1 Accident and Emergency Departments

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1 Summary

Introduction

Hospital accident and emergency (A and E) departments manage major illness, minor illness, major trauma and minor trauma. Currently there is a move towards:

- having fewer commissioning agencies and major provider units
- treating minor conditions in less specialized facilities or in general practice
- role-sharing between doctors and nurses
- the establishment of regional centres to deal with major trauma.

This chapter reviews and forecasts the nature and volume of demand for A and E department services, assesses the costs and effectiveness of the component parts and presents three models of organization which may be appropriate for particular geographical circumstances.

Structures

There were 237 major hospital A and E departments in England in 1993 and 198 minor or peripheral units. A major unit served a 196 000 catchment population on average and some covered 600 000–900 000. 99% had a 24-hour radiology service, 98% a pathology service, 94% an intensive therapy unit (ITU) on site and half had associated short-stay facilities. Nearly half lacked computerized tomography (CT) scanning facilities. 15% were in hospitals having cardiovascular surgery and 12% in hospitals with neurosurgery. By 1994/95 there were 216 Type 1 A and E departments defined as having medical staff on site, each open 168 hours a week.

Minor and peripheral units are mainly in community hospitals and some are developing in closed or downsized general hospitals, or in extended primary care centres and polyclinics.

There are approximately 2500 doctors in A and E medicine. Around 265 are consultants. The number of consultants has increased considerably since 1990. The British Association for Emergency Medicine in 1993 estimated an average of 1 : 225 000 population, with the range among major provider units 1 : 60 000–1 : 500 000. Designated nurse practitioners worked in 9% of major units and managed 3% of the new caseload.

Incidence of conditions giving rise to demand

With the introduction of more safety measures in the occupational environment and transportation, the incidence of serious injury from these sources is falling, but this is offset to some extent by the rise in criminal violence. The trend in incidence of minor conditions which make up the bulk of the work of an A and E department is unknown. The incidence of emergency medical and surgical conditions is increasing as the numbers and proportions of the middle-aged and elderly increase. This is demonstrable in respect of acute myocardial infarction and fracture of the neck of femur.

Activity

In 1994/95 there were nearly 12 million new attendances at A and E departments in England (246 per thousand population; regional range 188 to 295 per thousand). The numbers of new attendances are again increasing annually. Seven new attendances yield one reattendance on average. There were fewer than 35 000 first attendances annually in 54 Type 1 units, many serving scattered rural populations, but others were in the same or contiguous urban districts. Only 55 Type 1 units had 65 000 first attendances, or more.

The number and proportion of emergency admissions are increasing steadily. In some departments these patients are admitted through the A and E department, inflating new attendance numbers.

First attendance rates are highest among children, young adults and the elderly age groups, and among people in Social Class V. Inner-city A and E departments see proportionately more single people, commuters, migrants and the homeless.

A minimum data set is currently being adopted in A and E departments. No nationally representative information has hitherto been available on case-mix and case management. An overview of studies in individual units and areas suggests however that the new caseload of major A and E departments is mainly of low urgency. It includes:

1 in 1000	with major trauma
1 in 100	with life-threatening illness or injury, of which 75% is major illness, 15% trauma, 3% drug over-dose
1 in 4	whose condition does not require the facilities of a major A and E department
9 in 10	who attend without first consulting a GP
1 in 6 or 7	who is admitted as inpatient
1 in 4 or 5	is a child
1 in 700	dies in the A and E department

Demand is spread evenly over the days of the week and is higher during the summer. It is very low between midnight and 0800 (around 4%) but major trauma is more evenly spread, most cases presenting outside the well-staffed ‘office hours’.

Effectiveness

The effectiveness of A and E department services can be judged in terms of health gain or how patient demand is managed.

Structures

- **Size** Some studies show that major units in small hospitals are equally effective, clinically, as those in large hospitals for a range of conditions. US studies indicate better outcomes for major trauma in larger hospitals, with less frequent procedural mistakes and fewer avoidable deaths.
- **Observation wards** These are reported to be associated with improved processes of care in the elderly and patients with head injuries.
- **Dedicated operating departments** Delays in surgical intervention can lead to poorer outcomes in cases of major trauma.
- **Triage** In emergency conditions, pre-hospital triage to appropriate expertise and facilities improves outcomes. In hospital, triage into patient categories (hospital doctor, nurse practitioner, GP) improves the processes of care. Triage into degrees of urgency results in a tendency to 'over-triage' into more urgent categories, so that fewer admissions are actually seen urgently.

Clinical management

- **Major trauma**
  a) Regional trauma systems based on regional trauma centres have been shown to be effective in the US trauma setting. Such a system was shown not to be more effective nor cost-effective in the one situation in the UK where it has been evaluated.
  b) Specialists needed on site. Secondary transfer of cases, especially of head injuries, is associated with poorer clinical outcome. If neurosurgery is not available on site there should be locally agreed guidelines for the rapid transfer of cases to the appropriate facilities.
  c) Trauma teams. Early mobilization of senior medical (A and E, anaesthetist, surgical specialists) and nursing staff, with rapid assessment and resuscitation improves outcome.
  d) Advanced trauma life support (ATLS). The value of having a casualty team trained in ATLS is widely accepted.
  e) CT scanning. This is effective in improving the management and outcome for head injuries. The value for other injured parts is less clear cut.
  f) Radiographic service. A 24-hour radiographic service with senior radiological assessment improves outcome.
- **Minor trauma**
  a) Nurse practitioners (NPs). There is no evidence from prospective randomized, controlled trials that NPs manage minor conditions as, or more effectively than junior doctors.
  b) Minor injury units (MIUs). There is no evidence about the effectiveness of MIUs in managing minor trauma relative to major A and E departments or the general medical services.
- **Major illness**
  a) Disease management protocols. The value of following protocols for major medical conditions such as acute asthma and severe chest pain is established and they should be adopted.
  b) Basic life support. This improves survival chances in emergencies.
- **Minor illness**
  a) On-site GP services in major departments. Patients with minor conditions are managed comparatively more appropriately using on-site GP services rather than traditional junior casualty officers.
  b) Polyclinics and extended primary care centres. The effectiveness of these arrangements for managing minor illness and injury compared with other arrangements is unknown.

Costs

There are very few reports in the literature of relative costs of different methods of catering for accidents and emergencies, nor of the component parts of the service. In particular it is rare for the cost consequences of an A and E attendance to the health service or to the individual to be considered. Moreover there is currently no information system which provides the means of estimating the workload and hence the costs associated with each type of case.

Structures

- **Size of department** The average cost of a new attendance at an A and E department in England is about £45.00. The cost varies little and inconsistently among departments according to the annual number of new attendances.
- **Amalgamation of units; full or partial closure of units** No follow-up studies have been reported of the cost consequences to the health services. Whether or not hospital cost savings are achieved is not known. However when A and E department services are centralized additional costs fall on ambulance services and patients.

Clinical management

- **Major trauma**
  a) The additional cost of the first regionalized trauma system to be evaluated, including establishing and operating a regional trauma centre, was £0.5 million per annum. The cost consequences for contiguous A and E departments were small as the numbers of cases diverted were very small.
  b) Trauma teams, ATLS. Published data on the costs of these developments are not available.
- **Major illness** Data specific to the A and E department management of major illness are not available.
- **Minor injury, minor illnesses** The comparative costs of treating these conditions together with the other caseload in major A and E departments or of managing them in separate minor units are unknown. Where GPs are employed in major A and E departments to manage minor conditions there is a saving of more than one-third per case compared with management by doctors of senior house officer grade.

Cost-effectiveness

Estimates of the size of the health effects and the costs of different configurations of A and E services are generally either unreliable or non-existent.

Models of care

Three models are proposed which purchasers and providers will consider in relation to different geographical circumstances. There can be no generally applicable model for an A and E department and its associated services.

- Preservation of existing major A and E departments with progressive development of alternative ways of dealing with some of the minor injury caseload; that is, a near status-quo position.

  This model may apply best where population densities and levels of attendance at major A and E departments are low.

- Reduction in the number of major A and E departments with simultaneous development of alternative facilities for dealing with minor injuries and illnesses.

  The major A and E departments will rarely receive less than 50 000 new attendances annually and commonly receive 70 000–100 000 from a catchment area of 300 000–600 000. Above 100 000 new attendances it would be difficult to provide the necessary volume of inpatient support facilities.
- Regionalizing trauma care services.

  In this model the treatment of major trauma would be concentrated in regional trauma centres serving 2.5 to 3.0 million people on average. This would provide a three-tier system, comprising regional trauma centres, other major A and E departments (though fewer than the present number) and stand-alone facilities for treating minor conditions.

Outcomes and targets

Outcomes

Clinical outcomes are affected by pre-hospital management as well as any subsequent inpatient and post-hospital care. The one system of clinical outcome measurement specific to an A and E department is its performance compared with other A and E departments in avoiding mortality in cases of major trauma, defined in a standard way. The Major Trauma Outcome Study system, or a development of it, can be used to monitor the effectiveness of care in the provider units and purchasers will probably wish to stipulate its use.

Desirable intermediate outcomes include having the condition of each patient assessed for urgency within five minutes of arrival and a low ratio of total to first attendances (no more than 1.2 : 1).

Targets

- **Major A and E departments**
  a) Specialty mix. Opinion varies about the mix of specialties which should be on site or close to a major A and E department. As a minimum there might be:

     general medicine; paediatrics; acute psychiatry; general surgery (including vascular surgery) with 24-hour major theatre availability; trauma and orthopaedics; obstetrics and gynaecology; anaesthetics; intensive care; radiology (including CT scanning facilities) and pathology.

     Children should not normally receive A and E department services in hospitals which do not have paediatric specialists and inpatient facilities on site.
  b) Staffing. In order to provide 24-hour cover at senior clinical level the recommendation of the British Association of Emergency Medicine for four A and E consultants, eight middle-grade doctors and 20 senior house officer grade doctors in a department seeing 100 000 new patients annually should be seriously considered.
- **Minor injury services** No population based, quantitative targets can be suggested for the provision of these facilities. Local opportunities, initiatives and preferences will determine their developments.

Information

The national minimum data set should be provided by A and E provider units as soon as possible. Regional and national overviews of provider performance should be arranged by suitable downloading of data.

Attempts should be made to identify more fully the discrete costs of major and minor A and E departments and their component services. Providers should collaborate with other agencies in collecting a standard core data set on accident cases.

Research needs

The relative cost-effectiveness of the various configurations of arrangements for dealing with major and minor conditions is an under-researched area which should be addressed as soon as possible.

2 The problem and its context

The public needs a service for dealing with accidents and emergencies, 24 hours a day throughout the year. The district general hospital A and E department is the main institutional provider of emergency treatment for major accidents and illness. However A and E departments deal with the entire gamut of injury and illness and social as well as medical problems.

The Accident and Emergency Reference Group of the London Implementation Group defined the *primary* tasks of an A and E department as to provide the following.

- Resuscitation and immediate treatment for the critically ill and injured and to refer patients as appropriate.
- A diagnostic and treatment service for the less seriously ill and injured patients who merit urgent hospital attention and to refer patients on as appropriate.
- A diagnostic and treatment service for those with conditions which allow them to be subsequently discharged.[1]

A and E departments have traditionally fulfilled these functions.

This chapter looks at a variety of institutionally-based ways of providing A and E services. It does so in the context of purchaser–provider contracts. It attempts to take into account technological changes in the ways the acutely sick and injured are managed and changes in the roles and professional development of health care providers. The relevant issues include the following.

Move towards fewer, larger commissioning agencies and providers

The National Audit Office identified 235 A and E departments in NHS hospitals in England in 1991, approximately one for every 196 000 inhabitants and more than one per health district, on average.[2] In inner London in 1993, before any mergers or closures, there was an A and E department for every 160 000 resident population and very few people lived more than two miles from the nearest A and E department. In contrast in Leicestershire one major A and E department serves a resident population of over 900 000. As health districts merge and larger commissioning agencies are formed the numbers of major A and E departments required and their distribution are being reconsidered. As some of these A and E departments close, alternative ways of coping with the residual demand for treatment of minor injuries and ailments are being introduced or considered.

Management of major trauma

There is greater public and media concern about the quality of care in A and E departments than over almost any other sector of health care. This increases when professional opinion focuses on their shortcomings, as did the Royal College of Surgeons' consensus view that at least one in every five deaths from trauma was avoidable and that inadequate clinical care in A and E departments was a major contributor.[3] This has led to the recommendation that major trauma should be dealt with in regional trauma centres, each serving 2.5–3 million population on average, where a concentration of appropriate medical skills can be made available on a 24-hour basis. Following its report, an experimental regional trauma system was set up in the North West Midlands based around a regional trauma centre in Stoke-on-Trent. Although this experimental system has been evaluated and found not to be cost-effective,[4] questions remain about the role of regional trauma systems in other areas of the country where different conditions apply.

Introducing regional trauma centres would have consequences for the location of regional clinical specialties and for the range of professional experience and training opportunities available in the remaining A and E departments.

Role sharing

In A and E departments, as in other areas of health care provision, roles are becoming blurred. In particular nursing roles are broadening to include the management of minor illness and injury. This has coincided with a reduction in the number of hours for which junior doctors are contracted to work. Nurses are fulfilling these functions, officially or unofficially, in an increasing number of A and E departments, especially in minor injury units and single-specialty hospitals.[5] Nevertheless senior house officers will continue to provide the bulk of the medical workforce in consultant-led A and E departments.[6]

General practice–hospital interface

The introduction of the 1990 GP Contract[7] followed by the NHS reforms[8] extended the scope and availability of general medical services. Investment in a diversity of practice staff and premises has meant that more of the relatively minor conditions which A and E departments dealt with hitherto can now be treated at practice level.

GPs in rural areas have always provided first-contact emergency services. Primary care emergency centres are being developed, especially in urban areas, providing a wide range of services out-of-hours to aggregated practice populations, both on a walk-in and bookable basis.[9] These are already operating in Denmark and Sweden. If introduced widely they may influence the workload of A and E departments appreciably.

Pre-hospital care

Pre-hospital emergency care is outside the scope of this chapter. However its organization and operational efficiency influences the case-mix which presents to an A and E department.

By the end of 1995 every emergency ambulance crew was due to include at least one member trained to paramedic standards. The prevalence of advanced life support skills among ambulance crews is increasing[10] as is the sophistication of their diagnostic, resuscitation and communication equipment. Response-time targets are set for ambulance services according to the densities of the populations served, although this will change in the future.[11] Rapid transit of single paramedics by small non-patient carrying vehicles is now not uncommon in many regions.

Emergency services in the field can communicate directly with A and E department staff. Protocols are being considered for deciding when and where to transfer certain types of case. The most severely injured patients can then be conveyed directly to the most appropriate facilities, such as coronary care units or hospitals with neurosurgical facilities. Helicopter-ambulances are being used in London and by some rural ambulance services to transfer seriously ill or injured patients from the incident scene to hospital (primary transfer) and between hospitals (secondary transfer).

As a result of these developments the workload of some A and E departments may be increased by seriously sick and injured patients who previously would not have survived to reach hospital.

Patient perspectives

Patients are concerned with many aspects of A and E department services such as reception, privacy and support for victims and the bereaved[12] and targets have been set in the Patient's Charter for the management of patients in these situations.[13] Information technology is evolving which can produce data to audit the prioritization of patients for attention and their clinical management.

Services for children

Children have distinct needs[14] both in pre-hospital[15] and hospital care and providing paediatric emergency care may need different facilities and training. A central concern is whether appropriate services can be provided within adult A and E departments or whether different facilities and personnel are needed.

Wider hospital context

An A and E department operates in the context of an entire hospital, the parts of which are interdependent in functions. Not all emergency medicine involves A and E departments. However any case presenting to an A and E department has the potential to involve other specialist departments. Some specialties are essential on site. Others need to be rapidly accessible. When contemplating changes in the nature or volume of A and E department activity therefore, the capacity of other departments in the hospital to accommodate these changes has to be taken into account.

The clear and concise analyses of the management and organizational problems of the A and E departments contained in the reports of the National Audit Office[2], the Audit Commission[16] and the Clinical Standards Advisory Group[17] have helped to crystallize many of the planning and strategic issues involved. The present needs assessment for A and E departments does not attempt to duplicate that work. Rather it focuses on the ways in which A and E services are organized and examines the evidence for the effectiveness of different models relative to their costs. This leads on to a series of suggestions and recommendations on the structuring of A and E services.

3 Sub-categories

A and E departments deal with a wide range of illness and injury; from the individual walk-in patient who needs only reassurance about a trivial complaint, to the simultaneous arrival of several casualties with severe, multisystem injuries from a major incident. The particular case-mix will influence the way a department is organized.

Case-mix

Complexity

A simple classification of the clinical case-mix is:

- major injury
- major illness
- minor injury
- minor illness.

There are no precisely agreed definitions of these categories. 'Major' has the connotation of being potentially life-threatening, while 'minor' does not.

Although A and E departments are among the most intensively used parts of the health service, the only systematic data about their functioning are the annual numbers of new and total attendances.[18] It is not possible to characterize routinely the caseload of many A and E departments, still less to show how the case-mixes of different departments vary. Consequently it is impossible to produce a template of the level of patient dependency to fit all A and E departments and hence the mix and volume of skills needed; hourly, daily or seasonally.

The caseload is predominantly of low urgency, that is, not life threatening nor requiring the use of technically complex diagnostic or treatment facilities. The A and E department at Hull Royal Infirmary is capable of producing routinely an analysis of clinical activity. The cases first attending the department between 1990 and 1993 were, by local standards, predominantly minor in nature (Table 1).

Table 1: Number of patients attending Hull Royal Infirmary A and E department according to severity of condition

Category of severity	1990	1991	1992	1993
major	16 852	16 962	17 389	17 735
minor	61 286	55 761	53 703	57 084
Total	78 238	72 723	71 092	74 819

Source: Gosnold J (personal communication)

In an Edinburgh study 90% of attenders scored less than five on a 0–10 scale of urgency where ten represented the greatest degree of urgency (Figure 1). Older patients had higher ratings for urgency, as did ambulance-borne patients.[19]

It has been claimed that only one case in a thousand presents with major trauma[20–23] and in a review of A and E services in London in 1993 only an estimated 1% of new attenders had severe injuries or life threatening conditions. Conversely 40% had conditions which could have been managed in primary care settings.[24]

Appropriateness

'Inappropriate' demand is sometimes defined in terms of problems which could have been dealt with in general practice, or for which consultation was not justifiable in any setting. The difficulty in defining such cases is reflected in the wide range of estimates which have been made of the prevalence of inappropriate attendance in A and E departments – from 6.7%[25] to 64–89%.[26] The proportion depends upon the method used. When patients' cases are reviewed on the basis of the processes of care they actually received, an estimated one in four is found not to have needed the facilities of a major department.[27]

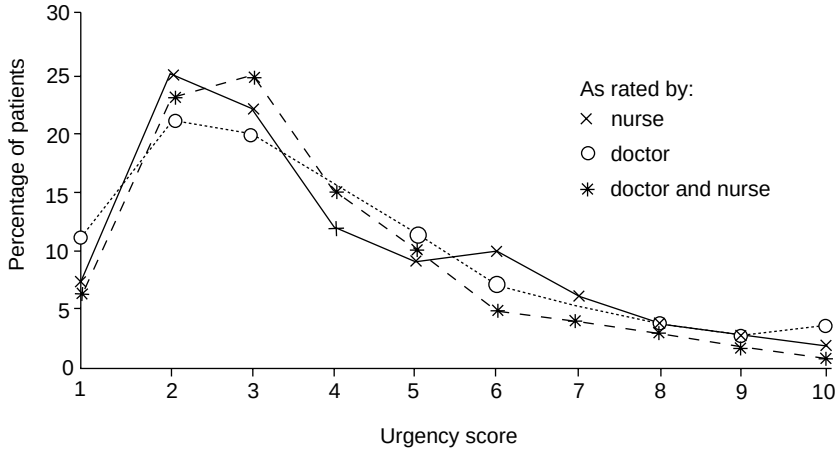

Figure 1: Urgency distribution for all patients attending the Royal Infirmary, Edinburgh A and E department. (Reproduced by kind permission of Blackwell Scientific Publications.)

Nine out of ten patients attend without first having consulted their own GPs.[28] Among the reasons for this are that they perceive their problems to be more appropriate to A and E departments and that their GPs are unavailable.[29,30] Some of these patients use the A and E department for primary care, therefore. The clientele in urban areas, particularly city centres, characteristically includes commuters with no immediate access to their usual primary care services, patients who are not registered with GPs and homeless persons. A problem which is 'inappropriate' for an A and E department clinically in terms of its minor nature may not be so when the patient's circumstances are taken into account.

In part, patients' perceptions and circumstances will always determine whether or not they use A and E departments. Short of attempting to change public perceptions there is little that can be done other than to arrange to cater for such patients, though not necessarily always in a major hospital facility as extensively equipped as a district general hospital A and E department. Ways in which this 'inappropriate' demand is catered for are described in section 5.

Special groups

The demographic patterns of attendance at A and E departments reflect largely those of their catchment area populations. Four groups need special consideration.

Children

Children need to be shielded from the disturbing situations sometimes to be seen in A and E departments and to be cared for in suitably staffed and equipped facilities.

Patients behaving aggressively or antisocially

These patients need to be managed effectively and with minimum inconvenience to others.

Bereaved

The bereaved need to express their grief and to be comforted.

Patients whose first language is not English

These patients may have additional needs related to their degree of understanding of what the service can do and the procedures to which they will be subjected.

Needs assessment for A and E departments is largely about clarifying the volume and the severity of the problems presented and about the special considerations which relate to certain patient groups and conditions.

4 Incidence and prevalence of conditions needing A and E department management

Accidents, poisonings and violence

The numbers and rates of fatalities from accidents, poisonings and violence have decreased over the past 20 years (Table 2). This may of course also reflect improvements in treatment which have occurred, irrespective of trends in incidence. However there is not yet a comprehensive information system capable of describing representative trends in incidence. Paradoxically as factors which caused severe accidents and injury in the past have been modified the demand for A and E department services has risen. The scale of heavy industry has declined sharply. Workplaces and work routines are safer; the accident rate at work has declined in all the major industries since 1971.[31] In 1986/87 a total of 499 fatal and 35 960 major injury casualties arose as a result of work and these numbers had declined by nearly 20% to 400 fatal and 29 531 major casualties in the seven years to 1994/95.[32] Road users are better protected now than at any previous time. Road traffic injuries reported to the police by the Department of Transport have decreased steadily from a peak in 1966. There were 59 034 fatal and serious road accidents in England in 1981 (126 per 100 000 population). By 1992 this number had fallen to 35 751 (74 per 100 000).[33] Violent crime has increased. Instances of violence against the person notified to the police in England and Wales rose from 100 200 in 1981 to 205 100 in 1993.[31] However the injuries which result from these offences make up only a very small part of an A and E department's caseload.

Table 2: Deaths from injury and poisoning

Year	Number (million)[a]	Rate (million)[a]
1970	22 701	466
1980	20 296	409
1990	17 943	354

[a] Data for England and Wales.

Source: *OPCS Mortality Statistics.* Serial tables. Series DHI, No. 25. 1992, London, HMSO.

Fracture of neck of femur

A predictable, age-related component of an A and E department's major injury caseload is the incidence of fracture of the neck of femur. Its occurrence virtually always results in transfer to an A and E department for

assessment and then nearly always leads to hospital admission. The discontinuity in data from the discharge-based, Hospital Inpatient Enquiry (HIPE) which last reported in 1985 and the Hospital (Consultant) Episodes System (HES) summary which replaced it in 1989/90 complicates any attempt to observe trends. Formerly a discharge may have represented more than one episode of consultant-led care in one period as an inpatient. Nevertheless the numerical trend in recent years was upward; from 38 260 discharges or deaths in hospitals in England in 1980,[34] to 43 050 discharges or deaths in 1985;[35] to 54 041 episodes in 1989/90[36] and 58 970 in 1993/94[37] (Table 3). The incidence rate of fracture of the neck of femur rises with age. Numerically although the age-specific incidence is no longer rising,[38] a rise in demand until the year 2020 can be expected, when the number of persons aged 75 or over is expected to stabilize.

Table 3: Inpatient cases by main diagnosis NHS Hospitals in England

Year	Main diagnosis, short-list[a]			
	270 Acute myocardial infarction	**323.2 Asthma**	**473 Fracture of neck of femur**	**53 Poisonings and toxic effects**
1989/90	115 598	100 188	54 041	101 117
1990/91	119 718	93 277	55 748	101 667
1991/92	116 518	99 717	57 143	97 363
1992/93	119 049	96 659	58 959	103 445
1993/94	116 776	103 324	58 970	104 766

[a] Ordinary admissions and day cases. All persons, all ages.

Source: *Hospital Episodes Statistics.*

Wrist trauma

Data from a population-based survey in Odense, Denmark, which has a population structure similar to that of England's urban population, indicated that 690 per 100 000 inhabitants aged 15 years or over presented in a year to a hospital's emergency room. 580 per 100 000 received radiographic investigation; 270 per 100 000 had distal radial fractures; but those presenting to hospital represented only 56% (95% confidence interval 31% : 78%) of all occurrences in the population.[39]

Deliberate self-harm

In 1990 in the A and E department at Hull Royal Infirmary, 1185 patients presented who had deliberately harmed themselves in some way. Based on a planning population of 400 000, this represented an occurrence rate of 296 per 100 000 population of all ages. By 1993 the number had risen to 1788 (447 per 100 000); of whom 6% were under the age of 15 years; 53% were between the ages of 15 and 29; 25% between 30 and 44 and the remaining 16% were middle aged or elderly (Gosnold J, personal communication).

Studies in Oxford and Edinburgh in the 1980s reported declining rates of occurrence of self-poisoning, especially among the young.[40] These findings were based on hospital inpatients. However the volume of inpatient activity for poisonings and other toxic effects among the 48 million population of England is rising slightly in the 1990s (Table 3). Studies of self-harm based only on inpatients underestimate the true incidence of A and E department-managed self-poisoning. Of 200 adolescent self-harm patients treated in the A and E department at Leicester Royal Infirmary in 1989, 89 (44%) were admitted.[41] Studies in one of England's largest-volume A and E departments, at the University Hospital in Nottingham, in the 1980s showed a small decline in the episodes of deliberate self-poisoning between 1981/82 (1444 episodes) and 1987/88 (1407). The rates of presentation fell from 272 to 255 per 100 000 population of all ages. This

masked a rise in the rate for the 15–34 year age group from 429 to 456 per 100 000, and corresponding falls in patients older than this.[42]

Using the figures from these surveys it may be estimated for planning purposes that about 300–450 patient episodes of deliberate self-harm per 100 000 population will need A and E department treatment annually; 250–300 per 100 000 will relate to deliberate self-poisoning, of which around 45–50% will lead to inpatient care and these will be among the 200–220 per 100 000 population treated as inpatients annually for poisonings and toxic effects.

Other major medical conditions

Since there is a lack of representative data about the incidence of the majority of diagnostic conditions the impact of any change in the incidence on the demand for A and E services cannot be predicted accurately. The London Ambulance Service's 1991 survey showed that 1% of all new attenders at London A and E departments had life-threatening conditions which required urgent transportation for immediate care. This represents the most severe end of the spectrum of illness and injury. At least 75% of these were due to medical (i.e. non-surgical) conditions, another 16% to trauma and 3% to drug overdose.[43] The incidence of serious illness in the population is the main determinant of urgent need for A and E department services. This is determined largely by the proportions of the population who are middle-aged or elderly and hence at greatest risk of becoming acutely ill.

Acute myocardial infarction

Age-specific mortality rates for acute myocardial infarction are generally falling. The number of admissions for acute myocardial infarction has changed little in recent years (Table 3). These data and even the population-incidence data produced by such thorough studies as the MONICA project[44] do not represent the demand on A and E departments by cases of suspected myocardial infarction.

An illustration of this is from the city of Nottingham, which has been served by a single A and E department, University Hospital, for two decades and no other major A and E department in the vicinity has closed during that time. The numbers of patients assessed in the A and E department for the occurrence of acute myocardial infarction rose from 735 in 1982 to 1670 in 1992. The size of the catchment area population, 650 000, remained fairly constant and its demographic structure altered only in line with national demographic changes. Over the same period the numbers admitted for assessment directly to a ward or coronary care unit (CCU) also rose, from 555 to 1343. The rise in direct admissions was especially marked in the later part of the period (Table 4), presumably reflecting the perceived value of using fibrinolysis in the ward or coronary care unit as soon after the event as possible.

Table 4: Suspected acute myocardial infarction in Nottingham, 1982–92

Year	Assessed in A and E department		Admitted direct to ward/CCU		Total	
	no.[a]	rate	no.	rate	no.	rate
1982	735	113.1	555	85.4	1290	198.5
1986	1161	178.6	725	111.5	1886	290.1
1989	1696	278.0	948	145.8	2695	406.8
1992	1670	256.9	1343	206.6	3013	463.5

[a] Admissions to A and E department in University Hospital, numbers and rates per 100 000 catchment area population.

Source: *Nottingham Coronary Register* (Gray D, personal communication, 1994).

The rate of contact more than doubled among both A and E department and ward or CCU cases. The numbers of cases which, after full assessment, proved actually to have had infarctions rose less steeply, from 444 in 1982 (34% of those assessed) to 615 (20%) in 1992, irrespective of where the initial hospital assessment was carried out. For cases first assessed in the A and E department the number who proved to have had infarctions rose from 235 (32% of those assessed) in 1982, to 374 (22%) in 1992. By itself, therefore, an area's incidence rate for acute myocardial infarction is not necessarily a good indicator of the workload the condition will create for the local A and E department.

Asthma

Only the minority of asthma attacks result in the use of an A and E department. Recently in 218 general practices distributed around the UK there were an estimated 14.3 attacks per 1000 patients per year. Of these 86% were managed in general practice; 12% led to hospital admission (usually via the A and E department) and 2% were discharged from the A and E department.[45] At most two per 1000 population use the A and E department for asthma annually. Moreover reported management of these attacks was at variance with recommended guidelines, so the 'true' need for hospital services is unknown.

The increasing trend in asthma admissions observed before 1985 has not been continued in recent years,[46] although there was a sharp increase in 1993/94 (Table 3).

Psychiatric conditions

There are no recently published population-based estimates of the incidence of psychiatric emergencies in the UK population. Community-based care of these emergencies can result in better symptom control and patient satisfaction than hospital-based care and much less consumption of hospital resources.[47] However outside office hours A and E departments and hospital psychiatric wards are the most-used agencies for emergency assessments.[48]

Homeless people are characterized by an above average prevalence of psychiatric conditions and high levels of A and E department utilization. A one-day census in Sheffield (population 526 000) located 340 single homeless people, including 48 women, a ratio of 64.6 per 100 000 population; among whom 29% of the men and 64% of the women reported psychiatric illness; 30% of men and 9% of women reported alcoholism and 65 (19%) reported attending a general hospital in the previous month, 45 (13%) for A and E services.[49] Social conditions which produce homelessness may also raise the extent to which A and E services are used.

Substance abuse

While there is a large body of literature on the prevalence of alcohol and drug-related conditions among attenders at individual A and E departments and especially among specific groups of attenders, such as those injured in road traffic accidents, victims of assault, etc., there are no recent reports of population-based studies of utilization by substance abusers, nor of trends in utilization. It is difficult to forecast the impact of any changes in legislation or social policy in relation to these issues therefore.

Minor injury and illness

The picture with regard to minor injury or minor illness is more clouded, since they are managed through different forms of provision in different places. No representative local, regional or national data on the incidence of minor injuries could be found.

A major A and E department's caseload of minor conditions includes many cases where assessment of the undifferentiated problem is needed to establish that it is, indeed, minor in nature. This often involves using the type of diagnostic equipment available only in a major A and E department. For example, a person who collapses in the street may prove after investigation simply to have fainted and not to have had the suspected cerebro-vascular accident. A patient who limps in with a painful ankle may merely have sprained it and not fractured any bones.

Moreover minor ailments, with justification, often present to health care providers other than those in the NHS. For instance during exercise taken as a leisure activity in England and Wales there were an estimated 19.3 million new injury incidents in persons aged 16–45 years in England and Wales in the year July 1989 – June 1990, of which about half, 9.8 million, were not trivial. Only 20% were managed in A and E departments. The remainder was treated largely by GPs and sports clinic staff and physiotherapists and other professionals allied to medicine were also involved.[50]

Summary

The main determinant of changes in the nature or the volume of demand for A and E services over the next 20 years is likely to be the increase in the number of elderly people in the population. The progressively greater numbers of the elderly will yield more medical and surgical conditions needing urgent differentiation and treatment, though the bulk of A and E workload will be minor in nature. The increase in available leisure time and the resulting opportunities for pursuing energy-expending activities will result in more minor injuries, but the impact on major A and E departments will be relatively small. The introduction of even more safety measures in occupational and social settings is likely to maintain the reduction in the incidence of injury.

5 Services available and their utilization

In this section A and E departments are considered in terms of their number, location, facilities, medical staffing and utilization.

Number and type

The main source of statistical information about the structure and distribution of A and E departments is the Department of Health's annual return of outpatient attendances at each provider's unit(s) (DH KH09). On another return (DH KH03) A and E departments are classified according to whether they have medical staff on site and whether they are open continuously.

On the KH09 return for 1994/95 there were 264 provider units with A and E department outpatient activity in England on 30 September 1994, according to the type of A and E department (Table 5).

Table 5: Number of A and E departments in England, 1994/95

A and E type		Number of departments
1	Medical staff on site, intended to be open 168 hours per week	216
2	Medical staff on site, intended to be open less than 168 hours per week	21
3	Service covered by other than medical staff on site, intended to be open 168 hours per week	20
4	Service covered by other than medical staff on site, intended to be open less than 168 hours per week	7
	Total	**264**

Source: DH Statistical return (KH03).

Categorizing A and E departments as major or minor depends on how they are defined. 'Major' might include only the 216 Type 1 departments, or those together with some or all of the 21 Type 2 departments. According to the British Association for Accident and Emergency Medicine's (BAEM) Directory 1993, there were 237 major A and E units in England and 198 minor, or peripheral units. The major units included six A and E units in children's hospitals and four in ophthalmic hospitals or units.[51] In a 1995 survey the Audit Commission cited 228 major A and E departments in England and Wales, treating all types of injuries and medical emergencies and, with few exceptions, open 24 hours a day.[16] In the intervals between the BAEM survey, the 1994/95 statistical return and the Audit Commission Survey some departments will have closed and others may have merged. The comparison is not straightforward, however, in that the Department of Health collects and reports data on a provider basis so that an NHS trust covering more than one hospital site will provide only one return even if it has A and E services in more than one location.

Location

Using the BAEM source the locations of major A and E departments can be plotted according to health authority boundaries (Table 6). Four authorities each had four major units in their area. At the other extreme the population of nearly one million in Leicestershire is served by a single major unit, supported by a number of minor units countywide.

Table 6: Number of district health authority areas according to number of major A and E departments in England, 1993

No. of A and E departments	No. of authorities
0	1
1	102
2	43
3	11
4	4
Total	**161**

The Audit Commission compiled a 1995 atlas of major A and E departments in England and Wales. It located 19 major units (17 with less than 35 000 new attendances) which were more than 20 miles from the nearest alternative and concluded that there was little scope for closing such departments in small areas. In contrast 60% of major departments were within ten miles of another hospital with a full A and E service and a third, mostly in metropolitan areas, within five miles and serving less than 50 000 new patients a year.[16]

Facilities

There are no complete profiles available of the supporting specialties, units or equipment in hospitals with major A and E departments. A British Orthopaedic Association survey reported the on-site situation in 1992 in 217 hospitals with major A and E departments which claimed to be able to manage major fractures; 99% had a 24-hour radiology service; 98% pathology (24-hour transfusion service); 94% an intensive therapy unit; 51% computerized tomography (CT); 15% cardiovascular surgery and 12% a neurosurgery specialty on site.[52]

Accident and emergency wards

Around half the major A and E departments have associated short-stay, observation or initial inpatient treatment facilities.[53] The BAEM believes such a facility:

> is an essential part of every Accident and Emergency (A&E) Department. The advantage of such a ward is that it provides expertise in the management of its typical patients. They stay in hospital for shorter periods than in other wards and are often better and more economically managed because of the use of social and other liaison services for crisis intervention. Such a ward provides a safety net for some patients who might otherwise be discharged injudiciously. Flexibility of use is also an important feature.

The BAEM recommends one bed in an accident and emergency ward for every 5000 new attenders.[54]

Computerized records systems

In 1992 the BAEM reported the prevalence of computerized registration systems, with or without a link-up to a patient administration system in 'the British Isles'. Of 268 A and E departments identified as having 25 000 or more new attendances annually, 165 (62%) responded to the enquiry. Fifty-two departments were computerized; another 70 planned to become computerized, 58 definitely and 12 hopefully. There were 15 commercial software systems in use and nine more developed 'in house'. No information was obtained about the respective data sets, nor the compatibility of their contents.[55]

Computerization is a requirement for providing the Contract Minimum Data Set for A and E departments, specified by the NHS Executive's Committee for Regulating Information Requirements (see section 9).

Staff

Doctors

In 1994 there were 2549 doctors in A and E medicine posts in England; an increase of 19.5% over 1980, but only 1.4% over 1990. However the number of consultants rose to a much greater extent – up by 70 (35%) over the period 1990–94. Moreover when translated into whole-time equivalents, the increase in the number of consultants, 1990 to 1994, was similar (34%). The staff grade also expanded appreciably – by 100 (98.5 whole-time equivalent (wte)) over four years and there were 164 more doctors (158.5 wte) in training grades (senior registrar, registrar, senior house officer) (Table 7).

Table 7: Numbers of doctors according to grade, A and E specialty in England

Grade of doctor	1980		1990		1994[a]	
	no.	wte	no.	wte	no.	wte
All grades	2133	1497.8	2514	1886.4	2549	2124.0
Consultants and senior hospital medical officer (SHMO) with allowance	123	122.3	199	196.4	269	263.4
Staff grade	–	–	43	41.6	143	140.1
Associate specialists	86	83.9	66	62.1	46	45.3
Senior registrars	16	16.0	56	54.6	81	78.6
Registrars	60	57.4	81	78.2	110	98.8
Senior house officers	1050	1047.3	1270	1262.2	1380	1376.1
House officers	6	6.0	6	6.0	1	1.0
Other staff with SHMO allowance	1	1.0	–	–	2	2.0
Hospital practitioners	44	9.3	35	5.9	41	6.9
Clinical assistants	747	154.6	758	179.4	476	111.8

[a]NHS Executive 1995 (personal communication).

Sources: Department of Health. *Health and Personal Social Services Statistics.*[36]

Surveying the management of skeletal trauma in the UK in 1991/92 the British Orthopaedic Association reported that 79% of the 228 departments with a major trauma service were administered by an A and E consultant; 49 (21%) had no A and E consultants; 141 (62%) had only one; 35 (15%) had two and three (1%) had three.[52] The ratio of A and E consultants to catchment area populations varied from one per 61 000 to one per 500 000, with an average of one to 223 000, which was little less than the average population of a health district. The total A and E medical staff of all grades in a hospital was broadly proportional to the size of the population served. 66% of the hospitals had no intermediate training grade doctors at all. Many hospital A and E departments function mainly through the services of junior medical staff, the majority at senior house officer level. It is not known what proportion of these doctors are trained in advanced life support.

There is scope, therefore, for exploring the most cost-effective mix of medical staff which A and E departments of various sizes need, taking into account the possibilities of role-sharing with nurses for the management of minor conditions.

Nurses

No collated data are available routinely on the levels of nurse staffing in A and E departments, nor on the range of activities which nurses undertake. In 9% of major A and E departments in 1990/91 there were nurses who were officially designated as nurse practitioners. Nurses who functioned in the same ways, but who were not designated as such, worked in 8% of major A and E departments; 48% of specialist A and E departments and 58% of minor injury units. Clinically they managed an estimated 3% of the new caseload in the year, mainly minor illnesses and injuries, but junior doctors working in the same departments managed even more cases with similar conditions.[5]

Again nothing is known of the proportion of nurses in A and E departments who are trained in advanced life support.

Minor injury units

A recent NHS Executive survey report defined a minor injury unit (MIU) as:

> offering an open access, self-referral minor injury and ailments service for ambulatory patients but which may also see patients referred by GPs. It will provide a service more akin to that provided by an A and E department than by GPs in their surgeries, but there will be some overlap with the work of both A and E departments and GPs. A minor injury unit will not, however, fulfil the continuing care role undertaken by GPs. Minor injury units do not require in-patient facilities. [57]

The BAEM Directory in 1993 listed 198 minor or peripheral units.[51] The NHS Executive survey members visited seven such units and obtained information on three more. They found a number of different ways of staffing the units, which included nurse practitioners working alone or in combination with GPs and clinical assistants or staff-grade specialists working with nurses. Different units dealt with very different caseloads, with some in the more isolated areas accepting emergency ambulance cases within a given area.

Some units are in long-standing community (cottage) hospitals; a few, such as the units at Ancoats Hospital, Manchester[58] and St Charles Hospital, London[24] are on the sites of general hospitals which have closed, either totally or partially. At least one other is in specially converted premises in the community.[59]

A variant of the minor injury/illness unit is the King's College Hospital, GP-staffed facility located within its A and E department, to which patients are directed according to clear protocols and which offers treatment for minor injuries and ailments similar to that of a well-organized general practice, but also affording immediate access to X-ray and pathology facilities.[60]

Other settings for treating minor injuries are, as stated earlier, major A and E departments; primary care centres, such as the South Westminster Healthcare Centre which, as well as providing minor treatments during weekday office hours, also serves as a base for community nursing services, professions allied to medicine, and other community health services[61]; and traditionally, general practice premises.

The range of equipment available in MIUs varies according to their location. Units in community hospitals can utilize the resuscitation, pathology and radiographic services of the hospitals. There is however no source of information which can be used to profile the facilities for treating minor injury in England; nor is it usually possible to identify the discrete areas of expenditure which these units incur, because their particular functions are not disaggregated from those of the parent institution.

A and E department utilization

New attendances

There were 11 943 000 new A and E department attendances in England in 1994/95, a rate of 246 per 1000 population, or approximately one new attendance for every four persons. The new attendance rate ranged among regions from 188 per 1000 in the Oxford region to 295 per 1000 in the heavily urbanized Mersey and North Western regions (Table 8). Distance and the length of time expended in obtaining care are factors which are known to influence a decision to attend.[62] These new attendances include those of an unknown number of emergency patients who pass through A and E departments as arranged inpatient admissions (p. 21).

Table 8: A and E departments in England and in RHAs, 1994/95

	First attendances (thousands)	Rate per 1000	Attendances per new A and E outpatient
England	11 943	246	1.16
Northern	722	233	1.19
Yorkshire	916	247	1.17
Trent	1 006	211	1.21
East Anglia	466	222	1.11
NW Thames	772	219	1.12
NE Thames	1 062	279	1.09
SE Thames	1 067	287	1.13
SW Thames	719	240	1.13
Wessex	627	199	1.19
Oxford	487	188	1.11
South Western	756	227	1.25
West Midlands	1 432	271	1.15
Mersey	713	295	1.17
North Western	1 191	295	1.17
Special health authorities	8	–	

Numbers and rates per 1000 population, first attendances, and total attendances per new A and E outpatient

Source: Department of Health. *Outpatients and Ward Attenders, England, Financial Year 1994–95.* Government Statistical Service. OPCS. 1993-based sub-national population projections. Series PP3 No. 9.

The annual number of first attendances rose by approximately 17% over the decade to 1990/91. It then peaked in the period 1989–91 at 11.2 million; after that it fell slightly, but by 1994/95 it had risen again to nearly 12 million (Figure 2). The first-attendance rate rose from 202 per thousand population in 1981 to the highest level yet recorded; 246 per thousand in 1994/95.

Over the period 1984 to 1994/95 the number of first attendances rose by an annual average of 1.5%. Over the same period follow-up attendances fell annually by an average of 6.1%. By 1994/95 only one in seven first attendances yielded a follow-up attendance, compared with one in four a decade earlier.

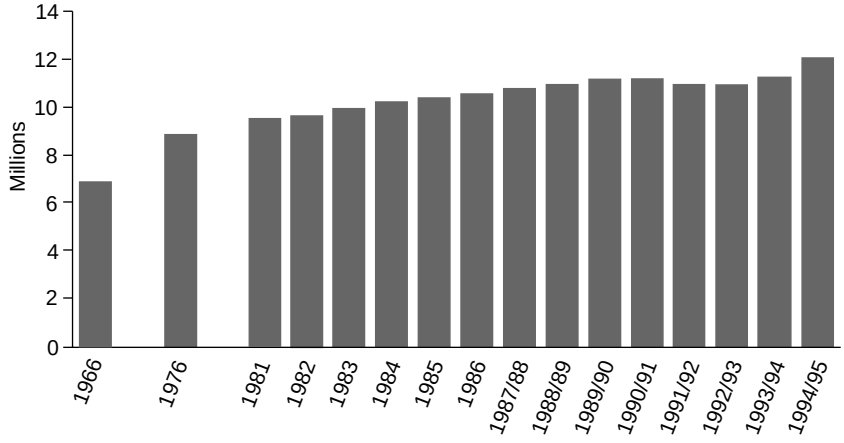

Figure 2: Number of new attendances at A and E departments annually 1966–1994/95 in England.

(Sources: Department of Health, *Health and Personal Services Statistics*, 1976–93. Department of Health, *Outpatients and Ward Attenders, England*, 1994–95.)

This increase in the use of A and E departments did not represent a shift of demand from general practice. Over the decade to 1993, according to the annual reports of the General Household Survey, consultation rates with GPs rose from four to five per 1000 population.[63] The 1990 GP Contract extended the hours for which GPs were to be personally available to qualify for the maximum practice allowance. It also provided incentives for extending the range of services offered.[7] This may have had the effect of actually diverting some of the demand away from A and E departments.

Aggregated regional data 'hide' wide inter-district differences in new attendance rates, however. They have varied among health district populations by as much as 18-fold[64] and the ratio of reattendances to new attendances has varied by as much as 26-fold.[65] The former is related to the proportions of males, young adults and non-marrieds in the population and only partly to the socio-economic diversity of the resident populations. The latter appears to reflect different departmental management policies.[66]

Emergency admissions through the A and E department

Emergency admissions of patients for inpatient care which are routed through the A and E department add considerably to the department's workload. This was the position in nearly one-third of the hospitals which were included in the Clinical Standards Advisory Group's 1992 survey of urgent and emergency admissions to hospital, particularly for patients en route to the orthopaedic specialty.[17] Moreover in an unknown number of major units they are logged as new A and E outpatients, inflating the numbers of first attendances. The number of emergency admissions rose by over 400 000 in the period 1989/90 to 1993/94, and by 4.2%, to 61.9%, of all admissions (Table 9).

Table 9: Emergency admissions as percentage of total ordinary admissions in England (and range for 14 RHAs)

Financial	Number of admissions		
year	Emergency	Total	% emergency
1989/90	3 418 623	5 923 799	57.7 (55.2–63.7)
1990/91	3 451 292	5 824 198	59.3 (55.8–64.2)
1991/92	3 454 746	5 960 935	58.0 (51.0–64.9)
1992/93	3 639 735	6 069 599	60.0 (55.9–65.6)
1993/94	3 825 994	6 184 144	61.9 (55.9–65.8)

Source: *Hospital Episodes Statistics.*

Patient activity

There is considerable variation in levels of patient activity in A and E departments in England.

Fewer than half the (major) Type 1 units had more than 50 000 new attendances, even allowing for the probably few cases where the activities of any minor units covered by the same provider Trusts were included in these numbers. Fifty-five providers had 65 000 or more first attendances, of which eight had 100 000 or more (Table 10).

Table 10: Number of providers according to type of main A and E department and number of first attendances in England, 1994/95

	No. first attendances					
Type[a]	0–	20 000–	35 000–	50 000–	65 000–	Total
1	18	36	59	48	55	216
2	11	3	4	3	0	21
3	17	1	1	1	0	20
4	6	1	0	0	0	7
0	4	0	1	0	0	5
All	56	41	56	52	55	269

[a] For description of types 1–4 see Table 5, p. 15. Type 0 indicates no A and E department.

Source: KH09 returns.

Data collected systematically in a research project from eight district general hospital A and E departments in various parts of England were used in a study of reattenders.[66] Another unpublished analysis of the data collected in this survey showed that young adults make up proportionately more of the clientele than other age groups; over 20% are children, a group for whom special arrangements are needed[67] (Figure 3).

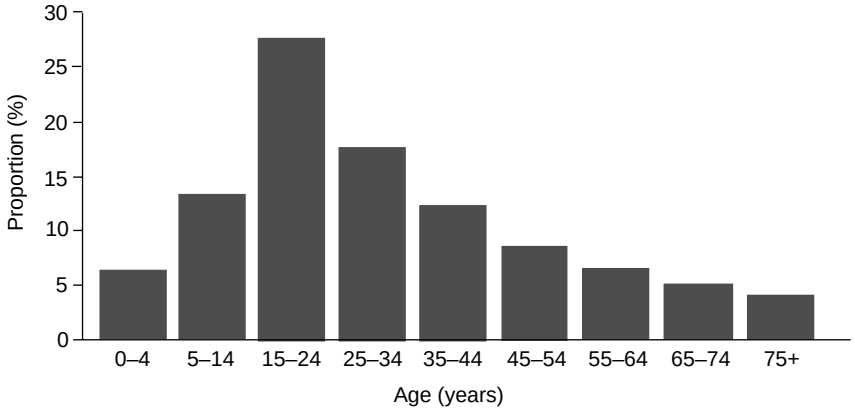

Figure 3: Percentages of new attenders at A and E departments in eight English hospitals in 1987.

A and E departments have proportionately more new attenders in the summer months than in winter (Figure 4), but there are generally no great differences from day to day (Figure 5).

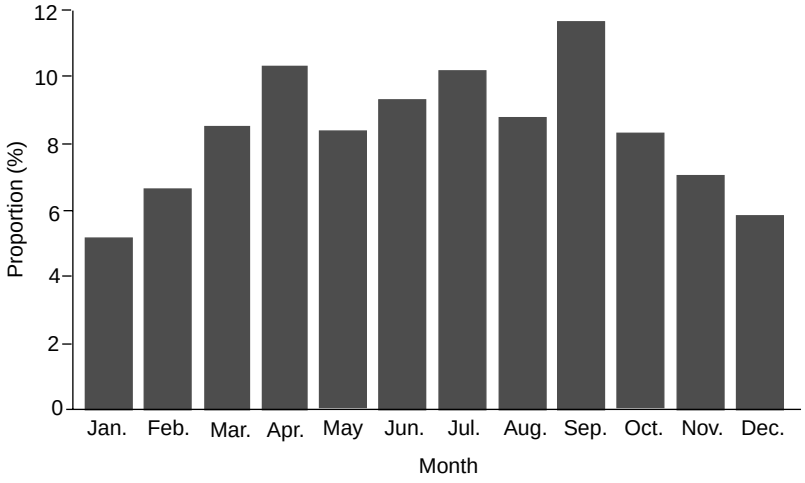

Figure 4: Percentage of new attenders according to month.

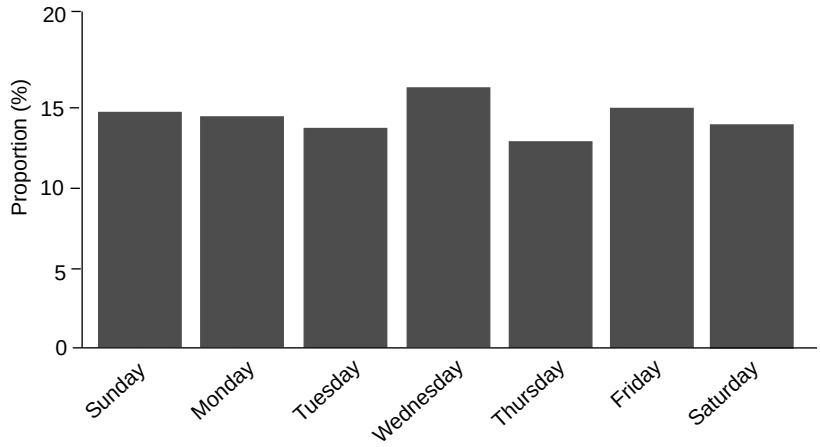

Figure 5: Percentage of new attenders according to day of the week.

Demand is high in the 12-hour period from 9.00 am, but very low after midnight. Demand from children (0–14 years) is high throughout the day but with a pre-bed-time peak, which is when most GP surgeries have closed for the day (Figure 6a). This is unlike the demand from adults, which is highest in the morning. Demand through the night is mainly from adults (Figure 6b).

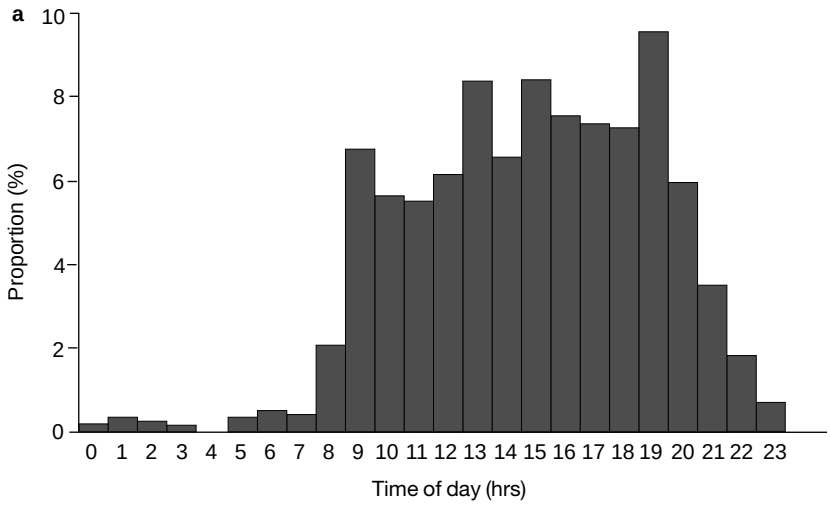

Figure 6a: Time of day of attendance for children.

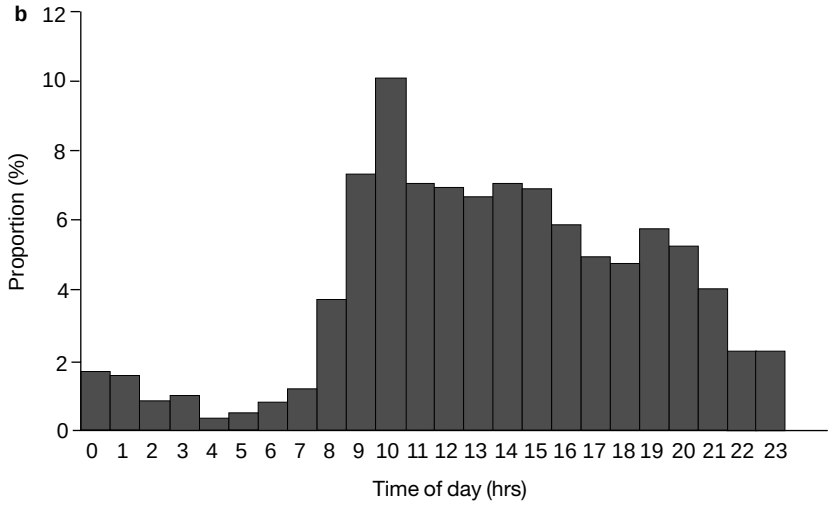

Figure 6b: Time of day of attendance for adults.

A study of major trauma in the Yorkshire region showed that only a minority of such cases reached hospital during 'office-hours', 9 am–5 pm. So most of the severely injured had to be dealt with when hospitals were staffed at the on-call level. One in seven arrived between 1 am and 9 am[21] (Figure 7).

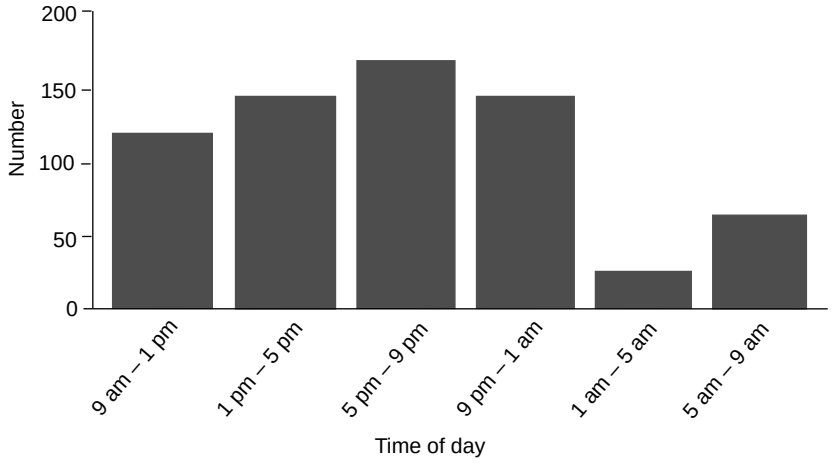

Figure 7: Time of day of attendance for new attenders with major trauma in A and E departments in Yorkshire region.

The patients

The age distribution of new attenders at A and E departments depends in part, of course, on the age structure of the population. In the combined inner and outer London electoral wards the estimated annual rates of new attendance in 1981 were consistently higher for males than for females and lowest for patients in the 35–64 years age groups[68] (Figure 8).

Figure 8: Attenders at A and E departments: estimated annual utilization rates by age and sex.
(Source: Chambers and Johnson.)

There was no consistent pattern of utilization rates by different social classes (Table 11). However from the table it is fairly clear that both in inner and outer London, the grouping of rates into a) social classes I and II; b) social classes IIINM, IIIM and IV and c) social class V reveals an upward trend in rates from the first group to the third.

Table 11: Estimated annual utilization rates per 1000 population by social class

Social class	Inner London		Outer London	
	(*n*)	Rate	(*n*)	Rate
I	(91.1)	200.2	(65.2)	110.8
II	(174.3)	102.4	(127.1)	65.5
IIINM	(258.2)	254.3	(230.5)	200.2
IIIM	(395.1)	223.1	(256.4)	155.0
IV	(205.0)	146.6	(143.1)	207.0
V	(185.1)	298.0	(71.1)	407.7

n = number in ward sample, adjusted pro rata for missing and unclassified data.

Source: Chambers and Johnson.[68]

Compared with a non-metropolitan urban environment, the clientele of an inner-city A and E department differs, in that there are more commuters and tourists, single people, people living alone and those who have moved recently or are homeless. Despite this in one recent study similar proportions of patients were admitted in the two settings and the distribution of diagnostic groupings of attenders was also similar.[69]

Deaths in the A and E department

Excluding patients who are brought in dead (b.i.d.), whose accompanying persons may nevertheless require comfort and advice; approximately one in 700 new patients dies while in the A and E department. This estimate is based on the observation of seven deaths among 5150 new patients attending A and E departments of a representative sample of 30 UK hospitals during one-week periods in 1992/93 during the course of the study of urgent and emergency admissions to hospital, commissioned by the Clinical Standards Advisory Group[17] (West RR, personal communication, 1995).

Comparisons with US

In contrast to the little we know clinically about patients attending A and E departments in this country, much more is known about attenders at hospital emergency rooms in the US. In the US in 1991 the National Hospital Ambulatory Medical Care Survey was inaugurated by the National Center for Health Statistics.[70] This annual sample survey of patients attending emergency rooms or outpatient clinics in short-stay or general hospitals uses a standard data collection form. On it are recorded data about the patient; the circumstances of the visit; the patient's diagnostic condition and the interventions undertaken. A copy of the form used is shown in Appendix I.

The estimated first attendance rate in 1992, 357 per 1000 population, was greater than the first attendance rate in A and E departments in England in 1991/92 (230 per 1000).[56] This no doubt reflected in part the absence of a generalized system of community-based, medical treatment services. In England many would probably be dubbed inappropriate attenders. The lower ratio of total attendances to first attendances (1.1 vs 1.2) also bears this out, although in the US financial issues may also affect decisions on whether or not to reattend.

As many as 45% of the patients were however categorized as 'urgent or emergent' by the staff treating them. Nevertheless only 14% of visits resulted in hospital admission. The proportion of new attenders at A and E departments in Central London who are admitted is around 18% and this is thought to under-represent the proportion nationally because a relatively high proportion of attenders in London present with minor injuries and ailments.[29] However this 18% probably includes some patients whose immediate admission had already been arranged and who were in transit to inpatient facilities.

In 17.5% of cases the patient did not see a physician, but in contrast to the assumed situation in England, 17.0% of cases did not see a registered nurse.

Summary

In summary the caseloads of major units in England vary greatly in size. In some instances this is understandable on account of the urban–rural differences in population density. It is in urban areas where there are major units with relatively small caseloads that the scope for merging units is greatest. Attendance rates are highest among males and among children and young adults. Contrary to expectations no consistent differences have been uncovered in the utilization rates of A and E departments according to the socio-economic classification of the populations they serve, but people in social class V have the highest rates.

6 Effectiveness and costs of A and E departments

Introduction

An important part of a needs assessment is to examine the cost-effectiveness of different service options. An option is cost-effective if it is found to be the cheapest way of achieving a given objective (e.g. a choice between different types of staff where they provide a service with equal outcome). A more difficult decision arises when a service option is both more expensive and more effective than the alternatives. The choice will then depend on the purchaser's priorities. Furthermore effectiveness has often been measured in terms of the processes of care, such as waiting times to see a doctor, rather than the health outcomes of that care. This raises further difficulties in making an assessment of cost-effectiveness in terms of health gain because improvements in processes will not necessarily translate directly into improved health outcomes.

Within these constraints, this section examines the effectiveness and costs of various characteristics of A and E departments and services which A and E departments could provide. The characteristics and services are listed in Table 13 on page 37, which also summarizes the evidence discussed in the text and offers tentative recommendations.

This section only considers options which A and E services could provide and the basic services and facilities available in a standard A and E department are assumed, without question, to be cost-effective.

First, general characteristics and service organization issues are discussed and second, issues relating specifically to the four categories of A and E patients referred to earlier – major trauma, minor trauma, major illness and minor illness.

Effectiveness

General services

Size and location of departments

The ideal size for A and E departments, which will depend on the sizes of the populations served and the distances involved amongst many other factors, is not known. Some studies have suggested that small hospitals can be as effective as larger hospitals in the management of both major[71] and minor[72] trauma, but others suggest that reducing the scale of the hospital leads to more frequent errors and avoidable deaths.[73] It is known that surgical procedures[74] and trauma management[75] supervised by senior medical staff have better outcomes than without such supervision and this implies that larger A and E departments, with more senior posts, may be preferable to smaller departments. There is some evidence that high-volume departments have better outcomes for severe trauma than low-volume departments[76] and the American College of Surgeons recommends that for optimal care 12–20 severe or urgent trauma cases should be seen each week in departments designated to manage major trauma.[77] Although such numbers are unlikely to occur in the UK setting even with triage of appropriate patients to such hospitals (since only approximately 0.1% of new attenders at A and E departments in England have sustained major trauma[21–23]) it does imply that large departments are preferable at least for the management of major trauma.

The distance to the nearest A and E department is another factor in the equation and while there is no evidence that, for example, the single major A and E departments serving Leicestershire[78] and Cornwall result in any worse outcomes for severe trauma than in other areas (for example in South Yorkshire where all of the population live within ten miles of their nearest A and E department) it is self-evident that there must be a penalty for too large a distance.

A North West Thames RHA Task Force suggested that A and E departments with fewer than 50 000 new patients per year did not have the necessary caseload or case-mix needed in order to provide the necessary experience to be able to provide the highest standards of care.[79] Where journey times from the scene to the nearest casualty hospital are frequently going to be excessive smaller departments might be more appropriate.

It should also be remembered that there are many major life-threatening conditions other than major trauma and these may benefit most from the earliest possible attention in departments of any size or complexity. The chances of resuscitating patients in cardiac arrest, for example, deteriorate rapidly within minutes of arrest; and chances of recovery from myocardial infarction improve with appropriate early treatment. Equally there is some non-major trauma such as drowning and poisoning from which early treatment in standard departments of any size and complexity will nearly always be preferable to later treatment. The arguments for larger, but inevitably more distant departments, cannot also be interpreted as arguments for the closure of smaller A and E departments.

Observation wards

Approximately 50% of A and E departments in England and Wales have associated short-stay observation wards[53] and although the value of these wards has not been universally established, short-stay wards are reported to be effective in improving the care of injured patients[80,81] particularly in the case of elderly patients[82,83] and patients with head injuries who might otherwise be discharged inappropriately.[84]

Hours-of-opening

As shown in section 5 demand for A and E services follows a very well characterized and distinct pattern, typically remaining high from about 0900 to 2100 hours but rapidly tailing off and remaining very low between 0100 and 0700 hours. During the out-of-hours period the nature of attendance at A and E department differs in some respects to that in-hours. For example 80% of asthma presentations occur between 1600 and 0800 hours[85] compared with 51% of all attenders and 72% of major trauma presents between 1700 and 0900 hours[21] compared with 48% of all attenders.[23] During the night time there is also considerable demand for radiographic services[86] and orthopaedic surgery[87], for example. Some of this out-of-hours activity has been shown to be essential. Furthermore where full A and E department services are available on two sites, with one or the other alternately not open for part of the 24-hour period, this has been reported to be unsatisfactory.[88]

Dedicated operating theatre services

There is good evidence that amongst many factors leading to poor outcomes in major trauma, delays in operation[3,89,90] which could be brought about by difficulties in access to operating theatres[91,92] are very important. There is evidence, for example, that early fixation of long bone fractures substantially increases chances of survival[93] and reduces morbidity.[94] Dedicated operating theatres are therefore assumed to be effective.

There is also some evidence that operations performed out-of-hours unsupervised by a consultant have comparatively poor outcomes[95] and it is presumed that the frequency of this happening might be reduced by dedicated emergency operating theatres which can enable the uninterrupted planned use of other theatres.

Triage

- **Pre-hospital** In order to help reduce the burden of untimely or inappropriate attendance, at least one hospital in the UK is encouraging patients with non-emergency conditions and their carers to telephone the A and E department about their problems first.[96] Although A and E staff are not usually trained to

assess telephone enquiries,[97] telephone advice lines may provide a safe and low cost[98] means of controlling the number of inappropriate attenders.

For patients with severe trauma, triage to hospital A and E departments with appropriate expertise and services on the same hospital site may also be important and has been reported as improving outcomes over and above those found from taking patients to the nearest hospital[99] even if this results in a small increase in time to arrival at hospital.[100] Unfortunately there is no evidence from the UK about the effectiveness of triaging patients to the nearest appropriate hospital rather than the nearest hospital.

- **In hospital** Within hospitals the value in terms of patient outcomes of triage into priority categories remains undemonstrated as does its value in terms of the timing of care. Large numbers of patients triaged into an urgent (or 'see immediately') category may mean that no one is seen immediately; small numbers inevitably result in false negatives. One study concluded that nurse triage may impose additional delay for patient treatment, particularly among patients needing the most urgent attention.[101,102]

  On the other hand triage of patients into types (suitable for GP care or attenders needing A and E care)[103] and the provision of appropriate care, has been found in one setting to improve the processes of care for those patients suitable for GP care.[60]

Services for children

Whilst benefits from separate children's facilities[104] and of observation wards for children[105] have been described, there is no conclusive evidence about whether children have better outcomes if they are treated in dedicated paediatric A and E departments rather than in general departments. It has been found that outcomes in major trauma generally are equally good for children and young adults treated in the same department,[106] but that in specific diagnostic groups children fare substantially better in dedicated facilities.[107]

Services for major trauma patients

In 1986 the American College of Surgeons reviewed the needs of the injured patient and issued guidelines on the services, facilities, training and experience which it is believed contribute to the care of major trauma.[77] Much of this remains plausible though knowledge of the effectiveness and cost-effectiveness of the various components is limited.

Specialties on site

Access to appropriate facilities and experienced personnel in such specialties as A and E medicine, anaesthetics, general surgery, neurosurgery and orthopaedic surgery, 24 hours per day in major A and E departments is presumed to be effective in improving outcomes in major trauma.[3,77] There is some evidence that secondary transfer of patients, particularly those with head injuries, should be avoided if possible,[108–111] that associated delays in treatment have adverse consequences,[112] that outcomes for patients with head injuries when neurosurgery is not available on site are not optimal[79] and that delays in orthopaedic treatment can lead to relatively poor long-term outcomes.[93] If neurosurgery is not available on site then it is suggested that detailed guidelines for the transfer of head injured patients need to be agreed locally to minimize the hazard of transfer.[113]

Trauma teams

The most common pattern of management of the seriously injured has been transportation to the nearest A and E department where the initial assessment and treatment are conducted by a casualty officer. Specialists are then called in to treat specific injuries.[114] Early management by a relatively junior doctor and late involvement of specialists can lead to inadequate resuscitation, missed diagnosis of injuries and delays in definitive treatment – all factors which have been judged to contribute to avoidable death in the trauma patient.[77] One response to this problem has been to develop the concept of the trauma team.[115] This involves the early mobilization of senior medical (accident and emergency, anaesthetics and surgical specialties) and nursing staff who can rapidly assess, resuscitate and prepare the patient for definitive treatment including transfer to another more appropriate hospital if necessary.[116]

Call out of the trauma team is usually initiated on the basis of the revised trauma score[75] (a measure of physiological compromise) or on the basis of physiological, anatomical and mechanism of injury criteria.[117] The latter criteria have been shown to have a very high sensitivity (> 95%) but poor specificity. However including mechanism of injury in the call-out criteria enables the trauma team to be alerted earlier than if this depends on the findings of the primary survey in the initial assessment.

Audit of trauma team performance has demonstrated several improvements in trauma management. Resuscitation times can be reduced although they vary from between 15 to 105 minutes.[118] It is also claimed that the trauma team approach results in more effective resuscitation, particularly volume replacement with intravenous fluids and fewer delays in treatment.[75] This is achieved by performing horizontal rather than vertical care,[119] where assessment, airway control and treatment are carried out concurrently rather than consecutively and by the early involvement of specialists.[75]

It is argued by some that the best way of managing major trauma is in trauma centres but until the issue of in which circumstances they are advantageous is resolved, the use of trauma teams provides a more efficient and organized approach to the care of the seriously injured in district general hospitals.[120]

ATLS training

Advanced trauma life support[121,122] is a highly structured protocol for the initial assessment, management and resuscitation of seriously injured patients, developed in the US during the 1980s for medical staff but now extending to other staff in the A and E department.[123]

Although there is considerable dispute about the effectiveness of the practice of advanced life support in the field,[124] in hospital the value of a casualty team trained in ATLS is accepted widely.[125,126]

Regional trauma systems

Whilst it seems self-evident that regional trauma centres, with 24-hour trauma teams led by senior, experienced medical staff and with all major specialties on site and with a high volume of major trauma activity, could be effective in improving the outcomes for multiply injured trauma patients admitted to the centres, the effectiveness of regional trauma systems is less clear cut.[127]

However evidence both from before and after studies[128] and from cross-sectional comparisons[129] has shown that regional trauma systems, based on designated trauma centres with pre-hospital triage to appropriately graded trauma centres, is effective in improving outcomes when the nature and volume of trauma is as seen in the typical US setting. The benefits of such systems depend not only on the performance of the trauma centres but also on the performance of the pre-hospital services and their ability to transfer patients to appropriate hospitals.

Preliminary indications from New South Wales, Australia also suggest that such systems may be effective outside the US (Lyall D, personal communication, 1994) although there is some doubt about the effectiveness of such systems in European settings.[130]

The regional trauma system set up in the North West Midlands to examine whether this concept would translate into the UK setting, showed little evidence of any benefit.[4] There were no statistically significant improvements in standardized major trauma mortality rates compared to two other regions and no improvement in the avoidable death rate. However the system had no method of triaging patients directly to the trauma centre in Stoke-on-Trent and the volume of major trauma seen in the centre was less than 20% of the volume recommended by the American College of Surgeons for a level 1 trauma centre. Furthermore although the North West Midlands system may have exemplified the performance of such systems in similar mixed urban and rural settings elsewhere in the UK, it is difficult to draw conclusions about their effectiveness in other settings such as densely populated conurbations like London.

Computerized tomography

Amongst patients with major trauma, the most common anatomical site of fatal injuries is the head[131] and it is widely recognized that CT scanning[132–135] and possibly on-site neurosurgery[79] are effective in improving the management and outcome of patients with severe head injuries. The value of CT scanning in less severe head injury patients (those with history of loss of consciousness, or post-traumatic amnesia and a Glasgow Coma Score greater than 12) is disputed. Some authors have claimed it is effective[136] and cost-effective,[137] partly because a normal neurological examination coupled with a normal scan may enable patients to be discharged from casualty without the need for a period of observation in hospital[138] and the use of CT scanning should be widened to include more patients with less severe injuries.[139] Others have suggested that if an initial neurological examination of blunt trauma patients is normal then CT scanning can be delayed safely.[140]

Computerized tomography scanning at sites other than the head is also common, but evidence is less clear cut. It has been shown, for example, that conventional diagnostic peritoneal lavage is more sensitive and specific than CT scanning in blunt abdominal trauma.[141] In the UK CT scanners are widely but not universally available[142] and some large hospitals were reported in 1990 not to have scanners[143] and to our knowledge as late as 1993 there were some hospitals in the UK receiving major trauma which did not have CT scanners . In many departments in the UK where there are scanning facilities but no neurosurgery services, CT scanning and the transference of the images to regional neurosurgery centres for assessment has been introduced, but such systems have not been formally demonstrated to be cost-effective.

24-hour radiographic services

The incidence of major trauma does not follow exactly the same pattern by time of day as other trauma. As has been mentioned one study, for example, showed that 72% of all major trauma occurred outside normal working hours (weekdays from 0900–1700).[21] Evidence about the reduced value of 24-hour radiographic services[87] may not apply therefore to 24-hour radiographic services for major trauma. However senior radiographic assessment has been shown to be important in the management of major trauma generally and the cost-effectiveness of 24-hour radiographic services for major trauma may therefore depend not only on the incidence of major trauma 'out-of-hours' but on whether there is a system in place for transferring or triaging major trauma to regional centres.

Minor trauma

Nurse practitioners

The primary function of a nurse practitioner in the A and E department is in the care of patients with minor trauma – although they also manage patients with other minor conditions.[5] A nurse practitioner is able to make diagnoses, decisions about patient management in some cases, including treatment and disposal and to

administer and supply prescriptions for a limited range of drugs under standing orders/protocols. Ordering investigations may be a problematic area and nurse practitioners are not always empowered to order X-rays, for example.

Despite their patchy but widespread use there is no evidence yet from prospective randomized studies of the relative effectiveness, or cost-effectiveness of nurse practitioners and junior doctors. However if the use of nurse practitioners resulted in smaller costs, without affecting quality of care or patient outcomes, this would be one possible way of reducing junior doctors' hours without increasing expenditure.

Minor injury units

Special facilities for the care of patients with minor injuries have been established in several places in the UK, usually in the wake of the closure of A and E departments. Typically these minor injury units (MIUs) are GP supervised or have direct links to other local A and E departments and are staffed by appropriately trained nurse practitioners, have on site X-ray facilities, but are not usually open for 24 hours/day. They may be sited with community hospitals, or with community or primary health care facilities, or on DGH premises.

A number of uncontrolled audits[144–153] have shown that they see 5000–25 000 patients each year, nearly all of whom attend appropriately, that patient satisfaction is high and that MIUs adequately manage the processes of care for such patients with some patients being treated on site and others transferred to conventional A and E departments for further assessment or management.

A recent review of options for treating patients with minor injuries[154] concluded that for MIUs to be successful, a close relationship with the nearest major A and E department is desirable for clinical supervision, rotation of staff and continuing education, so that patients may be transferred without delay when necessary and that nurse practitioners working in MIUs need explicit and widely agreed working protocols or clinical guidelines which should include the authority to request X-rays.

However no formal studies of the effectiveness or cost-effectiveness of MIUs are known and their contribution to improving health as opposed to managing patient demand remains unclear.

Major illness

There are few special services which could be optionally purchased for the care of major illness patients, who include those with coronary emergencies, cerebro-vascular accidents and other conditions such as asthma, epilepsy and diabetes. For acute myocardial infarction, early thrombolysis[155] and resuscitation protocols[156] are known to be effective. Protocols and guidelines for the care of other patients with emergency medical conditions such as asthma[85] have also been shown to be effective and such protocols might form a valuable service.

Basic life support training involving skills in the resuscitation and management of the critically ill, non-trauma patient has also been demonstrated to be effective in improving survival chances for patients,[157] but other services such as coronary care ambulances[158] and other ways of integrating pre-hospital and in-hospital care, for example by direct transmission of electrocardiogram (ECG) recordings taken in an ambulance to coronary care units for assessment have yet to be shown to be effective.

Minor illness

Patients attending A and E departments with minor illnesses, which were assessed by GPs as capable of being managed in a general practice setting, make up approximately one quarter of the average caseload of a UK A and E department.[27] It does not follow that such patients should be managed in general practice. Some GPs may have little knowledge or interest in managing minor conditions, or if they do, they may lack the quantity and range of equipment needed. It has been shown that in the facility at King's College Hospital these

patients, as well as those with minor injuries, are managed comparatively effectively and efficiently using on-site GP services rather than traditional junior casualty doctors.[60] For example primary care practitioners were less likely to utilize hospital resources and made fewer investigations and referrals to specialist teams or outpatient clinics, without any detrimental effect on clinical outcome. They were identified as practising more patient-centred care. This included broader assessment of patients' immediate health care needs and more concern about social and emotional factors. Their care was highly acceptable to patients. However these comparisons were between the care of junior casualty doctors and more experienced GPs and the differences could reflect the extent, rather than the nature, of their experience.

An alternative to the provision of GP services in A and E departments is an extension of GP-based services to cover minor, walk-in or book-in medical emergencies for up to 24 hours/day,[9] although there is little evidence of the need for such a service between midnight and 0600. Such emergency care centres might typically be combined with a minor injuries service to create a polyclinic. Neither the effectiveness nor cost-effectiveness of such developments have yet been tested, but as they may become part of a common, alternative model in the future their cost-effectiveness needs to be evaluated.

Costs

The cost-effectiveness of alternative ways of delivering A and E services depends on the consequences for costs, as well as health.[159] The cost consequences of the A and E components identified in the previous section extend beyond the department itself. There are costs from the use of investigations, hospital admission, subsequent outpatient care and from the use of general practice, social services and ambulance services. A and E attendance also involves the time of patients and their friends and relatives. Studies undertaken in the US have found that the costs of care provided in emergency rooms represent only a fraction of the total costs of trauma care.[160] For minor trauma, costs incurred within an A and E department will be more important, but even for these cases it has been shown that investigations represent a substantial proportion of costs.[161] For major trauma cases a recent study of helicopter-transported cases found over 80% of NHS costs were related to the periods of inpatient admission.[162] There are few studies in the field of A and E medicine which examine costs in any way[160–166] and it is extremely rare for a study to examine all cost consequences. Therefore it has been necessary to look beyond what is published in academic journals and to include reports from academic and consultancy studies and use unpublished NHS statistics.

General services

Costs of A and E departments

All providers (trusts and directly managed units (DMUs)) are required to generate a financial return, which includes a code for expenditure on A and E services and attendance levels (THR and HFR21/22s). It includes all expenditure attributable to services provided within the A and E department and its associated overheads, but excludes the cost consequences of any treatment or investigative procedures provided outside the A and E department. These data have been used to examine expenditure on A and E services and whether they vary with the number of attendances by trust or DMU. The average costs per attendance for 250 trusts and district managed units are shown in Table 12.

Table 12: Average A and E costs per attendance by number of attendances in England 1992/93

Total number of attendances	No. of Trusts and DMUs with A and E departments	Mean cost per attendance (SD) £		Mean cost per new attendance (SD) £	
0–19 999	36	24.91	(13.34)	33.75	(18.85)
20–39 999	51	36.91	(14.55)	45.56	(16.45)
40–59 999	82	40.46	(11.06)	48.24	(12.81)
60–79 999	48	38.42	(13.22)	45.81	(14.80)
80–99 999	22	37.23	(10.73)	43.75	(11.47)
100 000+	11	39.76	(10.36)	45.95	(10.94)
Overall	250	36.28	(12.21)	43.84	(14.22)

Note: Data were not available on all providers with A and E departments.

Sources: NHS Financial Returns (DoH, 1993).

In 1992/93, the average cost of an attendance was £36.28 and £43.84 for a new attendance, but the range of costs was very wide. These data should be interpreted with caution, since the costings rely on apportionment procedures which permit considerable local discretion and returns for many trusts include satellite A and E departments such as minor injury units. Furthermore attendance levels are a poor measure of workload, since they take no account of the type and severity of the condition and these data should not be used to compare the efficiency of different departments.[16]

In addressing many of the cost-effectiveness questions it is necessary to estimate the marginal costs of treating the different types of trauma and to separate the costs of minor from major trauma and trauma from emergency medical cases. However in practice these are difficult to estimate. Currently there is no routine means of estimating the workload associated with each type of case. More fundamentally even if a valid measure of workload were available, cost allocation between these types of case is problematic due to the existence of joint costs within A and E departments. Large cost items are shared between all the types of attendance, including medical and nursing staff, administration, overheads and capital charges, which together may account for 78% of the total cost of an A and E department.[88] A consequence of these joint costs is that the marginal cost of a service depends on the context of the decision. For example the marginal costs of treating extra minor trauma in an existing A and E department could be limited to the cost of an additional nurse. Where the opening of an A and E department is required to manage minor trauma, then more of the costs would be included. Ultimately the marginal cost of a development in an A and E department depends on the local cost structure and standards of care and caution must be taken when extrapolating from studies conducted elsewhere.

Size and location of departments

In the NHS there have been moves to increase the size of A and E departments to improve the quality of care and to reduce costs. In the analysis of the costs of 250 providers presented in Table 12 there was no evidence to support the existence of cost economies, either for total or new attendances. The case-mix may have been more complex for the larger departments but this cannot be proven from this data set. In local studies it has been suggested that significant economies may occur at higher levels of attendance.[163] The amalgamation of two medium sized A and E departments was predicted to yield savings of around 15%, although this saving was substantially reduced by the additional costs for the ambulance service from the consequent increase in the number of patients transported between the two hospitals.[88] There have been no published follow-up studies of the cost consequences of any amalgamation or closure of A and E departments to see whether any of the expected cost savings were achieved.

Centralizing A and E services increases the average travel time for patients and their companions attending the A and E department. The private cost to patients of the time and inconvenience caused by the extra journey should be considered against any cost economies for the hospital. Reduced access may also deter some patients who, as a consequence, may decide to visit their GP or other locally-organized emergency treatment service.

Hours of opening

An important choice for A and E facilities is the hours of opening. Major A and E departments with consultant cover are usually open for 24 hours but minor injury units are often open between eight to 16 hours per day. Night-time opening is expensive because it involves employing extra staff at enhanced rates of pay when the number of attendances is low. In one study it was predicted that opening between 8.00 am and midnight for seven days a week would result in an average cost per attendance of 20% less than a 24-hour service[164] with little impact on the travel time of the 4% of cases attending A and E during these hours. Although this option retains the access advantages for the vast majority of patients of having an extra A and E department or minor injury unit, part-time opening may mean that patients are uncertain whether or not the department is open and this has been reported to be unsatisfactory.[88]

Observation wards and dedicated theatre services

Extra costs from providing these services might arise from the duplication of services and an increase in unused capacity. Nevertheless it reduces the disruption for other hospital departments and the transportation of patients. The overall cost consequence is not clear and has not been examined empirically.

Staffing

- **Senior house officers or GPs** Traditionally patients are first seen by a junior doctor. In the study at King's College Hospital in London, the cost-effectiveness of introducing GPs into an A and E department has been evaluated. For the NHS a GP's time is more expensive than a senior house officer (SHO) due to higher remuneration and GPs spend more time with each patient. However GPs were found consistently to use fewer investigations, particularly X-rays and refer fewer patients for specialist care.[60] The cost per case of patients seen by a GP, including the use of investigations, was 61% of the cost of patients seen by an SHO.[161] (The difference is considerably higher with admission costs included, but the authors were concerned about the reliability of these data.) This cost difference might be partly offset by the cost of a higher number of onward referrals to general practice by the GPs in the A and E department.
- **Nurses** Nurses are being used both to triage cases and as alternatives to junior doctors in the provision of services. The cost of having a triage nurse is the need to divert a trained nurse from other activities and this will depend on the grade of the nurse. The cost comparison between trained nurses and junior doctors is more complex since the cost of their time will depend not only on the grade of nurse and the scale points of the nurse and doctor, but whether they are working overtime, since junior doctors are paid only one-third of their normal hourly rate during this time. Furthermore the evidence from comparing GPs and SHOs in the King's College Hospital Study suggests it is also important to examine the consequences for the use of investigations, drugs and referrals to specialists.[161]

Services for minor trauma and illness

Minor injuries unit

Many of the facilities of an A and E department are regarded as inappropriate for minor trauma and therefore it might be more cost-effective to manage them in a minor injury unit (MIU). The average cost per attendance in a MIU is usually lower than in a full A and E department, but this is largely because of a higher proportion of low-cost reattenders. This is also a false comparison, since it should be between the marginal cost of treating minor trauma in MIU compared with A and E departments.[163] In A and E departments this is likely to be substantially less than the average since a minor case is less time consuming than major trauma and many of the facilities would be needed for the more major cases, with or without minor trauma. The appropriate question is whether the costs of the joint production of treating major trauma and minor trauma together is more than treating them in separate facilities[161] and to this there is no answer based on evidence. Within the MIU option there are many choices in terms of size, staffing, facilities and location, all of which may influence this cost comparison. (A MIU can vary in character from being in a hospital with an associate specialist and full X-ray facilities, to a small MIU, run by nurses with very limited access to X-ray.)

General practice

Patients with minor trauma could be encouraged to go to their local GP rather than the A and E department, either through education or by closing facilities. Both these options have been pursued, but again little is known about the cost consequences. The costs to the NHS depend partly on the marginal costs of using these two facilities and, where facilities are to be closed, the consequences for the number of attendances.

Services for major trauma patients

Trauma centre

The evaluation of the first UK trauma system based around a pilot trauma centre in Stoke included a detailed costing of the centre itself as well as a follow-up for six months of the use of hospital and other services.[4] There was a large investment in staff, including four extra consultants in A and E and anaesthetics to provide 24-hour consultant cover, 14 wte nurses and 10 wte ITU nurses and a dedicated theatre which accounted for around an extra £1 million per year on the costs of running the A and E department. Substantial variations in these costs are expected if trauma systems are established at other locations. The additional service requirements had only small additional consequences for costs elsewhere. There was little evidence that this investment significantly relieved pressure on the A and E departments in the surrounding area since the numbers of cases involved were small. Net of cost changes in A and E departments in the comparator regions it was estimated that the regional trauma system cost an additional £0.52 million per annum and because there was little evidence of any health benefits it was concluded that the system which developed around Stoke between 1990 and 1993 was not a cost-effective service for major trauma.

'Out-of-hours' radiography

A study of out-of-hours radiography in a major teaching hospital found that referrals from the A and E department accounted for 80% of utilization[86] and the total cost was approximately £250 000. The researchers estimated that the adoption of guidelines for the use of this service could yield savings of 18%.

Trauma teams and ATLS training

These are developments in trauma care appearing in conventional A and E departments as well as being a part of a trauma centre. Trauma teams have a cost in terms of a reduction in staff availability elsewhere, whilst they are active in A and E departments. Advanced trauma life support training has a cost in terms of staff hours. Published cost data are not available on either service development.

Cost-effectiveness

In a cost-effectiveness analysis costs of different investments in health care are compared with their effectiveness at the margin, where the beneficial effects are measured in comparable units.[159] This is rarely possible in practice and this is true, *a fortiori*, in the case of A and E services. Estimates of the size of the health effects and costs of the different components of A and E services are either unreliable, or non-existent.This makes any assessment of desirability or cost-effectiveness of the service components compared with other uses of NHS resources extremely difficult.

Recommendations have been made where possible and these are summarized in Table 13, using the system of grading of evidence which is common to all chapters in this series. They are usually based on very weak and incomplete evidence (grade III) or professional opinion or deduction (grade IV).

For some of the developments, costs and effects will be also determined by local factors, such as the availability of certain services and the geographical distribution of populations and the priorities of the local purchaser. Furthermore these components of an A and E service have been evaluated in isolation but, in practice, a purchaser will need to consider whole models of care in order to assess cost-effectiveness, and these are described in section 7.

Table 13: Summary of evidence on costs and effectiveness of A and E department components and recommendations

Component	Quality of research evidence[a]		Recommendation[b]	Strengths of recommendation[a]
	Effectiveness	Costs		
General characteristics and facilities				
Size of departments				
Adult A and E	III	III	35 000+	B
Children's A and E	not known	not known	uncertain	uncertain
MIU/MCC	III	III	5 000–25 000	B/C
Hours of opening				
Adult A and E	IV	III	24 hrs Unless two A and E	C
Children's A and E	IV	IV	24 hrs in one city	C
MIU/MCC	IV	III	16 hrs	B
Observation wards				
Adult A and E	III	IV	Yes } Subject to cost[c]	C
Children's A and E	III	IV	Yes }	B
Triage: pre-hospital telephone				
Adult A and E	III	IV	Yes } Subject to cost	C
Children's A and E	IV	IV	Yes }	C
MIU/MCC	not known	not known	Uncertain	
Triage: in-hospital				
Adult A and E	II–2	IV	Yes } Subject to cost	B
Children's A and E	IV	IV	Yes }	B
MIU/MCC	III	IV	Yes }	B

Table 13: Continued

Component	Quality of research evidence[a]		Recommendation[b]	Strengths of recommendation[a]
	Effectiveness	**Costs**		
Services for major trauma				
Neurosurgery on site				
Adult A and E	III	not known	Yes } Cost depends on	B
Children's A and E	III	not known	Yes } current disposition	B
Cardio-thoracic surgery on site				
Adult A and E	III	not known	Uncertain	C
Children's A and E	III	not known	Uncertain	C
Trauma teams				
Adult A and E	III	IV	Yes	B
Children's A and E	IV	IV	Yes	B
ATLS training				
Adult A and E	II–3	IV	Yes	B
Children's A and E	IV	IV	Yes	B
Dedicated operating theatre				
Adult A and E	II–2	IV	Uncertain } Depends on	B
Children's A and E	IV	IV	Uncertain } availability	C
24-hour consultant cover				
Adult A and E	IV	IV	Uncertain } Subject to	C
Children's A and E	IV	IV	Uncertain } costs	C
24-hour radiographic service				
Adult A and E	IV	IV	Depends on costs	C
Children's A and E	IV	IV		C
CT scanning				
Adult A and E	II–3	IV	Yes } Subject to	B
Children's A and E	IV	IV	Yes } availability	B
Minor injuries				
Nurse practitioners				
Adult A and E	III	not known	Yes Subject to costs	B
Children's A and E	IV	not known	No	B
Minor injury unit				
Adult A and E	III	not known	Yes Subject to costs	B
Children's A and E	IV	not known	No	C
Major illness				
ALS training				
Adult A and E	not known	IV	Yes	B
Children's A and E	not known	IV	Yes	B
Other protocols for management of specific conditions				
Adult A and E	various	not known	Yes	B
Children's A and E	various	not known	Yes	B
Other illness				
On site GP services				
Adult A and E	II–2	III	Yes	C
Children's A and E	IV	III	Yes	C

[a] See below for definition of grades I–III and A–E. Grade IV evidence also includes that which is deduced or derived from related research.

[b] Where the preferred option is more costly the decision must ultimately depend on purchasers' priorities.

[c] This is where costs are unknown.

Quality of the evidence

I Evidence obtained from at least one properly randomized controlled trial
II–1 Evidence obtained from well-designed controlled trials without randomization
II–2 Evidence obtained from well-designed cohort or case controlled analytic studies, preferably from more than one centre or research group
II–3 Evidence obtained from multiple-timed series with or without the intervention, or from dramatic results in uncontrolled experiments
III Opinions of respected authorities based on clinical experience, descriptive studies or reports of expert committees
IV Evidence inadequate owing to problems of methodology, e.g. sample size, length or comprehensiveness of follow-up, or conflict in evidence.

Strength of recommendation

A There is good evidence to support the use of the procedure
B There is fair evidence to support the use of the procedure
C There is poor evidence to support the use of the procedure
D There is fair evidence to reject the use of the procedure
E There is good evidence to support the rejection of the use of the procedure.

7 Models of care

Introduction

As we have seen no major changes in disease or injury patterns are anticipated in the near future which would radically alter the size of the demand for A and E services. There is no one model of provision of A and E services which can be applied in every locality, however. Different considerations apply to urban and rural populations and, within urban areas, to metropolitan populations and to smaller urban concentrations. The underlying principles are that levels of service should be provided which are appropriate in type and location to meet within an acceptable time limit the needs of presenting patients. This means, for example, that whilst the development of a regional trauma system might be considered appropriate in sparsely populated areas such as Scotland, or in large densely populated conurbations such as London, they may not be appropriate in other regions. There is no reason in terms of cost-effectiveness why any of the three models outlined on page 40 has to be taken up nationally; nor can we see any organizational or policy reasons why different regional developments are not possible.

Cases which are diagnostically less challenging and in which the treatment needed is technologically less complex (which includes the majority of cases currently presenting to major A and E departments) may be dealt with by different cadres of staff. These may be located in separate facilities, as well as in major A and E departments, bearing in mind that the marginal costs that major A and E departments incur for catering for minor injuries and ailments may, in fact be less than those incurred by establishing new, stand-alone facilities.

Purchasers who take a strategic view will consider an overall model of care and will not plan separate components of the system in isolation from each other. Three models are proposed, each envisaging a slightly different role for the major A and E departments.

Three model options

1 **Preservation of existing major A and E departments, with progressive development of alternative ways of dealing with part of the minor injury caseload – a near status-quo position**

In some rural areas with sparsely distributed populations, even where levels of new attendances are relatively low – 30 000 to 50 000 – there may be little alternative to adopting this model. Elsewhere where travelling times for ambulances and patients can be maintained at acceptable levels, a multiplicity of smaller, major A and E departments may imply duplication of resources and effort and inadequate numbers of cases of major trauma and major illness to allow professionals to acquire and maintain high levels of skill.

2 **Reduction in number of major A and E departments with simultaneous development of alternative facilities for minor injuries and illnesses treatment**

In this model, a major A and E department would rarely receive fewer than 50 000 new attendances per year and would more commonly receive 70 000–100 000 and serve 300 000–600 000 population. There is little information available on what happens to the streaming of patients and problems when certain types of facility are closed or changed in scale or scope. Among the principal issues are whether the remaining departments and their supporting diagnostic and inpatient services can support the diverted demand and what proportion of the demand actually materializes.

Cases of major illness and injury will continue to be taken or referred somewhere, and the size of this group can be predicted from pre-closure observation of the nature of the clientele. It seems from a review of what happened in North West London after A and E departments were closed or reduced in scope over the period 1960 to 1985 that the proximity of alternative A and E departments determined the extent to which the numbers of ambulant patients were reduced.[166] The closure of St Mary's, Harrow Road resulted in the first year in 68% of its first attenders being accommodated in the neighbouring (within two miles) hospitals of St Mary's Praed Street and St Charles Hospital. Nearly one-third of the attenders 'disappeared'.[24] The further effect of the subsequent down-grading of St Charles Hospital's A and E department to a nurse-practitioner-led, minor injuries unit in February 1993 is unknown, but it is conceivable that some of the previously 'lost' minor ailment cases in the area eventually reappeared.

The various ways in which alternative arrangements can be made for patients with minor injuries and ailments such as simple fractures, dislocations, sprains, cuts and abrasions are discussed in section 6. These alternatives all require a framework in which the scope of the services they offer is defined and where there is close collaboration and lines of communication with the major A and E department and clear guidelines for referral to it of relevant cases and also to the general medical and social services. All treatment providers need to agree among themselves and with the local ambulance service the arrangements for transferring cases. Effective systems of clinical audit will be needed by all the various providers, especially in view of the uncertain nature of the caseload with which they may be required to deal in the transitional period.

The marginal costs that major A and E departments incur for retaining such patients may, in fact, be less than those which purchasers might incur by establishing new, stand-alone facilities. But in any case these marginal costs have not been measured. We do know from the King's College Hospital study that the primary care element of an A and E department's caseload can be managed differently within the department to good effect and more cheaply, by employing GPs to manage it. This may be a sound option for inner-city hospitals, but whether it is a more cost-effective option overall than developing emergency treatment centres based on existing premises in the community the authors do not know.

Purchasers would be well advised not to make too many assumptions about the overall financial effects of measures introduced, prima facie, to produce savings. Costs may simply be transferred, not lost.

3 **Regionalizing trauma care services. Major trauma treatment concentrated on regional trauma centres, each serving 2.5 to 3.0 million people on average**
Clear protocols would govern the primary and secondary transfer of patients to these units. A smaller number of major A and E departments than at present, along with a variety of forms of provision for minor injuries, would continue to serve sub-regional localities and these would function along lines similar to present A and E departments (level 2) other than for cases of major trauma. There would thus be a three-tier system, with regional trauma centres, A and E departments and minor condition units. This is the system currently being proposed for Scotland.[167] The regional trauma centre would also act as the major A and E department for the surrounding population, catering for 70 000–100 000 new attendances per year. The regionalized trauma care system would probably involve the concentration of hospital specialties such as neurosurgery, which deal with complex effects of major trauma at the hospital designated as the regional trauma centre. It would also imply that a form of rotation of appointments between the trauma centre and other A and E departments would be needed for doctors and others receiving post-basic training in aspects of health care related to major injury.

Summary

There is as yet no evidence that outcomes for patients with life-threatening conditions have been significantly affected by the introduction of planned changes in the organization of A and E department services in recent years. This simply reflects the fact that little evidence has been systematically collected. It is not possible at this stage to perform convincing option appraisals which take into account evidence on cost changes and effects on patients. Clearly there is no one generally applicable model for an A and E department and its associated services.

8 Outcomes and targets

Outcomes

Reviewing the first volume of epidemiologically based needs assessments, the editors reflect that 'the costs of collecting the additional information required to monitor outcomes, whether directly or indirectly, need to be considered in setting priorities, and that it may only be worthwhile collecting outcome data when the effectiveness of particular services is questionable, or when outcome measures, or proxies thereof, are easy to collect'.[168]

Sufficient concerns have been expressed over the years about the management and effectiveness of A and E departments for the public and the professions to wish to know that standards are set and adhered to.

Outcomes of clinical management in A and E departments are usually stated simply in terms of avoiding mortality from survivable illness or injury and avoiding complications or recurrences through inadequate treatment. Ideally residual impairment of function or disability should be absent or minimal.

Processes of clinical audit are designed to deal with these issues, as are confidential enquiries into undesirable outcomes, such as perioperative deaths or deaths from major trauma. In these examples experts from relevant clinical fields reach a consensus on the appropriateness of, or lack of the various interventions. However if each institution or department sets its own standards for auditing clinical care there may be considerable differences of opinion on what are regarded as satisfactory outcomes.

There are very few outcomes which rely solely on clinical management received in A and E departments. Outcomes may depend also on what was done for patients before they reached and after they left the departments. Consequently there are very few inter-hospital comparators which purchasers might use to

judge the clinical performance of their contracted providers. While every department is capable of reviewing the incidence of misdiagnoses, recurrences and complications of conditions treated, no reports have yet been found of the relative performance on these indicators over a representative range of providers, nor of definitive comparisons of the effects of interventions made by different grades and types of staff.

The exception to this general rule is the audit of the management of major trauma. The basis of this audit is the extent to which patients with injuries scored above a certain level of severity on a scoring system, which takes into account the degree of anatomical injury and physiological derangement, survive or die, and how a hospital compares in its associated risk of dying or surviving with other hospitals treating patients with comparable major trauma. The use of this system of audit, developed as part of a US major trauma outcomes study (MTOS) for comparing hospitals was reported for 33 hospitals in 1992.[169] Although major trauma forms only a minute proportion of caseload in an A and E department, the introduction of the MTOS system for auditing performance with major trauma is a commendable development and purchasers will probably wish to stipulate its use, despite its heavy reliance on clerical resources.

There are no similar, standardized ways of comparing the performance of A and E departments in the management of major illnesses of comparable severity.

The various intermediate 'outcomes' which can be measured include the intervals between the processes of assessment, treatment and discharge of patients. This calls for comprehensive management information systems in which timings can be recorded sequentially during a patient's career through the department.

Another measurement of process which will interest purchasers is the ratio of total attendances to new attendances in A and E departments. The ratio nationally is just under 1.2 : 1. Widely differing ratios from this would call into question the management policies of a department.

Targets

There is some scope for A and E department services to influence the incidence of illnesses and injuries though the identification of risk factors for occurrences and recurrences of various conditions,[170] patient education[171] and raising levels of immunity to infectious diseases.[172] However the departments do have more potential to reduce mortality rates from actual conditions. The caseload typically includes a significant amount of major illness, a relatively small amount of major trauma, and a great deal of minor illness and injury, of which a hard core is likely to remain, whatever alternative arrangements are made to cope with them.

Operationally targets may be set for the number, size and range of A and E services to be provided. It must be stressed again that owing to the dearth of information about costs and effectiveness of different configurations of service, it is not possible at this stage to perform convincing option appraisals. The following targets reflect the more convincing advice contained in the various reports reviewed in this needs assessment.

Major A and E departments

Size

There are advantages of economy of scale in having one, or relatively few large A and E departments in more densely populated areas. Departments with fewer than 60 000 new attendances per year are less well able to sustain the staffing levels needed to ensure that sufficient numbers of experienced staff can be deployed throughout the 24-hour period.

Bearing in mind the need for clinical back-up facilities, it is unlikely that a hospital could cope with more than 90–100 000 new attendances per year without causing patients to travel long distances for the other

forms of secondary care which a hospital provides and unacceptably long primary transfer times for the ambulance services.

Volume

At present on average the 246 new attendances annually per thousand population include about 25% who do not require the facilities of a major A and E department. If some of the demand for the treatment of minor ailments is syphoned off to minor injuries units the average rate of new attendance could be reduced to 150–200 per 100 000. The numbers of patients presenting with major illnesses or injuries would not change, being simply the aggregate of the numbers hitherto presenting to any A and E departments merged to form the new department. With increasing severity of the case-mix it is unlikely that the total/first attendances ratio could be reduced below 1.1 : 1, a ratio which has already been achieved in at least one RHA in the UK.

Specialties

If hospital facilities are concentrated on fewer sites a wider range of specialist facilities will be needed to match the increased numbers and range of urgent and serious cases to be dealt with. There is no consensus of opinion about the range of specialties which should be on-site. The London Implementation Group A and E Reference Group considered that a policy of 'treat and transfer' for the majority of common emergencies is unacceptable and that the following specialties should be available as a minimum and readily accessible to all major A and E departments:

general medicine; paediatrics; acute psychiatry; general surgery (including vascular surgery) with 24-hour major theatre availability; trauma and orthopaedics; obstetrics and gynaecology; anaesthetics; intensive care; radiology (including CT scanning facilities) and pathology.

The specialties to which A and E departments would require access, but not necessarily on site were considered to include:

ENT; ophthalmology; geriatrics; neurosurgery and neurology; cardio-thoracic surgery; facio-maxillary surgery; plastic surgery; genito-urinary medicine; and any other forms of specialist surgery.[173]

The minimum mix of specialties needed is a target which most providers would aspire to. Hospitals designated as regional trauma centres would offer more than this, especially neurosurgery and neurology and cardiovascular surgery.

Staffing

The increased volume and complexity of the caseload inherent in reducing the number of major A and E departments and diverting patients with minor injury or illness calls for experienced medical, nursing and related professional staff to be available 24 hours a day and, in the opinion of the British Association of Emergency Medicine, actually present in the A and E department 16 hours a day, seven days a week.[6] Clinically in order to provide 24-hour cover at senior clinical level it would be difficult to oppose the BAEM's recommendation that a department seeing 100 000 new patients each year should have four consultants, eight middle grade doctors and 20 senior house officers. This is especially convincing if proportionately more of the caseload were to consist of serious illness or injury. It is difficult to see how any provider A and E department employing fewer than two consultants in A and E medicine can offer adequate training facilities to junior medical staff.

Similarly nurses and other non-medical staff will be required, appropriately trained for the clientele and range of clinical problems presenting and capable of filling extended roles.

Processes of care

Where established protocols for the effective management of serious illness and injury exist they should be adopted in A and E departments. While the widespread establishment of regional trauma centres cannot be recommended as cost-effective options, suitably skilled trauma teams should always be accessible. The levels of skill available should include proficiency in advanced resuscitation techniques and advanced trauma life support.

Minor injury services

Closure of some major A and E departments has uncovered the need for alternative modes of delivery of care for minor injuries and illnesses and this is being provided in a range of different settings including A and E departments, community hospitals, GP surgeries, primary care centres, community clinics, polyclinics and dedicated minor injury units. The principles governing the provision of these facilities are that the complex and expensive resources of major A and E departments should not be diverted to treating minor conditions and that the public should have easy access to facilities for treating minor conditions which are beyond the normal scope of general practice.

Purchasers will need to consider a variety of decentralized provider facilities, designed according to local opportunities, initiatives and preferences. The service specification for such minor injury services should accord with the example set out in the NHS Executive report on the subject.[57]

Such is the level of ignorance of the incidence of minor injury and illness and the proportions of occurrences which are currently dealt with respectively by major A and E departments, other institutional providers, or GPs, that no population-based quantitative targets can be suggested for the provision of facilities.

9 Information

The dearth of information about the ways in which A and E departments have been managed has already been indicated. A and E departments need systems which allow them to describe for purchasers the demographic and diagnostic mix of the clientele; the severity and urgency of their conditions; the setting in which injuries occurred; the origin of the demand according to GP practice or no practice; the mix and timing of procedures to which patients are subjected; the extent to which patients reattend and what characterizes the reattenders; and the administrative and clinical outcomes of attendance where valid means of measuring these exist.

There is already a variety of software for information systems in use in provider units.[55] These differ in their coverage. The NHS Executive has established a series of contract minimum data sets, including one related to A and E departments. The Executive's Committee for Regulating Information Requirements reviews the data set from time to time. The mandatory data set which was operative at April 1993 in A and E departments with computerized information systems was specified in the Executive's Data Set Change Notice (DSC Notice 19/92). Details of the data set are shown in Appendix II. They include patient details and logistic details of attendance.

Codes and classifications have been constructed for the A and E attendance category (first attendance, follow-up attendance planned, etc.), the patient group (deliberate self-harm, sports injury, etc.) and the incident location type (home, work, etc.). A national clinical classification and coding structure for A and E departments has also been developed. This is designed to reflect investigation and treatment activity relating to diagnosis.

The data set is accessible to the provider unit itself and also to the purchasing authority. The aggregated data which are presently accessed at regional and national levels are the numbers of first attendances and total attendances only. The conditions will soon exist however when national policy on the organization and utilization of A and E services may be informed by surveying the minimum data sets held by provider units, along the lines involved in the US National Hospital Ambulatory Medical Care Survey.[70] The data set also facilitates local clinical and administrative audit, including the Patient's Charter requirement for prompt

assessment and will allow purchasers to compare performance across provider units. Universal adoption and exploitation of this minimum data set is urgently needed.

The inadequacy of the crude costing data produced on the functioning of major A and E departments and the failure to distinguish the costs of treating minor conditions in establishments which fulfil other clinical roles has already been mentioned. Developmental work is needed to increase the precision of cost information.

It is clear that comprehensive systems of information about morbidity relevant to the utilization of A and E departments are lacking. One area in which there is development is that of accident information. Data are available from a variety of sources on accident characteristics such as location, accident type (fall, poisoning, etc.), circumstances (adequacy of lighting, existence of smoke alarms, etc.), personal characteristics of the individual concerned, activity at the time (work, leisure, etc.) the consequences of the accident in terms of the nature and severity of the injury, the health service impact, and individual health outcomes. These sources include A and E department and ambulance records; hospital inpatient data, general practice records; Home Office fire statistics; the Department of Trade and Industry's Home and Leisure Accident Statistics (HASS and LASS); police records; the Department of Transport's Road Traffic Accident Statistics; the Health and Safety Executive's workplace injury reporting system (RIDDOR); the Office of Population Censuses and Surveys Mortality Statistics and coroners' records.

There are omissions and overlaps in the data coverage of accidents at present. To help overcome this the Department of Health's Public Health Information Strategy Group has drafted recommendations covering the standardization of data items and data linkage, based on a core minimum data set of accident characteristics and personal characteristics.[174] Read-coding of injuries is recommended for universal use and extensions to the present coding structure suggested to include codes for accident location, circumstances, activity, predisposing factors and individual health outcomes.

Benefits are likely to include enhanced means of monitoring injury severity and changes over time and the production of better quality information to assess prevention initiatives such as improvements in vehicle design and secondary prevention targets involving the organization of the health care services. There are cost consequences. Health commissions are encouraged to decide how the quality of information from local hospital A and E and inpatient service providers, associated health care agencies like the ambulance service and general practice records can be improved, with a view to requiring adoption of the standardized data set and linking arrangements when these have been piloted successfully.

10 Research needs

The NHS Executive priority areas of research and development include the evaluation of health technology and the primary–secondary care interface. Both embrace the needs for research into the organization and operation of A and E departments and related parts of the service.

This chapter has demonstrated to what little extent the methods of organizing, staffing and equipping and operating A and E departments have been evaluated clinically and economically. The added value of a regional trauma system has already been studied in one type of UK setting, but we do not know about the value of pre-hospital triage or high volume trauma units.

There is considerable scope for studying the costs and effects of having professions from different backgrounds perform similar functions in A and E departments. With so much effort being expended on the treatment of minor injuries and illness and attendance rates remaining high, the costs and effectiveness of different systems of provision in similar circumstances should be explored urgently. These include primary care emergency centres, free standing, alongside or within major A and E departments; and out of hours GP services administered by co-operatives or commercial deputizing services.

The impact of changes in the organization of pre-hospital care, such as the increased use of paramedical staff in the ambulance service and psychiatric crisis intervention services, should be measured. The consequences of closure and amalgamation of A and E departments for the organization of inpatient services, accessibility to the population served and health outcomes also need study.

Appendix I National hospital ambulatory medical care survey emergency department patient record

3. DATE OF VISIT
__/__/__
Month Day Year

4. DATE OF BIRTH
__/__/__
Month Day Year

5. SEX
1 ☐ Female
2 ☐ Male

6. RACE
1 ☐ White
2 ☐ Black
3 ☐ Asian/Pacific Islander
4 ☐ American Indian/ Eskimo/ Aleut

7. ETHNICITY
1 ☐ Hispanic
2 ☐ Not Hispanic

8. EXPECTED SOURCE(S) OF PAYMENT *(Check all that apply)*
1 ☐ Medicare
2 ☐ Medicaid
3 ☐ Other government
4 ☐ Private/ Commercial
5 ☐ HMO/Other prepaid
6 ☐ Patient paid
7 ☐ No charge
8 ☐ Other

9. MAJOR REASON FOR THIS VISIT *(Check one)*
1 ☐ Injury, first visit
2 ☐ Injury, follow-up
3 ☐ Illness, first visit
4 ☐ Illness, follow-up
5 ☐ Other reason

10. CAUSE OF INJURY
(Complete if injury is marked in 9. Describe cause and place of injury.)

11. PATIENT'S COMPLAINT(S), SYMPTOM(S), OR OTHER REASON(S) FOR THIS VISIT *(In patient's own words)*
a. Most important:
b. Other:
c. Other:

12. PHYSICIAN'S DIAGNOSES
a. Principal diagnosis/ problem associated with item 11a.
b. Other:
c. Other:

13. URGENCY OF THIS VISIT
(Check only one)
1 ☐ Urgent/Emergent
2 ☐ Non-urgent

14. IS PROBLEM ALCOHOL- OR DRUG-RELATED?
1 ☐ Neither
2 ☐ Alcohol-related
3 ☐ Drug-related
4 ☐ Both

15. DIAGNOSTIC/SCREENING SERVICES
(Check all ordered or provided.)
1 ☐ None
2 ☐ Blood pressure check
3 ☐ Urinalysis
4 ☐ HIV serology
5 ☐ Other blood test
6 ☐ EKG
7 ☐ Mental status exam
7 ☐ Chest x-ray
9 ☐ Extremity x-ray
10 ☐ CT scan/MRI
11 ☐ Other diagnostic imaging
12 ☐ Other *(Specify)*

16. PROCEDURES *(Check all provided on this visit)*
1 ☐ None
2 ☐ Endotracheal intubation
3 ☐ CPR
4 ☐ IV fluids
5 ☐ NG tube/ gastric lavage
6 ☐ Wound care
7 ☐ Eye/ENT care
8 ☐ Orthopedic care
9 ☐ Bladder catheter
10 ☐ Lumbar puncture
11 ☐ Other(s) *(Specify)*

17. MEDICATION
(Record all new or continued medication ordered, administered, or provided at this visit. Use the same brand name or generic name entered on any Rx or medical record. Include immunizations and desensitizing agents.)
☐ None
1.
2.
3.
4.
5.

18. DISPOSITION THIS VISIT
(Check all that apply)
1 ☐ Return to ED PRN
2 ☐ Return to ED - appointment
3 ☐ Return to referring physician
4 ☐ Refer to other physician/clinic
5 ☐ Admit to hospital
6 ☐ Transfer to other facility
7 ☐ DOA/died in ED
8 ☐ Left AMA
9 ☐ No follow-up planned
10 ☐ Other *(Specify)*

19. PROVIDERS SEEN THIS VISIT
(Check all that apply)
1 ☐ Resident/Intern
2 ☐ Staff physician
3 ☐ Other physician
4 ☐ Physician assistant
5 ☐ Nurse practitioner
6 ☐ Registered nurse
7 ☐ Licensed practical nurse
8 ☐ Nurse's aide

Appendix II Provider minimum data set for A and E departments with computerized systems

Item	Field	
	Size	Type
Contract details		
Contract identifier	16	A/N
Patient details		
Patient's name	35	A/N
NHS number[a]	17	A/N
Marital status	1	
Sex	1	
Birth date	8	
Patient's usual address	105	A/N
Postcode of usual address	7	A/N
Health authority code (of residence)	3	A/N
Code of GP (registered)	8	A/N
Attendance details		
Code of GP practice	6	A/N
Local patient identifier	10	A/N
A and E attendance category[b]	1	
Date of attendance	6	
Source of referral[b]	2	A/N
Mode of arrival	1	
Arrival time (24-hour clock)	4	
A and E: patient group[b]	2	A/N
A and E: incident location type[b]	2	A/N
Time of initial assessment (24-hour clock)	4	
A and E: time seen for treatment[b]	4	
A and E: staff member code[b]	3	A/N
Investigations code		
– first	6	A/N
– second	6	A/N
Diagnostic code		
– first	6	A/N
– second	6	A/N
Treatment code		
– first	6	A/N
– second	6	A/N
A and E attendance conclusion time (24-hour clock)	4	
A and E: departure time[a]	4	A/N
A and E: attendance disposal[a]	2	

[a]Collection not mandatory at present.
[b]New/amended data item.
Field types are numeric unless otherwise shown.
Reference should also be made to the Minimum Data Set Model for the data needed to identify A and E episode, A and E department and lodged patient.
Enquiries about this DCS Notice should be addressed to the CRIR Secretariat, IMG ME(C), Room 5E28, Quarry House, Quarry Hill, LEEDS LS2 7UE. Tel: 01532 546012, or to the nominated enquiry point where this is given in the enclosure.

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