dublin Corporation.

(ii) A common protocol for service provision for pre-hospital care should be agreed jointly between the Dublin Corporation Fire Brigade, the Eastern Health Board and the major Dublin Hospitals.

(iii) Dublin Corporation Fire Brigade and Eastern Health Board ambulances should provide the full range of Accident and Emergency services as outlined earlier in this report. Details of this may be redefined as necessary in the light of operational experience, by agreement between the parties.

(iv) **Dublin Corporation Fire Brigade should provide a full Accident and Emergency Ambulance Service from its 10 existing bases in the area set out in the map on page 103 of this Report (Figure 3).**

(v) **The Eastern Health Board should provide a full Accident and Emergency service for the areas as set out in the map on page 103 of this Report. This will require the development of an Eastern Health Board ambulance base in the northern part of County Dublin. The revised arrangements should take account of the service requirements of the North-Eastern Health Board area which should be negotiated between the Eastern Health Board and the North-Eastern Health Board. The Eastern Health Board should provide a frontline Accident and Emergency service from its James's Street Ambulance Base.**

(vi) **An operational protocol should be put in place to accommodate these new arrangements.**

(vii) **There should be a jointly agreed policy, based on the recommendations contained in this report, between the Eastern Health Board and Dublin Corporation on training, equipment, fleet management and industrial relations in so far as these affect both services.**

(viii) **The overall objective is that the entire ambulance resource for the area would operate as a single Service with no duplication of services and with clearly defined areas of operation. All ambulances serving the Dublin area should be brought under a single Command and Control Centre.**

(ix) **The Command and Control Centre for the Ambulance Service in Dublin should be accommodated at the new Command and Control Centre at Townsend Street, Dublin which is being financed from the Exchequer to improve communication systems for the emergency services.**

(x) **During its development phase, this new Command and Control Centre should have a Steering Group with equal representation from the Health and Local Authority Services on the following basis:**

1 representative from Dublin Corporation
1 representative from the other Local Authorities using the centre
1 representative from the Department of the Environment
2 representatives from the Eastern Health Board
1 representative from the Department of Health

The Chairmanship of the Steering Group should be rotated annually between a Local Authority representative and an Eastern Health Board representative. There should be two sub-committees, one dealing with fire matters and the other dealing with ambulance matters, which would include appropriate persons other than members of the Steering Group.

(xi) **For the development phase, the Head of Operations of the Command and Control Centre should be an officer of the Eastern Health Board nominated by the Chief Executive Officer of that Board. The Deputy Head of Operations should be an officer of Dublin Corporation nominated by the Dublin City Manager.**

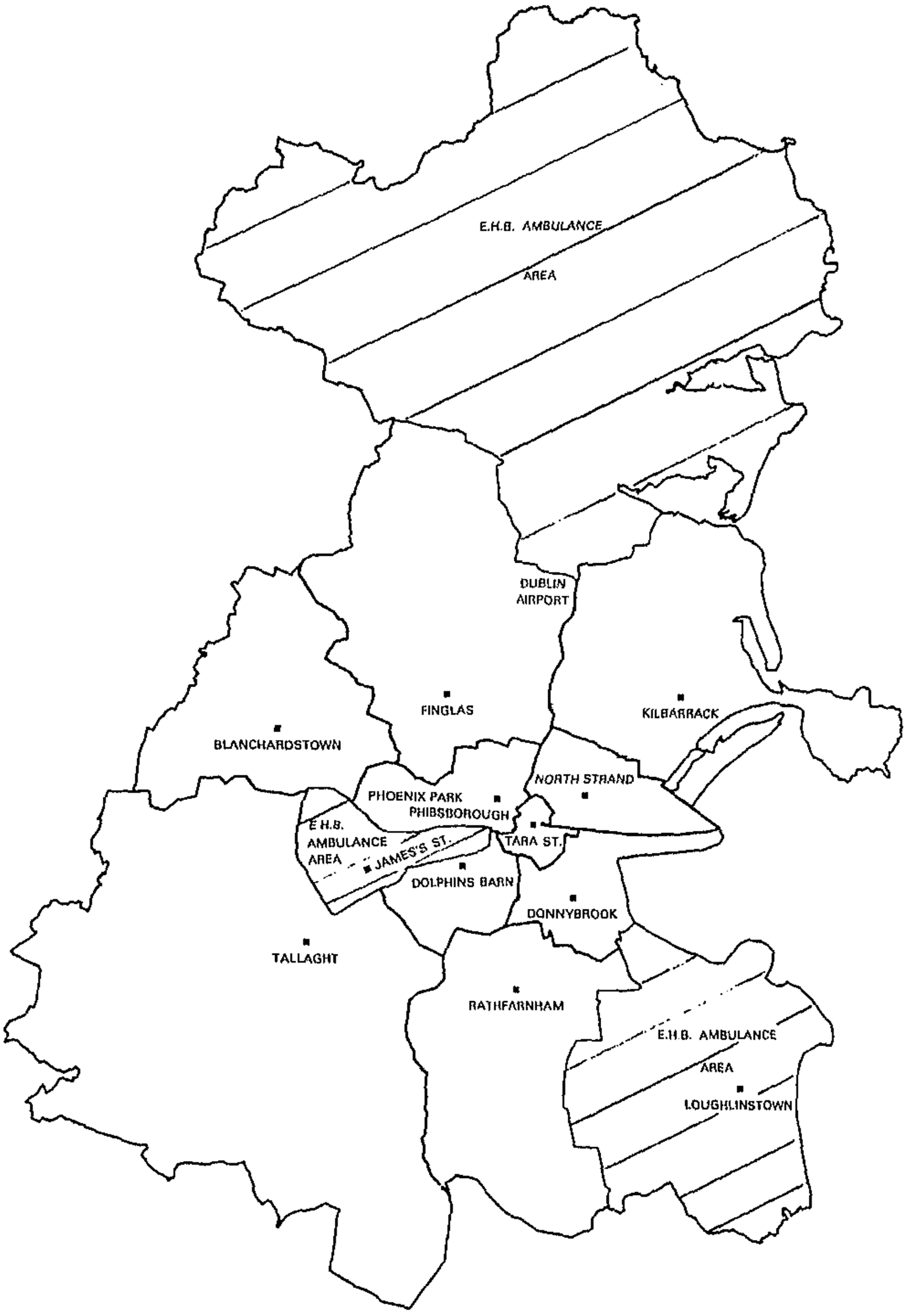
At the end of the development phase, the position should be reviewed and proposed changes, if any, should have to be agreed by all parties concerned.

The Review Group is satisfied that the agreed framework will

- provide for a fully integrated Ambulance Service for Dublin
- avoid wasteful duplication of services
- allow for the long-term involvement of Dublin Corporation Fire Brigade in the provision of the full range of Ambulance Services in Dublin, including Cardiac
- allow both the Dublin Corporation and the Eastern Health Board to operate within clearly defined roles with full co-operation and mutual assistance.

FIGURE 3

AMBULANCE AREAS – DUBLIN COUNTY



CHAPTER 12

Training Requirements for Ambulance Personnel

12.1 Introduction

The Group examined training requirements for ambulance personnel under the following headings:

(a) Definition of the extent and scope of the training needs of the Ambulance Service.

(b) To investigate and recommend the best means of meeting these needs and to define the resource implications involved.

(c) To outline each type of training course recommended.

(d) To recommend a timetable for the implementation of the training programme.

12.2 The Development of Ambulance Service Training

Prior to 1967, each Local Authority was responsible for the training of its own ambulance personnel and most ambulance personnel received little or no training. In 1967, training for ambulance personnel was introduced and confined to a four-week basic training course which every recruit attended shortly after joining the Ambulance Service. A fifth week was added to the course in the early 1970's.

In 1967, when the training courses started, the most urgent need was the necessity to have ambulance personnel trained to carry out Basic Life Support including emergency treatments such as external cardiac massage and resuscitation techniques.

The administrative support to the training courses was the responsibility of the Department of Health up to May, 1980, when it was devolved to the Eastern Health Board, with the agreement of the other Health Boards. The Health Boards at an early

stage decided to extend the basic full-time course to six weeks' duration. In April 1986, the National Ambulance Training School was established by the Ambulance Services Council and it has been responsible for the training of ambulance personnel since then. The National Ambulance Training School is located on the campus of St. Mary's Hospital, Phoenix Park, Dublin. The School has a staffing complement of one Training and Administrative Officer, four Training Instructors and one secretary. In 1992, the annual budget for the School was approximately £170,000. To date, approximately 95% of full-time ambulance staff have completed a basic course. A two-week full-time refresher training course was introduced in 1987 and in excess of 400 ambulance personnel have completed this course. The refresher course updates the skills which were acquired by ambulance personnel on their basic course. Personnel also receive instruction on new techniques, equipment and protocols which have been introduced since they attended the basic course.

As the standard and range of training being given to ambulance personnel in this country appears to have fallen behind that in other European countries, the Group considered it opportune and necessary at this stage to take a detailed look at the present level of training being given to ambulance personnel and to suggest improvements. While the present training course has served a very useful purpose, there is now a need for an expansion of the training provided, which should take the form of a comprehensive training programme for ambulance personnel, spanning their entire career in the Ambulance Service.

The Group was particularly conscious of the emergency nature of the Ambulance Service which demands an ability to provide treatment "at the scene", often under very trying conditions, and considers that the present training for ambulance personnel requires significant enhancement in order to achieve the level of service as described in Chapters 3 and 4.

12.3 Proposed Training

The Group considers that it is important to have standardised training arrangements for the whole country. To achieve the objectives in respect of the pre-hospital care by ambulance personnel as outlined in Chapters 3 and 4, requirements were addressed by the Group under two headings:

(i) New entrants

(ii) Existing ambulance personnel

A diagrammatic presentation of the proposed training programme is set out in Table 7 and a detailed description of the component courses is provided in the following pages.

(i) New Entrants

The Group recommends that for recruitment to the Ambulance Service, educational standards should be such as to allow new entrants to progress successfully through all stages of the training programme.

TABLE 7

Proposed Training Programme for Ambulance Personnel

NEW ENTRANTS - EMT-T
(Emergency Medical Technician/Trainee)

Induction/Basic Programme

6 weeks full-time course followed by a minimum of
6 months work experience.
Designated as **EMT-B**
(Emergency Medical Technician Basic)
after successfully completing the course.

EXISTING STAFF EMT-1
(Current six week full-time
Basic Course already completed)

Refresher/Development Programme

6 weeks full-time course
Designated as **EMT-2** after
successfully completing the course

Advanced Training Programme

10 weeks full-time course for personnel
from the Refresher/Development Course.
15 weeks full-time course followed by
a minimum of 6 months work experience for
personnel from the New Entrants stream.
Designated as **EMT-A** (Emergency Medical Technician
Advanced) after successfully completing the course.

The content and length of these courses should be reviewed and approved by the National Ambulance Advisory Council on a regular basis.

A small number of places should be available for mature students who may not have reached this educational standard but who have demonstrated an aptitude for the work. New entrants should have a Class B driving licence or will be expected to undergo a course to achieve the appropriate driver's class before proceeding to formal ambulance training.

The Group recommends that new entrants should undergo a two-stage training programme.

New entrants should be designated Emergency Medical Technician Trainee (EMT-T).

(a) Ambulance Service Induction Course for New Entrants

This should be a six-week full-time course which, on completion, will qualify the person to operate as an ambulance assistant on a front-line ambulance. He/she will be required to work a minimum six months and undergo continuous assessment by an in-service training instructor before proceeding to the next stage of training.

This course should be so designed to serve as an induction course to the Ambulance Service and should give the student the skills and knowledge necessary to perform Basic Life Support. It should include instruction in the following areas:—

General Patient Care, Basic Life Support, Communications, Health and Safety, Special Procedures and relevant Legal Matters.

On completion of this course, the student should be competent to work as a second crew member on a front-line accident and emergency ambulance. Personnel who successfully complete this course should be designated Emergency Medical Technician Basic (EMT-B).

The normal terms and conditions of employment should of course apply in all cases.

(b) Advanced Training Programme for New Entrants

Entry to this course should be by nomination of the Chief Ambulance Officer or Ambulance Officer, within nine months of induction. This course should comprise ten weeks' full-time training plus five weeks' hospital-based training. This should be followed by a minimum of six months' work experience under the supervision of experienced ambulance personnel.

The course should include more advanced instruction in the subjects covered in the EMT-T course and, in addition, should include instruction in Defibrillation, Advanced Airways Management and other Advanced Life Support skills. It should be followed by a period of in-hospital training in the following areas:— the Accident and Emergency Department, the Paediatric Department, the Coronary Care Unit, the Operating Theatres and in the Labour Ward. Students should also undergo an advanced driving course. Personnel who successfully complete the advanced training programme should be designated as Emergency Medical Technician Advanced (EMT-A).

(ii) Existing Ambulance Personnel

(a) Refresher/Development Course for Existing Ambulance Personnel

The Group recommends that all current qualified ambulance personnel (EMT-1) should undergo a six-week refresher/development course. All personnel who successfully complete this six-week course should then undergo assessment to determine their suitability to proceed to the advanced training programme.

The Refresher/Development course will cover in greater depth the subjects covered in the basic course. In addition, it will include instruction in Defibrillation and will also have an in-hospital training segment. This training should take place in the Accident and Emergency Department, the Coronary Care Unit and in the Operating Theatres. All personnel who successfully complete this six-week course should then undergo assessment to determine their suitability to proceed to the advanced training programme. Personnel who successfully complete the refresher/development programme should be designated EMT-2.

(b) Advanced Training Programme for Existing Ambulance Service Personnel

All ambulance personnel who pass the assessment tests at the end of the refresher/development course would be eligible to undergo further training to complete the full advanced training programme.

This course should be of six weeks' full-time duration. The course should include more advanced instruction in subjects covered in the EMT-2 course and, in addition, should include instruction in Advanced Airways Management and other Advanced Life Support skills. It should be followed by a period of four weeks' in-hospital training in the following areas:— the Accident and Emergency Department, the Paediatric Department, the Coronary Care Unit, the Operating Theatres and in the Labour Ward. Personnel who successfully complete this course should be designated EMT-A.

It is envisaged that personnel who proceed to the advanced training programme for existing ambulance service personnel should do so within one year of successfully completing the refresher/development programme.

12.4 Development of Paramedic Services

As a result of the high casualty/death rate amongst American soldiers during the Vietnam War, the United States Army began training personnel in Advanced Life Support skills such as infusion and intubation in an effort to decrease mortality. Subsequently, many of these highly skilled personnel became employed in the emergency care services in the United States. Areas such as Seattle and Florida were amongst the first to develop Advanced Life Support Units. These Units were found to be very effective in treating patients who required advanced intervention and as a result further Units were established throughout the United States. Later the use of paramedic services spread to other countries.

While paramedic services are a significant improvement over "basic level" services, they confer only a small increase in survival over an EMT-A service. In an analysis carried out by the Group, survival following paramedical intervention was better for arrests due to cardiac aetiology and ventricular fibrillation; however, overall survival after cardiac arrest was similar in both groups. Nonetheless the Review Group believes that it is worthwhile to undertake an evaluation on the possible role of paramedics in the provision of Advanced Cardiac Life Support and other advanced interventions, in the Irish context.

The Group recommends that a paramedic pilot project be established and that an evaluation programme be conducted on the effectiveness of a paramedic service in Ireland. The future development of paramedic services in Ireland should be considered in the light of the results of this evaluation programme.

The siting of this programme is considered important and the Group has identified suitable criteria which should be used to determine the locations where the programme could be established. These criteria are set out at **Appendix N.**

This evaluation should be undertaken both in a large urban area, so that adequate patient numbers may be obtained for the evaluation and in a rural area to ascertain the effect of providing ACLS or ALS at an earlier stage in pre-hospital treatment than it would normally be available in such an area.

The Group recommends that, when a general improvement in training has been achieved, as recommended in this Report, the question of further improvements in advanced training should be examined by the National Ambulance Advisory Council. The Group recommends that the national priority should be to provide a significant improvement in the quality of the training provided for current personnel across the eight Health Boards on a national basis.

In the light of advice from the National Ambulance Advisory Council, it should be the immediate priority to address the training needs of the entire country so as to provide an improved Ambulance Service for all citizens. This should be done in a planned fashion with each Health Board putting in place a programme of training which should be completed over a five-year period. In the meantime, the recommended evaluation programme on the effectiveness of a possible paramedic service should be agreed and evaluated.

12.5 Paramedic Training Programme — Pilot Project

The aim of this course should be to further develop Advanced Life Support skills. This course should consist of the subjects covered in the other training courses but to a more advanced level. This course should be of sixteen weeks' full-time duration, followed by six months' clinical development. It should include the following:—

Anatomy and Physiology, Emergency Pharmacology, Advanced Cardiac Life Support, Advanced Life Support, Advanced Management of Medical Emergencies including infusion, Advanced Airway Management procedures and the use of Manual Defibrillators.

It should also have an in-hospital training section covering the following areas:- Theatre, Coronary Care Unit, Accident and Emergency Department, Paediatric Department and the Labour Ward. It should also include a period of in-service training by having the trainee work with an experienced paramedic. Personnel who successfully complete this course should be designated EMT-P.

Detailed specifications for all training courses should be laid down by the National Ambulance Advisory Council. The content and length of training courses should be reviewed and approved by the Council on a regular basis.

12.6 Training Resources Required

The timescale involved in providing the training as set out previously in this Report will be dependent on the resources provided. To ensure the most effective use of resources it is proposed that the hospital placements should take place in the local Regional Hospitals under the direction of the local Accident and Emergency Consultant.

The Group envisages a five-year programme which should train the following number of personnel:

	Number of Personnel to be trained (approx)
New Entrants — Induction Course	200
New Entrants — Advanced Course	200
Existing Personnel — Refresher/Development Course	600
Existing Personnel — Advanced Course	250

This information is illustrated on page 112 (Figure 4).

The implementation of this programme would initially train all existing front-line ambulance personnel to a higher level of skills and knowledge in life support techniques as well as giving them the skills of defibrillation which is an important link in the "chain of survival".

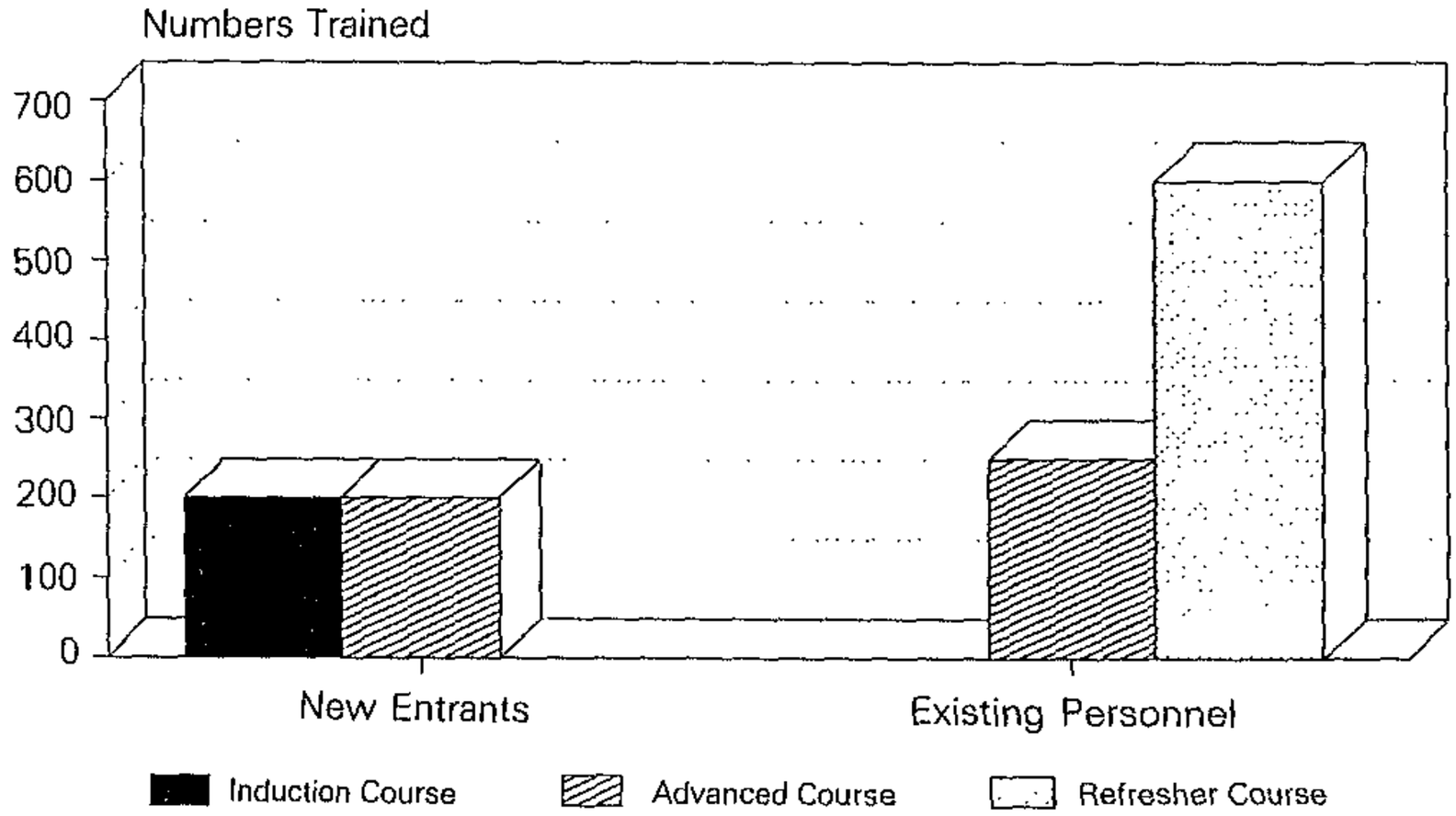
The advanced training programme proposed for ambulance personnel assessed as suitable for further training will train 250 of the existing operational personnel in the Ambulance Service. It is estimated that this will take five years. This programme, coupled with the new entrants advanced course should produce 450 personnel trained to an advanced level within six years of the commencement of the programme. If this programme is introduced in 1994, two-thirds of operational ambulance crews should be trained to an advanced level by December, 1999.

The "new entrants" programme is a very important development in the training syllabus. The induction and basic programmes provide the basis for building a professional and skilled workforce which should in time greatly enhance the quality of pre-hospital emergency care provided to the community. Health Boards should relate their recruitment and selection programmes to the training and development needs of a modern, highly skilled Ambulance Service.

FIGURE 4

PERSONNEL TRAINING

FIVE YEAR PROGRAMME



The Group recommends that the advanced training programme should only be available to ambulance personnel involved in accident and emergency work on a regular basis. This will help to ensure that the best return will be obtained from any additional resources that may be provided for enhanced training in the Ambulance Service.

The Group considers that the training of management and supervisory grades in the Ambulance Service should be addressed by the Health Boards as part of their normal training programmes. The ongoing training requirements for ambulance personnel should be dealt with by refresher courses and in-service training as the need arises. (See Chapter 13).

12.7 Advanced Life Support Training for Hospitals' Accident and Emergency Personnel

The Group recommends that appropriate members of staff working in hospital Accident and Emergency Departments should receive Advanced Life Support (ALS) training. (See Chapter 3).

This would improve the management of patients, especially where Advanced Life Support has already been given out-of-hospital by ambulance personnel and it would strengthen the "chain of survival" in cardiac arrest cases.

CHAPTER 13

Organisation and Management Arrangements

13.1 National Ambulance Service

Under the 1970 Health Act, the provision of Ambulance Services is a matter for each individual Health Board. The question of establishing a unified Ambulance Service was given careful consideration by the Group. The main thrust of this Report is that the Ambulance Service should increasingly be involved in pre-hospital care, with greater co-operation and linkage with local acute general hospitals. It is the view of the Group that the Ambulance Service should, therefore, continue to be managed by the statutory health agencies engaged in the provision of hospital care.

13.2 Ambulance Service Management

The Group considered that the overall control, management and supervision of Ambulance Services should be the responsibility of a designated Chief Ambulance Officer or Ambulance Officer in each Health Board area. The Group recognises that the supervision of ambulance personnel, vehicles, premises, communication systems and day-to-day operations places onerous responsibilities on the Chief Ambulance Officer or Ambulance Officer.

The Group therefore recommends that Chief Ambulance Officers and Ambulance Officers should receive appropriate management training.

The Group considers that Chief Ambulance Officers and Ambulance Officers should report to the Programme Manager responsible for acute hospital services in their Health Board area, who in turn reports to the Chief Executive Officer of the Board.

13.3 Management Support Staff

The number of management support staff varies between Health Boards and is related to the number of vehicles, staff and relative workload in each Health Board area.

The Group recommends that Health Boards should review their requirements for ambulance supervisory and command and control staff, by reference to the Group's overall recommendations for a more structured and homogenous Ambulance Service as contained in this Report.

In addition to these staff, there will also be a need for ambulance in-service training and development instructors in each Health Board area to maintain and develop the skills of operational ambulance personnel. Such personnel should work a number of shifts each week on frontline duty to assist with the training of ambulance personnel.

13.4 Ambulance Service Staffing

Approximately 70% of emergency ambulances are now staffed by two full-time ambulance personnel. The remainder are staffed by ambulance drivers supported by on-call part-time ambulance nurses or hospital nurses. The recommendations for the future recruitment and training of ambulance personnel have already been outlined in Chapter 12.

The Group recommends that each emergency ambulance should be staffed by two trained ambulance personnel with at least one having successfully completed the advanced training programme. Both should have current Class D1 driving licences.

13.5 Ambulance Nurses

With the exception of a number of larger metropolitan areas, nurses have traditionally been involved in the delivery of Ambulance Services. The involvement of nurses in the service is not uniform throughout the country and the nature of their involvement has been the subject of a number of submissions made to the Group in addition to having been the subject of consideration within the nursing profession.

The participation of nurses in the Ambulance Service may be classified as follows:—

(i) Hospital-based Staff

Data collected by the Group indicates that five of the eight Health Boards still utilise hospital-based nurses in the Emergency Ambulance Service although this practice is now a significant factor in only two Health Board areas. The historical basis for this practice appears to lie in the involvement of mainly rural hospitals in the provision of an Ambulance Service prior to the establishment of the Health Board structure.

In considering the organisation of services in this way, the Group wishes to endorse the Report of the Working Party on General Nursing published in 1980 which recommended "that the services of nurses for ambulance duty should be arranged for

by separate and pre-planned provision; not, as so often happens, at the expense of ward staffing". Significant and commendable progress has been made by the Health Boards in this area and this progress is continuing.

The Group recommends that, in situations where the current staffing arrangements for ambulances involves nurses being withdrawn from wards, this arrangement should be phased out as soon as possible.

(ii) Part-time Staff

Part-time nurses are also employed in the Ambulance Service. With the exception of the Eastern Health Board area and urban areas elsewhere in the country, nurses are retained on an on-call basis to attend ambulance calls as the need arises. This approach has traditionally existed in areas where the volume of ambulance calls has been considered insufficient to justify the employment of two-person crews on a 24-hour basis. Nurses may be on-call at their homes and required to be available to respond to an ambulance call should the need arise. In general the number of hours worked by such nurses would vary from week to week but would not usually exceed 20 hours.

A further variant in a small number of locations is the provision of cover by ambulance nurses on-call during the 8 a.m. to 8 p.m. period with cover for calls between 8 p.m. and 8 a.m. provided by nursing staff on night duty.

The Group gave detailed consideration to the continued operation of these arrangements. In assessing the appropriateness of this service, it is necessary to counter-balance the requirements of achieving the best possible response times with the need to optimise the benefits derived from the level of resources available to the Ambulance Service. The necessity to collect an ambulance nurse en route to a call has an obvious detrimental effect on response times. On the other hand the level of resources required to immediately introduce full two-person crewing on a round-the-clock basis where the level of calls may not be significant would require the allocation of a significant proportion of, even enhanced, Ambulance Service budgets. The issue of response times in rural areas is discussed in Chapter 3.

The Group recommends that the approach by individual Health Boards to the continued utilisation of the on-call system should be governed by the desirability of achieving a level of response time which is considered adequate, given the logistical and geographical factors involved.

The small number of emergency calls in some rural areas may not justify a change in existing arrangements for cover by way of day-time on-duty and night-time on-call.

The Group recommends that these part-time ambulance nurses should be fully integrated into the organisational structure of the Ambulance Service and should be required to undergo the same development and advanced training programmes as other ambulance personnel.

13.6 Medical Advisers

Because of the manner in which the Ambulance Service has developed and its emphasis on the transport of patients, the Service did not, as a general rule, integrate itself with the acute hospital service. It is the Group's view that the Ambulance Service must be seen as an outreach of the acute hospital.

The Group recommends that there should be a complete revision of the existing training programme for ambulance personnel and that there should be a major enhancement of the skills and knowledge base, in order to ensure a significant improvement in the standard of care provided by the Ambulance Service on a national basis.

Many of these skills and much of the knowledge is available locally and the Group is of the opinion that it is important to utilise the expertise of the local medical staff. The Ambulance Service should have medical advice available to it and the Group considers that the Accident and Emergency Consultants at the major centres in each Health Board region are most suited to perform this function. The Medical Adviser would not control day-to-day operations but would be available to offer medical advice to the Chief Ambulance Officer or Ambulance Officer and this would play an important part in the development of the Health Boards' Ambulance Service training programme.

The Group recommends that each Health Board should appoint a Medical Adviser to the Ambulance Service in its area. This post should be part-time.

13.7 National Ambulance Advisory Council

The Group recommends that a National Ambulance Advisory Council should be established to replace the existing Ambulance Services Council. The overall objective of the National Ambulance Advisory Council should be to ensure that uniform standards of service operate throughout the country so that the development of the Irish Ambulance Service keeps pace with good international practice.

The Group recommends that the most effective arrangement would be for the National Ambulance Advisory Council to be appointed by the Minister for Health and to operate under the aegis of the Department of Health, providing advice to the Minister for Health.

The Group recommends that the National Ambulance Advisory Council should have a broader representative base than the existing Council and should have significant medical representation as well as service, educational and management representatives.

The National Ambulance Advisory Council's functions should include the following

(a) to advise the Minister for Health on general ambulance and pre-hospital care issues.

(b) to review and set standards for pre-hospital care and standard operational procedures and protocols for the Ambulance Service.

(c) to assess and approve training courses which would meet the standards set by the Council and to award diplomas, certificates etc.

(d) to evaluate existing public and private Ambulance Services in the context of the standards set by the Council.

(e) to report annually on the Ambulance Service.

(f) to undertake research on developments in the Ambulance Service, especially in regard to emerging technology.

13.8 The National Ambulance Training School

The Group wishes to acknowledge the significant role played by the National Ambulance Training School in the training of staff for the Ambulance Service. At present the School is staffed by a Training and Administrative Officer, four Training Instructors and one secretary. The Group has noted that, with its present staff complement, the School is unable to adequately cope with the current demand for training from Health Boards. Furthermore, the Group considers that the training requirements outlined in Chapter 12 will require further additional resources. The Group is of the view that a restructuring of the School is necessary. In particular, it would appear desirable that the School should function separately from the National Ambulance Advisory Council, on a self-funding basis.

The Group recommends that the National Ambulance Training School should function separately from the National Ambulance Advisory Council and should be subject to the same evaluation and audit as other aspects of the Ambulance Service. The School should be accountable to the Health Boards and should have a small Management Committee who would be nominated by the Chief Executive Officers of the Health Boards.

The Group recommends that each Health Board should draw up a training programme for its ambulance personnel in line with the standards laid down by the National Ambulance Advisory Council and in consultation with the National Ambulance Training School. The School should organise its training programmes on a three-to-five-year roll-forward basis, through funding contracts with the Health Boards and other agencies using its services. Each Health Board should then provide the National Ambulance Training School with the funds pro-rata for the number of training days provided each year by the School to meet the Board's requirements.

Appendices

APPENDIX A

Written Submissions to the Ambulance Review Group

1. Accident & Emergency Association of Ireland
2. Mr Brian Abbott, Staff Member, Southern Health Board Ambulance Service
3. Mr Bernard Allen T.D., Dail Éireann
4. Ambulance Service Institute
5. Ambulance Services Council (4)
6. Arklow Urban District Council
7. Association of Ambulance Personnel (2)
8. Mr JK Brownlee, Dublin 4
9. Mr Richard Bruton T.D., Dail Éireann
10. Mr Eamonn Burns, Dublin 6
11. Cllr. Andy Callanan, Thurles Urban District Council
12. Chief Fire Officers' Association
13. Civil Defence
14. Mr Eamon Conway, Staff Member, South Eastern Health Board Ambulance Service
15. Mr Seamus Costigan, Staff Member, Southern Health Board Ambulance Service
16. Department of Defence
17. Department of the Environment
18. Mr John Doyle & Fr Thomas C Rogers, Waterford
19. Mr Kieran Doyle, Staff Member, Southern Health Board Ambulance Service
20. Dublin Corporation
21. Dublin Fire Brigade Section Committee (S.I.P.T.U.)
22. Eastern Health Board
23. Emergency Care Products Ltd., Dublin 8
24. Mr Raymond Farrelly, Dublin 9
25. Dr William Fennell, Cork Regional Hospital

26. Dr Elizabeth Griffin, Director of Paediatrics, Coombe Lying-In Hospital
27. Mr P Hanafin, Staff Member, Southern Health Board Ambulance Service (2)
28. Mr Sean Herlihy, and Staff Members, Southern Health Board Ambulance Service
29. Intensive Care Society of Ireland
30. Irish College of General Practitioners
31. Irish Heart Foundation
32. Irish Nurses Organisation
33. Irish Private Ambulance Association
34. Island Helicopters Ltd
35. K.P.M.G. Management Consulting, Dublin 2.
36. Limerick County Council
37. Dr C McDowell, Our Lady of Lourdes Hospital, Drogheda, Co Louth
38. Prof E McQuade, University of Limerick
39. Mr Macartan Hughes, and Staff Members, Eastern Health Board Ambulance Service
40. Mr Tom Maher, Waterford
41. Mater Misericordiae Hospital, Dublin 7
42. Mr Colm Megan, Staff Member, Eastern Health Board Ambulance Service
43. Dr Sylvester Mooney, Dublin 14
44. Dr Peter G Morehan on behalf of the local General Practitioners, Cobh, Co Cork
45. Dr Donal P Murray, Sligo General Hospital
46. Mr Denis O'Brien PC, Cork
47. Dr Edmund O'Callaghan, Bruff, Co Limerick
48. Dr P O'Connor and Dr A.E. Bourke, St Joseph's Hospital, Nenagh, Co Tipperary
49. Dr Hugh F O'Donnell, Athlone, Co Westmeath
50. Mr Sean O'Donnell, Dublin 10
51. Ms Anna O'Keefe, Cork
52. Mr Frank O'Malley, Ennis, Co Clare
53. Ms Mary O'Neill, Staff Member, Southern Health Board Ambulance Service
54. Mr Gerry O'Sullivan T.D., Dail Éireann
55. Cllr. Sheila O'Sullivan, Cork County Council
56. Order of Malta
57. Philips Communications Systems, Dublin 14

58. Mr Brian Power, Dublin 14
59. Dr David Power, Dublin 15
60. Rotunda Hospital, Dublin 1
61. Mr Harry Rowan, Staff Member, Eastern Health Board Ambulance Service
62. Mr Richard Shannon & Mr Anthony Donnelly, Staff Members, Eastern Health Board Ambulance Service
63. S.I.P.T.U. (2)
64. Southern Health Board
65. South Infirmary-Victoria Hospital, Cork
66. St James's Hospital, Dublin 8
67. St John's Hospital, Limerick — Medical Nursing & Casualty Staff
68. St Michael's Hospital, Dun Laoghaire
69. St Patrick's Hospital, Fermoy, Co Cork
70. St Vincent's Hospital, Dublin 4
71. Taylor Lightfoot Transport Consultants, Scariff, Co Clare
72. The Royal College of Physicians of Ireland (Faculty of Paediatrics)
73. Mr Michael Tierney, and Staff Members, Western Health Board Ambulance Service
74. Tipperary Urban District Council
75. Mr Tony Whelan, Staff Member, Southern Health Board Ambulance Service

Note: The figure in brackets indicates that more than one submission was received.

APPENDIX B

Organisations and Individuals who Made Oral Submissions to the Ambulance Review Group

1. The Ambulance Service Institute
2. The Association of Ambulance Personnel
3. Civil Defence
4. Mr. Michael Ferris T.D.
5. Intensive Care Society of Ireland
6. Irish College of General Practitioners
7. Mr. Colm Megan and members of the Eastern Health Board Ambulance Service
8. The Order of Malta
9. The Royal College of Physicians
10. The Royal College of Surgeons
11. S.I.P.T.U.
12. Tipperary Urban District Council

APPENDIX C

Fact-Finding Visits Undertaken by the Ambulance Review Group

1. The Air Corps, Casement Aerodrome, Baldonnel.
2. Dublin Corporation Fire Brigade Headquarters, Tara Street, Dublin 2.
3. Eastern Health Board Ambulance Control Centre, James's Street, Dublin 8.
4. Eastern Health Board Ambulance Base, Loughlinstown, County Dublin.
5. Eastern Health and Social Services Board Ambulance Service, Broadway, Belfast.
6. Erne Hospital, Enniskillen, County Fermanagh.
7. Fire Services Munster Interim System Mobilisation Project, Limerick.
8. Mid-Western Health Board Ambulance Control Centre, Limerick.
9. North-Western Health Board Ambulance Service, Ballyshannon, County Donegal.
10. Sligo General Hospital Mobile Coronary Care Unit.
11. West Midlands Ambulance Training School and Accident and Emergency Departments, United Kingdom.

APPENDIX D

Proposals for a Pre-Hospital Emergency Cardiac Care Training Module

(a) Aim

The aim of the Pre-Hospital Emergency Cardiac Care Course is to reduce mortality by extending the skills of ambulance personnel in the pre-hospital emergency care of the patient.

(b) Course Guidelines

The Cardiac rhythms that must be mastered are:—

(i) Normal sinus rhythm.

(ii) Ventricular tachycardia.

(iii) Ventricular fibrillation.

(iv) Asystole.

The basic decision faced by the ambulance personnel is whether the rhythm is ventricular fibrillation/ ventricular tachycardia or something else. If the rhythm is not ventricular fibrillation it is not mandatory that it be identified by name.

(c) Other Skills to be Acquired

The student must demonstrate to the standards set by the National Ambulance Advisory Council.

(i) Defibrillation protocol:— one-person operation.

(ii) One person CPR for a period of not less than four minutes.

(iii) The use of a resuscitation bag and mask on a simulated patient for a period of not less than two minutes.

(iv) Pre-shift check of defibrillator.

APPENDIX E

Pre-Hospital Emergency Care Report Form

Date: Vehicle:

Station: Call Sign:

Time of call: _____

Time Mobile: _____

Arrival at scene: _____

Time departing scene: _____

Arrival at hospital: _____

Location of incident: _____

Conveyed to: _____

Patients Name & Address (if known) _____

Age: Sex: M ☐ F ☐

G.P. Name: _____

Phone No:

Chief Complaint: _____

Trauma: *Describe the mechanism of injury:* _____

Medical

Chest Pain	☐	CVA	☐
Abdo Pain	☐	Collapse	☐
SOB	☐	Coma	☐

Cardiac Arrest:

Witnessed ☐ Time: _____

Unwitnessed ☐

Bystander CPR Yes ☐ No ☐ Duration ☐

Injury Assessment/Priority

S.T.A.R.T. Assessment

Critical	\Red	☐
Moderate	\ Green	☐
Dead	\White	☐

Airway

Clear	☐
Partial obstruction	☐
Complete obstruction	☐
Vomitus	☐
Suspect C spine injury	☐

Airway Maintenance

Recovery position	☐
Manual clearance	☐
Suction	☐
Head Tilt	☐
Jaw Thrust	☐
Airway Oro/nasopharyngeal	☐
Intubation ☐ Intubation Time	☐
C - Collar applied	☐
C - Spine Immobilisation Device	☐

Breathing

ASSESSMENT		TREATMENT	
Normal	☐	Mouth to Mouth	☐
Laboured	☐	Bag & Mask	☐
Absent	☐	Resuscitator	☐
		Oxygen	☐
		% _____	
		Duration _____	

Circulation

ASSESSMENT		TREATMENT	
Pulse: present	☐		
absent	☐	ECM	☐
Skin			
Normal ☐ Pale ☐ Cyanosed ☐			
Defibrillation	Man ☐	Advisory ☐	

Charge	200j	200j	360j	360j	360j
At Time					

Haemorrhage

Suspect Internal	☐
External	☐
Pressure bandage	☐
Control Achieved:	☐

Glasgow Coma Scale			T	T	T
Eye Opening	Spontaneously	4			
	to verbal command	3			
	to pain	2			
	no response	1			
Best Verbal Response	Orientated	5			
	disorientated	4			
	Innap. Words	3			
	Incomp. Sounds	2			
	Nil	1			
Best Motor Response	Obeys commands	6			
	Localises Pain	5			
	Flex./Withdrawal	4			
	Flex. to pain	3			
	Extn. to pain	2			
	None	1			
GCS Total					

Observations Chart	Vital Signs		
Time			
Resp. Rate			
Pulse Rate			
BP (sys)			
Sa02			
Cap. Refill			

Pupils *(other)*

Equal ☐ Unequal ☐

Dilated ☐ Constricted ☐

Reactive ☐ Unreactive ☐

Burns/Scalds ☐

Estimated Area: _____

I.V. Infusion ☐

If Yes - Fluid 1. _____

2. _____

3. _____

Estimated Vol. Infused: _____

Time Started: _____ Hrs.

Entonox ☐

If yes - Duration of use: _____

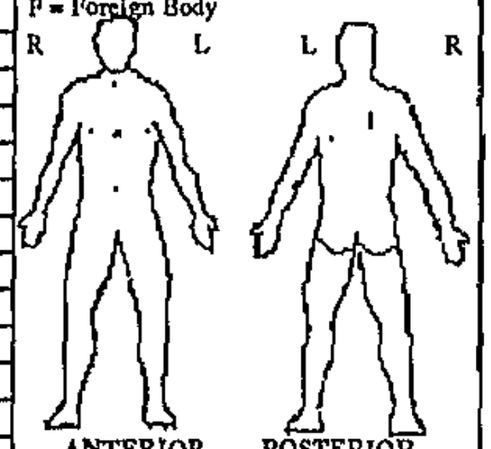
Drug Administration

Drug	Dose	Rate	Time

Key fractures c = closed o = open

B = Burns W = Wounds I = Internal

F = Foreign Body



Additional Information

A

M

P

L

B

I

RTA

Seat belt Yes ☐ No ☐

Air Bag Yes ☐ *No* ☐

Pre Hospital Care Provided

Rythm Strip Yes ☐ No ☐

Signed

Ambulance Person

Receiving Nurse/Doctor

Date: Time:

APPENDIX F

Resuscitation in the Community

Bystander CPR Compared with Delayed CPR: Outcomes

Study from Hospital	Response time	Numbers	Discharged Alive
Oslo	About 8 mins.	Bys. CPR 75 Del. CPR 556	36% (27) 8% (43)
Alabama	> 5 mins.	Bys. CPR 7 Medic CPR 12	86% (6) 50% (6)
Seattle	Mean 3 mins.	Bys. CPR 109 EMT CPR 207	43% (47) 21% (43)
Manitoba	> 10 mins. for most	Bys. CPR 65 EMT CPR 161	25% (16) 5% (8)
Iceland	Mean 7.3 mins.	Bys. CPR 38 EMT CPR 84	42% (16) 6% (5)
Vancouver	not available	Bys. CPR 43 Del. CPR 272	21% (9) 6% (17)
Los Angeles	Mean 5 mins.	Bys. CPR 93 Medic CPR 150	22% (20) 5% (7)
	VF only	Bys. CPR 45 Medic CPR 70	27% (12) 6% (4)
King Country	Mean 6 mins.	Bys. CPR 108 EMT CPR 379	23% (25) 12% (45)
Pittsburgh	not available	Bys. CPR 25 Medic CPR 59	24% (6) 7% (4)
Milwaukee	Witnessed	Bys. CPR 1,248 Late CPR 252	15% (182) 15% (38)
Michigan	not available	Bys. CPR 472 Late CPR 1,367	13% (56) 5% (64)
King County	not available	Bys. CPR 726 Late CPR 1,317	27% (196) 13% (177)

APPENDIX G

Long Term Survival Rates and Service Delivery

Service	Cardiac Arrests	Arrests: Cardiac Aetiology	Patients who Survived to Hospital	Survival of Patients with Ventricular Fibrillation	Other Arrhythmias
Paramedic	1020/13269=8%	1728/11963=14%	749/3313=23%	2310/9410=25%	224/6566=3%
Defibrillation Ambulance	264/3576=7%	261/2755=9%	445/3115=14%	464/2917=16%	17/1547=1%
MICU/MCCU	79/2318=3%	91/1227=7%	231/2318=10%	21/73=29%	31/650=5%
Basic Ambulance	1/54=2%	10/421=2%	32/475=7%	1/31=3%	0/23=0%

This table refers to a long term survival (i.e. to hospital discharge) of patients after a cardiac arrest. The first column of data refer to overall survival after a cardiac arrest (i.e. includes trauma). The second column refers to cardiac arrests where the cause is cardiac. The table is the result of a detailed analysis of trials reporting outcome after cardiac arrest. The data in each column should be interpreted separately because the analysis includes many studies using different end point outcomes.

APPENDIX H

Effectiveness of Various Methods of Pre-Hospital Care Delivery by Emergency Medical Services

(i) Basic Ambulances

Author	Location	Year	Cardiac Arrests	Arrests due to Cardiac Aetiology	Rhythm	Survived to Hospital	Discharged Alive
Einarrson, O	Reykjavik	1989	—	—	—	—	9%
Bachman, JW	Minnesota	1986	—	120	—	7(6%)	4(3%)
Olson, DW	Milwaukee	1989	—	—	—	—	3.6%
Eisenberg, M	Washington State	1979	—	301	—	17(6%)	6(2%)
Stults, ICR	Iowa	1984	54	—	31(57%)VF* 23(43%) Other 54(total)	7(23%) 1(4%) 8(15%)	1(3%) 0 1(2%)

*VF = ventricular fibrillation

Comments on Studies

Einarrson (1989) — Survival rates with new MICU is 17%

Bachman (1986) — Improved survival with EMTD (6%) and Paramedic services (1986) (11%). Data refers to witnessed arrests only, if all arrests are included, survival rates are roughly halved.

Eisenberg (1979) — Incidence of cardiac arrest was 7.1/10,000/annum. Paramedic service addition improved survival.

Stults (1984) — Rural community. Comparison group (EMTD) fared better. Response time 7 minutes — time at scene 9.9 minutes.

(ii) (a) Ambulances with Defibrillators

Author	Location	Year	Cardiac Arrests	Arrests due to Cardiac Aetiology	Rhythm	Survived to Hospital	Discharged Alive
Jakobsson, J	Stockholm	1989	—	109	29(27%)VF*	10(9%)	3(3%)
Cobbe, SM	Scotland	1991	111	—	602(54%)VF 509(46%) Other 1111 (Total)	180(30%) — 180	75(13%) 0(Presumed) 75(7%)
Bachmann, JW	Minnesota	1986	—	117	82(70%)VF 35(30%) Other 117 (Total)	— — 21(18%)	— — 7(6%)
Jakobsson, J	Stockholm	1987	227	—	—	28(10%)	9(3%)
Olson, DW	Milwaukee	1989	617	566	304(54%)VF 262(46%) Other 566 (Total)	74(24%) 9(3%) 83(15%)	33(11%) 3(1%) 36(6%)
Jakobsson, J	Stockholm	1987	307	294	140(48%)VF 154(52%) Other 294 (Total)	22(16%) 6(4%) 28(10%)	9(6%) 2(1%) 11(4%)
Jakobsson, J	Stockholm	1989	548	—	165VF 548 (Total)	21(13%) 44(8%)	3(2%) 4(1%)
Weaver, WD	Seattle	1985	87	—	—	51(59%)	26(30%)
Weaver, WD	Seattle	1988	687	—	285(41%)VF 402(59%) Other 687 (Total)	— — —	86(30%) 11(3%) 97(14%)

VF = ventricular fibrillation

Comments on Studies

Cobbe (1991) — Time from arrest to first shock was 3 minutes (Survivors) and 11 minutes (non survivors). This was significant. Advisory defibrillation was used.

Bachmann (1986) — Witnessed arrest survival rates only. If all arrests were included, survival rates were roughly halved.

Jakobsson (1987) — Defibrillator programme saved 3.5 lives per 100,000/year. Average cost/life saved was $14,700 USD. Marginal cost/life saved was $1,800 USD — data based on 1986 costs and all costs were taken into account (eg. cost of extra hospital admissions etc.)

Olson (1989) — Survival before defibrillation programme was 3.6% (significant difference). Survivors — response time 3.7 minutes, time to defibrillation 8.3 minutes, non survivors — response time 7.3 minutes, time to defibrillation 12.2 minutes, 72% of survivors were neurologically normal.

Jacobsson (1987) — Programme saved 4.2 lives/100,000/annum. Response time in survivors < 4 minutes, only few survived if time was 4-8 minutes. Average response time 7.8 minutes. Witnessed arrests were important.

Jakobsson (1989) — Advisory defibrillation sensitivity 97%, specificity 100%. Response time 7.5 minutes. Cardiac arrest incidence 110/100,000/year.

Weaver (1985) — EMTD survival better than paramedic but not statistically significant. EMTD Course — 10 hours.

Weaver WD (1988) — Used Advisory defibrillation, response time 3.6 minutes. Witnessed arrest and ventricular fibrillation were good prognostic indicators. Overall survival better than paramedic service alone.

(ii) (b) Ambulances with Defibrillators

Author	Location	Year	Cardiac Arrests	Arrests due to Cardiac Aetiology	Rhythm	Survived to Hospital	Discharged Alive
Haynes, BE	California	1991	—	1487	1009(68%)VF 1487(Total)	—	191(19%) 191(13%)
Stults, KR	Iowa	1984	110	—	64(58%)VF 46(42%) Other 110 (Total)	18(28%) 0 18(16%)	12(19%) 0 12(11%)
Jacobs, IG	Perth	1990	—	—	231VF	180(78%)	40(17%)
Stults, KR	Iowa	1986	—	182	88(48%)VF 94(52%) Other 182 (Total)	27(30%) — —	13(15%) 0 13(7%)
Jakobsson,J	Stockholm	1990	109	—	29(27%)VF 80(73%) Other 109 (Total)	5(17%) 5(6%) 10(9%)	2(7%) 1(1%) 3(3%)

VF = ventricular fibrillation.

Comments on Studies

Haynes (1991) — EMTD training — 100 hours course.

Stults (1984) — EMTD 16 hour programme. Significantly better discharge rates than basic ambulances. Incidence of cardiac arrest was 0.76/1000 population/annum. Rural community response time 5.7 minutes. Time at scene 13.7 minutes.

Jacobs (1990) — Response times were not significant. Average time was 8 minutes.

Stults (1986) — If EMTD arrived > 4 minutes before paramedics, survival increased. Response time survivors 3.7 minutes. Towns < 5000 population have 3.4 arrests per year (2.1VF). Towns 20-30,000 population have 10-20 arrests per year. In small communities, one third of arrests occur > 5 miles from EMT station. Advisory defibrillators were 100% specific and 92% sensitive and quicker to shock than manual defibrillator (1.56 minutes Vs 2.77 minutes) and converted VF better. EMT 16 hour training course.

Jakobsson (1990) — Response time 8 minutes. Advisory defibrillators were satisfactory.

(iii) Medical ICU/CCU

Author	Location	Year	Cardiac Arrests	Arrests due to Cardiac Aetiology	Rhythm	Survived to Hospital	Discharged Alive
Einarrson	Reykjavik	1989	—	138	73(53%)VF* 65(47%) Other 138(total)		21(29%) 3(5%) 24(17%)
Neilsen,EM	Holstebro	1989	2048	1089	649	175(27%)	67(10%)
Schinnerl,A	Innsbruck	1990	270	—	—	56(21%)	12(4%)

*VF = ventricular fibrillation

Comments on Studies

Einarrson (1989) — MICU operates 8am — 12 midnight, not on Sunday. Response time 5 minutes. Time to ACLS — 7 minutes. Before MICU, Survival was 9%. Time to ACLS (in hospital) 12 minutes. Incidence of cardiac arrest is 60/100,000 population.

Neilsen (1989) — Cardiac cases are approximate. Resuscitation commenced in 649 patients with 67(38%) discharged from hospital.

Schinnerl (1990) — Cardiac arrest in a public place improved survival.

(iv) (a) Paramedic Services

Author	Location	Year	Cardiac Arrests	Arrests due to Cardiac Aetiology	Rhythm	Survived to Hospital	Discharged Alive
Myerburg, RJ	Miami	1980	—	352 — —	244(69%)VF 108(31%) Other 352(Total)	108(44%) 9(8%) 117(33%)	67(27%) 0 67(19%)
Eisenberg, MS	Israel	1987	3868	2995	910(30%)VF 2085(70%) Other 2995(Total)	— — 531(18%)	142(16%) 56(3%) 198(7%)
Bachman, JW	Minnesota	1986	—	46	26(57%)VF 20(43%) Other 46 (Total)	— — 13(29%)	— — 5(11%)
Angus, Y	Minneapolis	1990	—	—	—	105	24(23%)
Martin, TG	P.Sylvania	1988	611	525	246(47%)VF	31(14%)	13(6%)
Aprahamian, C	Wisconsin	1985	445	—	129VF 316 Other 445(Total)	65(50%) 29(9%) 94(21%)	32(25%) 10(3%) 42(9%)
Cummins, RO	Seattle	1985	—	2043	—	—	373(18%)
Hallstrom, AP	Seattle	1985	—	—	—	149	73(49%)
Weaver, WD	Seattle	1984	370	—	—	217(59%)	105(28%)
Eisenberg, M	Washington State	1979	—	156	—	39(25%)	27(17%)

VF = ventricular fibrillation

Comments on Studies

Myerburg (1980) — 80% of arrests received attention in <4 minutes.

Eisenberg (1987) — Survivor response time 5.4 minutes, non survivors 6.8 minutes (significant). Time to CPR — 2.4 minutes and 4.9 minutes; time to advanced life support 4.8 minutes and 9.6 minutes.

Bachman (1986) — Study involved basic and defribillator ambulances and paramedics. Survival rates are for witnessed arrests rates only. If unwitnessed arrests are included, survival rates are approximately halved.

Angus (1990) — 45% of arrests due VF. Asystole has negative prognosis.

Martin (1988) — Defibrillation before medical therapy was beneficial. Response time not significant.

Aprahamian (1985) — Response time in successful resuscitation 5 minutes, unsuccessful 7 minutes. VF and short paramedic treatment times were associated with successful outcome.

Cummins (1985) — Survival in unwitnessed arrests was 4%. Response times for EMT 4.4 minutes and paramedic 9 minutes. VF and bystander CPR important. EMT training 81 hours, paramedic 1600 hours.

Hallstrom (1985) — Response times EMT 2.6 minutes and paramedic 6 minutes. Poor prognostic factors — heart failure, time to CPR. Survival rates are for witnessed arrests.

Weaver (1984) — Survival for EMTD group was 30% (not significant). If paramedic response time was 9 minutes, EMTD survival better.

Eisenberg (1979) — Must have CPR < 4 minutes and paramedic response time < 10 minutes.

(iv) (b) Paramedic Services

Author	Location	Year	Cardiac Arrests	Arrests due to Cardiac Aetiology	Rhythm	Survived to Hospital	Discharged Alive
Weaver, WD	Seattle	1986	—	—	247(EMD) 1059(Asystole) 3981(VF) 5287(Total)	— 150(14%) — —	15(6%) 13(1%) 977(25%) 1005(19%)
Roth, R	Pittsburg	1984	598 (317DOA)*	187(67%)	98(52%)VF 89(48%) Other 187(Total)	33(34%) 22(25%) 55(29%)	15(15%) 3(3%) 18(10%)
Weaver, WD	Seattle	1988	600	—	235(39%)VF 365(61%) Other 600(Total)	— — —	49(21%) 15(4%) 64(11%)
Gueugniaud,P	Lyons	1989	730	—	—	108(15%)	25(3%)
Valenzuela,TD.	Tucson	1992	416	372(89%)	54%VF 372(Total)	— 75(20%)	15% 22(6%)
Hearne, TR	Seattle	1988	—	—	1894VF	—	607(32%)
Stueven, HA	Milwaukee	1989	5631 (1415 DOA)	—	1919(46%)VF 2297(54%) Other 4216(Total)	— — —	421(22%) 112(5%) 533(13%)

*DOA = patients pronounced dead on arrival by team
*VF = ventricular fibrillation

Comments on Studies

Weaver (1986) — Non trauma cases, asystole with trauma — no survivors. For each 1 minute delay CPR — survival decreased by 3%. For each 1 minute delay defibrillation — survival decreased by 4%.

Further paper on survival factors. Time to defibrillation for survivors 6.1 minutes, non survivors was 7.3 minutes, significant. If defibrillation time was shortened by 3.5 minutes, it leads to 10-13% improvement in overall survival rates. For paramedic versus EMTD services, in 942 patients, if EMTD gave first defibrillation, 94 additional lives would be saved.

Roth (1984) — Paramedic response time 5.97 minutes. Survival rate 16% if response time < 4 minutes, 3% if time > 4 minutes, not significant.

Weaver (1988) — Comparison against EMTD service where survival was 14% overall.

Gueugniaud (1989) — Survival dependant on paramedic response time. If time < 10 minutes — 5% survival, for 10-20 minutes — 2%, > 20 minutes — 0%.

Valenzuela (1992) — In witnessed arrests 48/118 (15%) of VF cases survived. EMT response time 4.1 minutes, paramedic time 5.1 minutes.

Hearne (1988) — Incidence cardiac arrest 6.3/10,000/year. Data on witnessed VF only. If response time < 8 minutes, 44% survive; if > 8 minutes, 25% survive; if advanced life support time < 6 minutes, 37% survive; if > 6 minutes, 11% survive.

Stueven (1989) — 1415 of 5631 were dead on arrival and resuscitation was made in 4216 cases. EMT — Response time 2 minutes, 102 training hours. Paramedic — response time 5 minutes, course duration was 1104 training hours.

(v) Significance Testing (95% Confidence Intervals)

Service	Cardiac Arrests	Arrests: Cardiac Aetiology	Hospital Survival	VF Survival (Ventricular Fibrillation)	Other Arrhythmias
(1) Paramedic					
Vs Defibrillation Ambulance	1.04 (0.91-1.21)	1.61 (1.4-1.86)	1.75 (1.54-2)	1.72 (1.54-1.92)	3.18 (1.9-5.4)
Vs MICU/MCCU	2.44 (1.92-3.11)	2.11 (1.68-2.64)	2.64 (2.25-3.1)	0.81 (0.47-1.38)	0.73 (0.22-2.93)
Vs Basic Ambulance	4.41 (NS)	6.94 (3.6-13.8)	9.76 (1.43-192.7)	NS	4.04 (2.76-5.95)
(2) Defibrillation Ambulance					
Vs MICU/MCCU	2.26 (1.73-2.95)	1.31 (1.01-1.69)	1.51 (1.27-1.79)	0.47 (0.27-0.81)	0.23 (sig)
VsBasic Ambulance	4.22 (NS)	4.3 (2.21-8.65)	2.31 (1.57-3.41)	5.67 (NS)	N.S.
(3) MICU/MCCU					
Vs Basic Ambulance	1.87 (NS)	3.29 (1.64-6.79)	1.53 (1.03-2.29)	1.65 (1.4-1.94)	NS

This table compares the relative effectiveness of the different services against each other. A figure greater than unity means that the service is more effective than the one with which it is being compared. An example is the paramedic service compared to MICU/MCCU's. The results for cardiac arrests (2.44) mean that paramedic services are more than twice as effective as MICU/MCCU's in terms of the patient surviving after a cardiac arrest. The underlined figures in the table indicate statistically significant results. The results indicate that paramedic services are generally the most effective in treating patients with cardiac arrest, however, defibrillation ambulances are almost as effective.

APPENDIX I

Ambulance Service Communications
Outline of Present Systems Technology

General Systems:

The ambulance communication system is based on radio and telephone communications on the whole, with some use of digital media for administration functions.

The existing radio systems work in the 74-84 MHz waveband range, with 11 channels in use, including a National Ambulance Channel. The systems are AM (amplitude modulation) in the main with some Health Boards moving to FM (frequency modulation) and operating a dual system to facilitate the different modes throughout the country.

The system configuration consists of control equipment, fixed mobiles, mobiles and message logging facilities on the operational side and repeater sites, links and transmitters on the transmission side.

There are also hand portables available, using UHF for mobile site operation at major incidents.

The radio communications equipment which is in use by the Ambulance Service as a whole is approximately as follows:

- Control Equipment 22 sets
- Repeater Equipment 50 sets
- Fixed mobiles 115 units
- Mobiles 500 units
- Hand portables 90 units

EQUIPMENT CONFIGURATION

Data which the Group extracted from a questionnaire indicates the following configuration for each Health Board:

EASTERN HEALTH BOARD

System Configuration

Control Centres	3	St. James's Hosp. Wicklow Naas			
Repeaters	8		**Local** St. James's Hosp. Naas Loughlinstown	**Rented** Saggart Howth Kilpoole	**Shared** Rossmore Trooperstown
Modulation	Dual: AM (Dublin) FM (Naas, Wicklow)				
Fixed Mobiles	17 AM 4 FM				
Mobiles	150 AM 50 FM				
Portables	30				
Voice Recording	3 (Naas, St. James's Hospital, Wicklow)				
Paging System	Yes				

MIDLAND HEALTH BOARD

System Configuration

Control Centres	5	Portlaoise Tullamore Mullingar Longford Athlone		
Repeaters	3			**Shared/Owned** Coolcrease Slieve Bloom Mount Frewn
Modulation	AM			
Fixed Mobiles	5			
Mobiles	25			
Portables	6			
Voice Recording	No			
Paging System	No			

MID WESTERN HEALTH BOARD

System Configuration

Control Centres	3	Limerick (Central) Ennis Nenagh			
Repeaters	3				**Shared/Owned** Woodcock Hill Knockenumpha Devil's Bit
Modulation	Dual: AM & FM				
Fixed Mobiles	12 AM 16 FM				
Mobiles	33 AM 38 FM				
Portables	10				
Voice Recording	1 (Limerick)				
Paging System	Yes				

NORTH EASTERN HEALTH BOARD

System Configuration

Control Centres	1	Navan			
Repeaters	6		**Local** Navan	**Rented** Cavan Saggart Collon Kingscourt	**Shared/Owned** Ballybay
Modulation	FM				
Fixed Mobiles	8				
Mobiles	28				
Portables	8				
Voice Recording	1				
Paging System	Yes				

NORTH WESTERN HEALTH BOARD

System Configuration

Control Centres	1	Ballyshannon
Repeaters	9	

Local	**Rented**	**Shared/Owned**
Sligo	Moville	O'Donnell's Rock
Letterkenny	Truskmore	Ballyshannon
	Carn Hill	Dungloe
		Barnsmore

Modulation	AM
Fixed Mobiles	4
Mobiles	40
Portables	4
Voice Recording	1
Paging System	Yes

SOUTH EASTERN HEALTH BOARD

System Configuration

Control Centres	4	Kilkenny Clonmel Waterford Wexford
Repeaters	7	

Rented	**Shared/Owned**
Mount Leinster	Forth Mountain
Johnswell	Rossmore
	Harney's Cross
	Kilnafarna
	Donnell's Hill

Modulation	AM
Fixed Mobiles	6
Mobiles	63 AM 8 FM
Portables	10
Voice Recording	1 (Waterford)
Paging System	No

SOUTHERN HEALTH BOARD

System Configuration

Control Centres	2	Cork Tralee
Repeaters	11	

Rented	**Shared/Owned**
Bweeng	Propogue
Kenmare	St. Mary's (Cork City)
Bantry	Mount Gabriel
Kilkeveragh	Glanbrack
Lackeragh	Muinganear
	Kilnafarna

Modulation	AM
Fixed Mobiles	27
Mobiles	37
Portables	12
Voice Recording	2 (Cork and Tralee)
Paging System	*Yes*

WESTERN HEALTH BOARD

System Configuration

Control Centres	3	Castlebar *Roscommon* University College Hospital Galway
Repeaters	4	

Rented	**Shared/Owned**
Abbeyknockmoy	Treenagleeragh
	Slieve Bawn
	Mulranny

Message Logging	1
Fixed Mobiles	16
Mobiles	49
Portables	9
Voice Recording	*No*
Paging System	Yes

APPENDIX J

Ambulance Service Circuits/Channels Required

	UHF Fixed	UHF Portable	Overlay Paging	PSTN	Ded. Line	EIRPAC	EIR CELL	EIR PAGE	VHF MOBILE
Ambulance Control Centre									
—Telecom AME	—	—	—	X	X	—	—	—	—
—Ambulances (Own Board)	—	—	—	—	—	—	—	—	X
—Ambulances (Other Boards)	—	—	—	—	—	—	—	—	X
—Ambulances (Military)	—	—	—	—	—	—	—	—	X
—Ambulance Bases	—	—	—	X	—	—	—	—	X
—Ambulance Staff	—	—	X	X	—	—	—	—	—
—Chief Ambulance Officer	—	—	X	X	—	—	X	—	X
—Supervisors	—	—	X	X	—	—	—	—	X
—MCV	—	—	—	X	—	—	X	—	X
—A&E Depts	—	—	—	X	—	—	—	—	X
—Hospitals	—	—	—	X	—	—	—	—	X
—BTSB	—	—	—	X	—	—	—	—	X
—Contiguous Amb Controls	—	—	—	X	—	—	—	—	X
—Other Amb Controls	—	—	—	X	—	—	—	—	—
—Doctors	—	—	X	—	—	—	—	X	X
—Garda Control	—	—	—	X	X	—	—	—	X
—Fire Control	—	—	—	X	X	—	—	—	X
—Remote Radio Sites	X	—	—	—	X	—	—	—	—
—MRCC	—	—	—	X	—	—	—	—	—
—Health Agencies	—	—	—	X	—	—	—	—	X
—Remote Data Bases	—	—	—	—	—	X	—	—	—
—Airports (ATC)	—	—	—	X	—	—	—	—	X
—Harbour Controls	—	—	—	X	—	—	—	—	X
—Others	—	—	—	X	—	—	—	—	—
Ambulance									
—Ambulances	—	—	—	—	—	—	—	—	X
—Crew	—	X	X	—	—	—	—	—	—
—Hospital	—	—	—	—	—	—	—	—	X
—Doctors	—	—	—	—	—	—	—	—	X
—Garda Control	—	—	—	—	—	—	—	—	X
Mobile Control Vehicle									
—Ambulances	—	—	—	—	—	—	—	—	X
—Hospitals	—	—	—	X	—	—	X	—	X
—Site Medical Officer	—	X	—	—	—	—	—	—	—
—Site Ambulance Officer	—	X	—	—	—	—	X	—	—
—Co-ordinating Group	—	—	—	X	—	—	X	—	X
—Others	—	—	—	X	—	—	X	—	—

APPENDIX K

Ambulance Service — Command and Control Centres

(i) Number of Command and Control Centres by Health Board Area

Ambulance Command and Control Centres	EHB	MHB	MWHB	NEHB	NWHB	SEHB	SHB	WHB	Total
Regional Control (Fully Central)	1		1	1	1		2		6
District County Control (Part Central)	2		2			4		3	11
Local Hospitals		5							5
Total	3	5	3	1	1	4	2	3	22

(ii) Location of Command and Control Centres by Health Board Area

Eastern	Midland	Mid-West	North-East	North-West	South-East	Southern	Western
James's St	Portlaoise	Limerick	Navan	Ballyshannon	Kilkenny	Cork	Castlebar
Naas	Tullamore	Ennis			Clonmel	Tralee	Galway
Wicklow	Mullingar	Nenagh			Waterford		Roscommon
	Longford				Wexford		
	Athlone						

APPENDIX L

Population per Health Board (1991)

Eastern	Midland	Mid-West	North-East	North-West	South-East	Southern	Western	Total
1,244,238	202,948	310,511	300,265	208,027	383,003	531,533	342,876	3,523,401

Number of Ambulance calls answered per Health Board in 1991

	Eastern†	Midland	Mid-West	North-East	North-West	South-East	Southern	Western	Total
Emergency	80,000	6,000	7,000	6,000	6,000	8,000	9,000	6,000	128,000
Other*	42,000	7,000	12,000	8,000	7,000	17,000	18,000	21,000	132,000
Total	122,000	13,000	19,000	14,000	13,000	25,000	27,000	27,000	260,000‡

Area per Health Board Region

Health Board	Eastern	Midland	Mid-Western	North-Eastern	North-Western	South-Eastern	Southern	Western	Total
Area (sq miles)	1,792	2,568	3,020	2,462	3,192	3,692	4,713	5,516	26,955

*Including Urgent and Routine, but excluding all enquiries

†This includes 59,000 emergency calls answered by the Dublin Fire Brigade.

‡This figure does include queries from patients and their relatives where the dispatch of an ambulance is not required.

APPENDIX M

Mileage Travelled by the Ambulance Service — 1991

Health Board	Eastern	Midland	Mid-Western	North-Eastern	North-Western	South-Eastern	Southern	Western	Total
Mileage	2,180,000	935,000	593,000	1,189,000	714,000	1,746,000	858,000	819,000	9,034,000

Patients Carried by the Ambulance Service — 1991

Health Board	Eastern	Midland	Mid-Western	North-Eastern	North-Western	South-Eastern	Southern	Western	Total
Patients	185,000	37,000	57,000	16,000	22,000	174,000	28,000	32,000	551,000

APPENDIX N

Criteria for Establishing a Paramedic Pilot Project and Evaluation Study

Research undertaken in the United States and elsewhere has suggested that the key factors to the success of these paramedic programmes are:

(a) the commitment and determination of the medical directors,

(b) the integration of the University Medical Schools with the programme,

(c) the involvement of key Medical Departments and their consultant and nursing staff in the training and development of the paramedics.

The training should involve didactic and supervised skills development, both in-hospital and pre-hospital.

1. Paramedic training should therefore require the involvement of experienced and interested medical specialists and Paramedic Ambulance Training Officers.

2. The medical specialists primarily required would be Cardiologists, Accident and Emergency Consultants and Anaesthetists. Other medical specialists involved include Accident and Emergency Paediatricians, Obstetricians, General Practitioners and Pathologists. The commitment of the above medical specialists is paramount to the success of the paramedic programme.

3. Specialised Units, such as Accident and Emergency Departments, Coronary Care Units, Theatres, Intensive Care Units, Labour Wards and Burns Units, with a high throughput of patients, are essential if the required skills levels are to be achieved. Other units such as Acute Psychiatric Units, Anatomy Laboratories and Regional Ambulance Command and Control Centres will also be required.

4. A Paramedic Ambulance Training Officer should plan, organise, control and supervise both training and field internship in conjunction with the medical specialists. He/she should be required to develop training objectives and operational protocols.

5. A core of ambulance personnel would have to be retrained to a higher level (EMT-A) prior to commencement of paramedic training. As paramedic training is new in this country, time will have to be devoted to preparing the programme and the logistical detail involved.

Glossary

Access Overload Control

Allocation of a dedicated channel in a cellular radio system to an emergency service, in situations (e.g. major emergencies) where the system may be overloaded by other users.

A.C.L.S.

Advanced Cardiac Life Support. An organised method of keeping a cardiac patient alive involving the use of defibrillation, airway support, intubation and intravenous medication.

AED

Automated external defibrillator — this machine analyses the patient's heart rhythm and either automatically defibrillates or advises the operator to defibrillate.

Air Transport

Transport by fixed wing or rotory-wing aircraft.

All Informed Mode

Radio mode whereby all parties can hear all other parties' communications .

AM

Amplitude Modulation. Variation of the amplitude of a carrier wave in response to a modulating signal.

Ambulance (General Definition)

An Ambulance is a vehicle which is staffed by two personnel with appropriate medical training for the provision of treatment and/or transport to sick or injured persons.

Ambulance Activation Time

The time elapsed from the receipt of an emergency call at the ambulance Command and Control Centre to the departure of the emergency ambulance from the ambulance base.

Ambulance Patient

An ambulance patient is a sick or injured person, who needs medical treatment and/or suitable transport.

Ambulance Response Time

The time elapsed from the departure of the emergency ambulance from the ambulance base to its arrival at the scene.

Asystole

Arrest of the action of the heart.

ATC

Air Traffic Control.

Automatic Site Selection

Transmission from the mobile being used by the control system to select automatically the best remote base station for a reply transmission from control.

Auto Time Injection

Facility on voice-recording equipment whereby the unit's internal clock automatically records the time together with voice on tape.

BTSB

Blood Transfusion Service Board.

Built-in Redundancy

Provision in an emergency communications system of additional units and circuits in order to prevent total failure of the system. These additional units and circuits may be activated manually or automatically.

Cardiac Arrest

Complete cessation of the hearts activity. Failure of the heart action to maintain an adequate cerebral circulation.

Cardiac Arrhythmia

Any deviation from the normal cardiac rhythm.

CEPT

Council of European Posts and Telecommunications Administrations.

CPR

Cardiopulmonary Resuscitation. A technique used to manually maintain a patient's respiration and circulation.

Defibrillation

The termination of atrial or ventricular fibrillation by applying an electric shock to the heart, to encourage a more organised rhythm.

Defibrillator

A piece of equipment which is used to apply appropriate energy to the heart in order to generate an adequate transmyocardial current flow.

ECG Transmission

Transmission of electrocardiogram data over a mobile radio system.

Electrocardiogram

A measurement of the rhythm and conduction (electrical activity) of the heart using cables placed on the chest wall.

Emergency Ambulance

An emergency ambulance is a vehicle, identified as an ambulance, and designed and equipped to provide for the transport, emergency treatment and monitoring of patients.

Emergency Ambulance Patient

An Emergency Ambulance Patient is a patient, who by sickness, injury or other circumstances is in immediate or subsequent danger to life, unless emergency treatment and/or monitoring and suitable transport to subsequent treatment is provided.

Emergency Medical Assistance

The sum total of intervening persons and measures taken by such persons on behalf of a patient requiring emergency care, the infrastructure in terms of equipment and hospitals and the organisation of the action taken.

Emergency Medical Technician Defibrillation

The defibrillation service provided by emergency medical technicians (ambulance personnel who work on emergency ambulances).

Emergency Secondary Transport

Refers to the situation in which an acutely ill patient requires emergency transport to a specialist receiving hospital. The stay at the local hospital is brief and is primarily to allow resuscitation and organise transfer.

Fibrillation

Uncoordinated electrical activity of the heart muscle. Untreated fibrillation of the ventricles (main pump of the heart) results in death.

First Responder

A person, activated by the Emergency Medical Services, whose duty it is to respond to accidents and emergencies in order to provide Basic Life Support, to a specified standard, while awaiting the arrival of the Ambulance Service.

Fixed Mobiles

This term is used to describe mobile-type radios situated at a fixed location, e.g. Hospital Accident & Emergency Department.

FM

Frequency modulation. Variation of the frequency of a carrier wave in response to a modulating signal.

Frequency Reversal

A reversal of the normal frequency pattern, e.g. the use of a mobile transmit frequency at a fixed location.

Ground Transport

Transport by road vehicle.

Hand Portable

Hand-held transceiver.

Interface with Telephone Circuits

Facility to link a mobile radio system with a telephone system to allow a mobile radio user to communicate with a telephone user.

Interleaving

The use of channels at spacings in between the standard channel spacings.

Intubation

The insertion of a tube into the trachea to maintain an airway.

Link-fail Talk-through

Facility on a radio system whereby the base station operates in the talk-through mode if the link fails.

Long Range Propagation

Propagation of radio signals far beyond the normal range and arising during certain atmospheric conditions.

Low Band VHF

Frequencies in the range 68-87.5 MHz.

MCV

Mobile Control Vehicle.

Medical Priority Dispatch System

A system for dispatching ambulances, based on the medical priority of the call.

Microwave Links

Links in the frequency band above 6 GHz. Used, for example, to carry signals from Ambulance Control to transmitter sites for broadcasting to mobiles.

Mid Band VHF

Frequencies in the range 138-174 MHz.

MCCU

A Mobile Coronary Care Unit is a vehicle which is staffed by a specially trained doctor and nurse and equipped to deliver Advanced Cardiac Life Support and thrombolysis at pre-hospital level.

MICU

A Mobile Intensive Care Unit is a vehicle which is designed and equipped for the transport, and advanced treatment and monitoring of patients.

Mobiles

Radios situated in mobile vehicles, or hand-portable sets.

Modulation

Variation of Carrier Wave to enable it to convey information, e.g. speech.

MRCC

Marine Rescue Co-ordination Centre.

Multiple High Sites

Two or more unmanned radio base stations normally located on hilltops to provide area-wide radio coverage.

MI

Myocardial Infarction. Death of part of the heart wall from deprivation of blood — a heart attack.

National Ambulance Channel

Common radio channel available to all Health Boards.

Neonate

A newborn baby up to four weeks old.

Overlay Paging

Radio paging-system whereby a mobile channel normally used for voice communications is also used for paging transmissions.

Paramedic

A person (not a doctor), who in addition to performing all the live-saving measures of an emergency medical technician is also trained to perform Advanced Cardiac Life Support and pre-hospital Trauma Life Support.

Patient Transport Ambulance

A patient transport ambulance is a vehicle, identified as an ambulance, and designed and equipped to provide for the transport of patients not expected to become emergency patients.

Primary (Pre-Hospital) Transport

Transport of patients from the scene of acute illness or injury to hospital.

PSTN

Public Subscriber Trunked Network, i.e. public telephone system.

Receiver Voting

System to compare and select the best signal from a mobile when the mobile signal is received at a number of remote base stations.

Receiving Hospital

Hospital to which a patient is transferred.

Referring Hospital

Hospital initially providing care and from which a patient is transferred elsewhere.

Remote Radio Site

Unmanned hilltop site.

Repeater

Automatic radio transmitter/receiver which re-transmits signal to extend range of signal propagation.

Secondary or Inter-Hospital Transport

Transfer of patient between a referring and receiving hospital. This is usually to secure specialist investigation and/or treatment not available in the referring hospital.

Selective Calling

Transmission of a radio signal from Ambulance Command and Control to an individual ambulance, to alert crew that Command and Control wishes to speak to them.

Sequential Tone Signalling

Facility to transmit information, e.g. vehicle status, in the form of coded audio tones over a mobile radio system.

Simultaneous Voice and Data Transmission

Transmission of voice and data at the same time over the same line or radio circuit, without mutual interference.

Switchable Talk-through

Facility whereby a control station can switch a remote base station in order to allow two mobile units to communicate via the base station.

Telecom AME

Telecom Auto Manual Exchange.

Terminal Equipment

Any equipment in a communications system which acts as a servicing or user interface.

Thrombolysis

The attempted disintegration of a blood clot using fibrin-dissolving agents.

Transmitter

Device which emits radio signal.

Triage

A system of priority classification of patients in any emergency situation.

UHF

Ultra-High Frequency: Frequency range 300-3000 mHz.

Ventricular Tachycardia

An abnormal fast rhythm of the heart which may lead to ventricular fibrillation.

VHF

Very High Frequency: Frequency Range 30-300 mHz.

Voice Logging

24-hour recording of all radio and telephone communications.

Voice and Low-Speed Data

Simultaneous transmission over a radio or line circuit of voice and data at less than 1,500 bits per second.

Voluntary First Aider

Person working occasionally or during set periods for an emergency medical assistance service and capable of bandaging, fixing and cardiopulmonary resuscitation. Voluntary first aiders work with non-governmental organisations.

Wave-Band

Set range of radio frequencies.

Note

The ambulance vehicle definitions contained in this glossary may have to be amended in keeping with whatever definitions are adopted by CEN (European Committee for Standardisation) Technical Committee 239 — Rescue Systems and which may be issued by way of EC Directive.

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