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Emergency medicine

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Introduction

Emergency medicine specializes in acute illness and injury (Edwards, 1996; Tang et al., 2010). It has developed from the realization that these conditions can occur at any time and that dealing with many of these events within more traditional medical specialties led to suboptimal care. Recently the increasing relevance of time-critical interventions such as those associated with complex trauma care, stroke thrombolysis and sepsis therapies have further underlined the importance of a clinically broad but temporally focused specialty. The provision of emergency care is therefore a key function of most major hospitals.

Irrespective of most other health system features, patients with acute severe illness or injury present to or are taken to an emergency department (ED). In the United Kingdom these departments have been officially termed accident and emergency (A&E) departments since the Platt report of 1961 (Anon, 1961). However, accidents and associated injuries have diminished in frequency across western Europe, with a particularly large reduction in injuries associated with road traffic accidents, interpersonal violence and occupational activities (Eurostat, 2017). Consequently, the mix of patients presenting to the ED or A&E has changed significantly over the last 50 years. Case volumes have, however, continued to rise in excess of population growth, especially since 2000; the reasons for this vary but most countries have seen an increased demand for the treatment of acute exacerbations of chronic disease and conditions associated with frailty and ageing (see Chapter 4). Ageing and population growth do not fully explain this growth in demand.

It is increasingly recognized that the presentation of illness is not related solely to aetiology or pathology and it is apparent that we are witnessing a changing utilization of emergency medical systems by patients of all age cohorts.

This chapter looks at the branch of medicine responsible for the initial treatment of many of these emergencies and the emergency departments within the acute general hospitals in which they are usually based.

The development of contemporary emergency medicine

Emergency medicine is a relatively new specialty. First formally recognized in the United Kingdom and the USA in the mid-1960s, it has undergone major changes in many countries since then (Totten & Bellou, 2013). Often starting as a service that provided triage and emergency treatment for victims of injury, modern emergency medicine covers the early management and investigation of a broad range of conditions in addition to trauma, from infectious diseases to psychiatric illness (Box 7.1). Most recently the specialty has evolved in response to pressures to specialize and standardize with demonstrable improvement in outcomes. For conditions such as sepsis, major trauma and stroke it has become increasingly clear that early expert intervention makes a significant difference (Cameron, 2014).

Box 7.1 Defining emergency medicine

Emergency medicine has been defined as “a field of practice based on the knowledge and skills required for the prevention, diagnosis and management of acute and urgent aspects of illness and injury affecting patients of all age groups with a full spectrum of episodic undifferentiated physical and behavioural disorders; it further encompasses an understanding of the development of pre-hospital and in-hospital emergency medical systems and the skills necessary for this development” (International Federation for Emergency Medicine, 2018).

“It is a specialty in which time is critical. The practice of Emergency Medicine encompasses the pre-hospital and in-hospital triage, resuscitation, initial assessment and management of undifferentiated urgent and emergency cases until discharge or transfer to the care of another physician or health care professional.” (European Society for Emergency Medicine, 2007)

In some countries it became common for patients admitted as acute emergencies to be dealt with in a single specialist emergency department rather than in different wards, clinics and departments within the hospital. This provided a rationale for the development of a separate specialty. There were also historic factors, including the development of major trauma care first developed in North America, in part in response to experience gained in the Vietnam War, spreading first to the British Isles in the 1980s and adopted more widely in Europe after 1994.

The provision of emergency medical care varies widely between and, at times, within countries. Internationally, two principal models have evolved, the continental European model (sometimes referred to as the “Franco-German” model) and the Anglo-Australasian-American model (Cone et al., 2015). In continental Europe emergency care tends to focus on the critical care end of the spectrum and the management and investigation of emergencies requiring hospital care is undertaken by inpatient specialties. In this model the most seriously injured and ill are typically attended to by anaesthetist-led teams at the scene and often receive extensive treatment before transfer to the operating theatre, intensive treatment unit, or medical or surgical ward. In the Anglo-Australasian-American model treatment at the scene is usually more limited and predominantly paramedic led; the emphasis is on rapid transport to an appropriate hospital where emergency department clinicians are responsible for the investigation and management of the patients and the consequent decision to discharge or admit them.

Proponents of the European model assert that better outcomes are achieved when organ-specific specialists lead the investigation and treatment of patients. The Anglo-Australasian-American model contends that most patients do not arrive with an organ or even a specialty-based diagnosis but have multiple and often interacting conditions. However, the models have in general arisen not as a reflection of deliberate policy choices based on these views but because of circumstance, resource availability and history.

There are no high quality comparative studies of different systems. Moreover, most countries operate some components of each model. Thus, trauma care has evolved to reinforce pre-hospital interventions and direct transfer to major trauma units and centres, whereas patients who meet criteria to consider sepsis are often insufficiently “labelled” to allow triage to particular hospitals or even inpatient teams.

The emergency medicine care pathway

Ideally the emergency care system should commence at the first point of contact between the patient and a clinician or emergency call system. Current systems, though far from mature, aim to coordinate services to provide the most appropriate response to the medical needs of the patient. Where this is achieved, such a system should reduce the inappropriate use of hospitals, ensure that patients who require urgent care receive it promptly, and make best use of limited resources.

Entering the emergency department

In most countries significant numbers of patients self-present to the emergency department. The remainder attend following advice or referral from a general practitioner (GP) or other clinician, by way of a telephone triage service, or following an attendance and subsequent conveyance by an ambulance. In Denmark and Norway patients are required to have sought advice from the GP or ambulance service prior to coming to the emergency department. In the Netherlands this approach is strongly encouraged by the use of insurance deductibles and by providing very accessible general practice services.

Most countries now have a telephone service dedicated to providing urgent health care advice and signposting. The United Kingdom uses lay advisers assisted by computer algorithms; these do not attempt to provide a diagnosis but instead lead to a recommended course of action (disposition). The limitations of this approach and the consequent over-triage to both GP and emergency department care has led to a recent commitment to increase the proportion of calls handled by a clinician, as happens routinely in the systems operated in Sweden and Denmark. All these systems aim to ensure that patients are directed to the right point of care without unreasonable delay or duplication of effort, although the extent to which they achieve this can be unclear (see below).

The Franco-German model has traditionally put doctors in ambulances or cars as a key part of the immediate response. There are some signs of convergence between the United Kingdom model and Franco-German models of pre-hospital care, with initiatives to “front-load” more highly trained clinicians (doctors, paramedics and advanced nurse practitioners), either as staff on an ambulance or dispatched by car from

a hospital. The evidence from the United Kingdom for better patient outcomes from pre-hospital deployment of doctors is very limited. The use of medically staffed helicopters for this role has grown significantly but there are major concerns about their cost-effectiveness (Bledsoe et al., 2006; Butler, Anwar & Willett, 2010; Delgado et al., 2013).

The ambition of all systems is to bring triage and immediate treatment to the earliest safe and effective point in the pathway. In consequence it is expected that the development of ambulances staffed with personnel and equipment that allow greater assessment and evaluation skills will enable these same services to either treat and discharge more patients at the scene or convey them to non-hospital providers of health care.

Paramedics can also transport patients to specialist units directly, bypassing non-specialist hospitals and in some cases the emergency department. Hyperacute stroke centres (Ramsay et al., 2015), trauma units and specialist ST elevation myocardial infarction units have evolved across Europe over the last 10 years. Accessing these facilities without intermediate delays has seen an improvement in outcomes that has more than offset the consequential increased journey time, although in many countries only limited progress has been made in achieving change in structures and processes (Albrecht et al., 2017).

These “condition-specific” diversion protocols require either autonomous paramedic practice or make use of telephone/online support from a specialist clinician based at the hospital. In the United Kingdom enhanced paramedic training and autonomy has enabled up to 40% of emergency ambulance calls to be managed without transport to an emergency department (National Audit Office, 2017).

In a number of countries (including the Netherlands, Spain, England, and Norway) primary care centres staffed by GPs or nurses can offer a range of treatment for minor injuries and minor ailments.

Minor injury units were associated with many community hospitals in the United Kingdom even before the creation of the National Health Service (NHS). These units have been variously staffed by GPs and nurse practitioners. The effectiveness and utility of such units, especially in more rural settings, has become increasingly recognized.

In urban areas of the United Kingdom the recognition that at least 20% of patients attending an emergency department can be better dealt with by primary care staff has incentivized the development of

co-located primary/urgent care services. Such facilities can decongest the emergency department. These are also an increasing feature of the Dutch system.

The hospital emergency department

The emergency department provides care in the first phase of almost all acute medical episodes that are of a severity sufficient to require hospital resources. Traditionally this was not the case. For most of the 20th century, the majority of acute admissions were seen and assessed by a GP/family doctor who arranged both transfer to hospital and direct admission to an appropriate ward under an inpatient specialty team. In 2017 fewer than 25% of admissions were managed in this way in the United Kingdom; 75% of acute admissions now enter the hospital via the emergency department.

By necessity, emergency departments usually offer care to all types of acute illness and injury, physical and mental health problems, and to all ages. However, the way services are organized varies considerably within and between health systems. For example, obstetric emergencies are usually seen in maternity units, while isolated mental health problems may be seen in a geographically separate mental health facility. Paediatric attendances represent one in four emergency department visits (Tang et al., 2010) and although few in number in the United Kingdom, specialist paediatric emergency departments are common in other parts of Europe, especially in France.

Triage is widely used in emergency departments to prioritize cases so that those with time-critical conditions and greatest symptom severity are treated first. Although formal systems have been evaluated and shown to be reliable they do have significant over and under triage consequences with both resource and risk implications (Parenti et al., 2014).

Ideally triage would not be required because patients could be treated immediately. “See and treat” approaches (Parker, 2004) aim to use triage resources to treat patients rather than risk managing the queue. Such approaches may be difficult to maintain during periods of peak demand.

Senior physician involvement in the initial assessment of all attenders has benefits for ED performance (Abdulwahid et al., 2016) and quality of care (Oredsson et al., 2011). This, however, creates a paradox in resource-constrained services with the least ill or injured being assessed by the most senior clinician.

There is only limited published evidence that streaming of patients into different tracks, performing laboratory analysis in the emergency department, or shifting responsibility for ordering certain radiological investigations to nurses results in shorter waiting time and length of stay (Oredsson et al., 2011), although this is likely to reflect the absence of rigorous research rather than the lack of any effect, as their advantages are intuitive.

The performance of some of these models may also depend on local circumstances – for example, streaming of primary care type patients may be of limited value where most patients see a GP prior to attending, but may be very useful in circumstances where access to local primary care is poor. Data from the United Kingdom indicate that there is considerable variation in the proportion of patients whose needs can be better addressed by primary care clinicians (15% to 40%) (Moulton, Mann & Tempest, 2014). This is an area in which further research and evaluation is required.

Resuscitation is a core component of all emergency medicine systems. In most cases resuscitation of the most seriously ill and injured will be led by an emergency medicine team. They will usually be supported by other specialties – in particular, anaesthesia, intensive care, surgery, and orthopaedics. In some European systems the intensive care team is responsible for resuscitation. Nevertheless, irrespective of the lead clinicians the process of care of seriously ill and injured patients is becoming more standardized with evidence-based guidelines for the management of cardiac arrest, major trauma, paediatric resuscitation and other severe illness such as septic shock.

Improvements in road safety measures, falling levels of interpersonal violence, improving workplace safety, and reductions in suicide (European Association for Injury Prevention and Safety Promotion (EuroSafe), 2013) mean that while major trauma is an important component of emergency medicine, its share of the work of the emergency department is decreasing. In the United Kingdom major trauma accounts for less than 1% of emergency department attendances. It was therefore apparent by the 1990s that it was neither appropriate nor feasible for every emergency department/acute hospital to maintain and deliver high quality trauma care. In consequence trauma services were reorganized into a tiered response with a network of trauma units acting as spokes to the major trauma centre hubs with a demonstrable improvement in outcomes (Celso et al., 2006). In 2013 results from the Trauma Audit

and Research Network (TARN) national audit show that one in five patients who would have died before the networks are now surviving severe injuries (McCullough et al., 2014).

The formal designation of trauma centres in Europe has been a slower process than in the USA, which may reflect a lower incidence of severe trauma – in particular the much lower incidence of penetrating trauma associated with gun and knife crime. There are also significant historical, logistical and political difficulties in ensuring that the wide range of specialist services required for an integrated trauma centre are located on the same site. An issue in eastern Europe and the countries of the former Soviet Union is the siting of specialist institutes on different sites that would need to be relocated to create an integrated trauma service.

A significant proportion of patients attending an emergency department will require hospital admission. In the United Kingdom this varies from 15% to 35% depending on case-mix. The proportion is higher in the Netherlands and higher again in Norway. Of those not requiring admission a proportion will require a short period of observation, further investigation or time to establish the efficacy of initial treatment. Historically such patients were admitted to a co-located observation ward. Such units continue to provide appropriate care for many patients attending emergency departments, including those recovering from procedures requiring sedation or anaesthesia, or awaiting specialist interpretation of radiological investigations, such as computerized tomographic pulmonary angiograms. Other patient groups that benefit from such a facility include elderly patients who have fallen and are being assessed by therapists and frailty teams (see Chapter 4).

In many countries people with mental health problems requiring an emergency response are taken directly to mental health units. Patients who have self-harmed and need medical treatment for poisoning or injuries may need to attend the emergency department for assessment and treatment of their physical injury or toxicological emergency. For this reason many health systems have established specialized mental health teams based in the emergency departments.

In the United Kingdom recent systems of “street triage” for mental illness have shown a reduction in ED attendances and the number of compulsory detentions (Dyer, Steer & Biddle, 2015). This system combines police, ambulance and a mental health clinician in a single response vehicle. These initiatives have been shown to lead to improvements in

the quality of care of mental health patients, reduced delays and have delivered significant resource savings (Tadros et al., 2018).

Emergency departments have an increasing role in secondary prevention. This may be at an individual patient level, e.g. detection and intervention for high risk alcohol intake, or at system level, e.g. injury surveillance to detect trauma hotspots or emerging causes of trauma.

Admission and post-acute care

In some countries, such as the United Kingdom and the Netherlands, many patients who require further investigation and care are moved to acute medical or surgical assessment units. These units may be run either by internal general medicine specialists or by the emerging specialty of acute medicine. These units have a very active approach to treatment with the aim of further front-loading senior review to optimize care and reduce length of stay.

Patient flow is a major issue for many emergency departments. In particular, inability to move patients who require admission into the right hospital bed or promptly arrange a safe discharge home can substantially delay care and impede efficiency. When patients require admission it is highly desirable that they are admitted to a bed managed by the specialty appropriate to their condition. It is clear that admission to a bed that is available but inappropriate is associated with higher mortality (George & Wilkinson, 2016) and increased lengths of stay.

There are also problems in the emergency department if admission is delayed because of lack of bed capacity; staff become stretched as they have to assess and care for new patients as well as those awaiting admission. There is evidence from Canada, Australia and the United Kingdom that high levels of emergency department crowding are associated with treatment delays (Gaieski et al., 2017) and increased mortality (Sun et al., 2013; Filippatos & Karasi, 2015).

Recognition of the iatrogenic harm caused by delays has encouraged greater scrutiny of patient flows and attendant obstacles to prevent or minimize such risks. While there are many internal hospital processes that can facilitate patient flow, effective discharge is particularly important. Shortages of nursing homes, intermediate care, home care and other support have a significant impact on the effectiveness of the emergency care system.

Discharged patients may be referred for follow-up by other specialties, such as follow-up of patients with fractures by the orthopaedic service. Others will be referred back to their GP and many will be discharged with no requirement for further follow-up. It is increasingly recognized that the ability to discharge a patient with a referral to a specialist clinic within 48 hours is both expedient and usually preferable to admission for many patients.

Workforce

The model and levels of staffing of emergency departments vary considerably depending on a combination of history, primary care provision, and the availability of emergency medicine specialists to provide dedicated staffing.

The Franco-German model has generally used junior medical staff, GPs and nurses with early senior specialist review of most cases before further investigation and treatment. By contrast the Anglo-American-Australian model has supported the development of emergency medicine specialists, with referral of about 25% of patients to specialty teams after assessment, stabilization, investigation and treatment has commenced.

The rising workload has outstripped the ability of the United Kingdom, Ireland and New Zealand to provide sufficient fully trained emergency medicine doctors to manage the service safely and within various process targets. Consequently, various strategies to make better use of other staff groups have been introduced. Such staff include advanced nurse/clinical practitioners, physician associates, paramedics and frailty practitioners. However, the changing nature of the case-mix related to an ageing demographic and the attendant problem of multimorbidity has created real problems for the Franco-German model. Patients presenting with single illness issues represent a minority of patients requiring admission; for this reason reliance upon traditional specialist inpatient teams is increasingly malaligned to patient need.

The role of the senior emergency medicine doctor varies among countries. The main determinant seems to be the number of senior doctors within a department at any one time. Many studies have shown the advantages of early senior intervention in a wide range of conditions improving outcomes and increasing admission avoidance (Purdy, 2010). Senior staff leading and supervising cases in the resuscitation room is

almost universal but there are varying approaches to the deployment of senior staff within the remainder of the emergency department. The most common models of this role are:

- Delivery – where the senior staff see and treat patients throughout their care.
- Instigation – where the senior clinician undertakes a rapid assessment and defines a plan which is then implemented by junior staff.
- Attending – where junior staff see the patients initially and then check with senior staff before referral or discharge.
- Consulting – where junior staff see the patient and ask for help when they perceive the need.

Emergency nurse practitioners are now well established in the United Kingdom but their acceptance in other countries is limited. They can provide a safe and effective minor injury service, although in some departments they may be more expensive than a junior doctor model as they are relatively well paid and may take longer to complete their work (Sakr et al., 2003; Wilson et al., 2009). The barriers to implementation are related to emergency department culture, physician reimbursement systems and case-mix. In the United Kingdom advanced clinical practitioner programmes have been established to develop nurses, paramedics and pharmacists to become autonomous practitioners seeing a wide range of cases in the emergency department (Swann et al., 2013). Other somewhat niche roles have also been developed, such as emergency department practitioners (with a background as anaesthetic assistants/operating department practitioners) who can undertake investigations and invasive procedures in the resuscitation room.

The use of geriatricians in the emergency department has been shown to be effective at reducing admissions and is not associated with a high readmission rate (Jones & Wallis, 2013). This may be better in a dedicated unit rather than in the main emergency department (Sophia & Bashir, 2014) and if supported by a wider MDT to facilitate assessment and discharge.

Every emergency department also needs support from imaging and pathology services, although there is an increasing use of near-patient testing (see Chapter 10). Turnaround times can be reduced but quality control may be more difficult and near-patient testing is often relatively expensive (Asha et al., 2014; Larsson, Greig-Pylypczuk & Huisman, 2015). Certain other specialties are often considered mandatory to

support any emergency department that receives undifferentiated emergency cases; these include anaesthetics, intensive care, general medicine, general surgery, orthopaedic trauma, and paediatrics.

It is increasingly recognized that emergency medicine can be highly stressful (Berger, 2013) with consequent challenges for both recruitment and retention. High demand and low job control were found to be common in a systematic review but other factors included insufficient support at work, an imbalance between effort and reward, and organizational injustice (Basu, Qayyum & Mason, 2016).

Barriers to delivering optimal care

The key barriers to delivering optimal care are: rising levels of demand; inefficient use of resources; and downstream delays in the system which lead to queues and consequential overcrowding. These are compounded by problems arising from the physical design of some emergency departments and the workforce challenges discussed above.

Managing demand

It has been clearly demonstrated that difficulty in accessing primary care is related to higher emergency department attendances. Conversely, systems that have easy timely access to primary care have less emergency department usage. Similarly many emergency department attendances are preceded by unsuccessful attempts to obtain a primary care appointment. In some studies interventions to improve primary care access have resulted in reduced emergency department attendances (Whittaker et al., 2016), although extending the hours primary care is available has a limited effect and may not be cost-effective. For those systems where the emergency department receives substantial numbers of primary presentations the provision of co-located primary care facilities has been effective in decongesting the emergency department itself. In England alternative sites, such as urgent treatment centres, have been developed so people can be assessed and treated in a lower acuity setting than an emergency department.

Telephone advice lines that aim to direct the user to the most appropriate location in an appropriate timescale do not seem to reduce the workload to emergency departments and there is some evidence they increase overall demand (Turner et al., 2013; Collins, 2015). This

may be improved by involving doctors and other clinicians in the call decision-making (Anderson & Roland, 2015).

Good chronic disease management may be able to reduce the number of acute episodes if better control of the patient's condition can result in fewer episodes of acute need, even if the general trajectory is one of deterioration, although this is rarely easy. Equally important is the early detection of, and intervention for, deterioration. A key part of this is patient education and a good understanding of their disease, together with an agreed plan ranging from self-care (e.g. home-held antibiotics for COPD), to seeking urgent advice before deteriorating further. Support for nursing and residential homes can also avoid attendances at the emergency department, by ensuring optimal ongoing care, good end of life planning, and the use of telehealth advice before calling an ambulance (Nick et al., 2015).

There is no evidence to support the idea that public information campaigns can reduce attendance at emergency departments. For most people it is a rare event for a different condition each time, and the appropriateness of attendance depends not only on medical considerations but also factors such as availability of alternatives and social support. Some disease-specific education campaigns have increased the early recognition of acute episodes but invariably have a high cost of false positives with consequent increase in emergency department attendances. Diverting people away is unlikely to be effective as most people believe the emergency department is the correct location for their care (Atenstaedt et al., 2015) and there are some significant risks.

Although often advocated as a means to reduce demand, there is no evidence that co-payment schemes reduce inappropriate attendances (Reed et al., 2005; Selby, Fireman & Swain, 1996; Siddiqui, Roberts & Pollack, 2015) and they bring many other problems, often costing more to operate than they raise, while deterring necessary care. In Ireland attendances at emergency departments have increased significantly despite a co-payment system designed to encourage primary care use.

Finally social changes are also impacting on emergency departments. In the United Kingdom the "liberalization" of the alcohol licensing laws in 2005 has produced a wholly predictable increase in alcohol-related presentations. The public, media and politicians increasingly expect care seven days a week and 24 hours per day; this in turn has produced a disproportionate increase in demand during "anti-social" hours with major consequences for staffing.

Queues and overcrowding

Demand for emergency care is subject to high levels of variability – both seasonal and at different times of day and days of the week. Although there is some predictability to this, average hourly attendances are subject to wide variation (greater than 50%) (Blunt, 2014). Consequently, systems need to be able to deal with surges in demand and hence there needs to be some redundancy built into staffing and the physical environment. The situation is made worse by the fact that activity in planned care is often even more variable. These variations in demand, both predictable and random, combined with capacity constraints associated with historically high bed occupancy rates, ensure that emergency departments are prone to significant overcrowding during peak periods. This phenomenon is endemic to health systems in many countries, including Ireland, the Netherlands, South Africa, the United Kingdom and the USA – indeed, it is the one almost invariable feature of all current health care systems! Avoiding overcrowding requires better alignment of resources to demands. Within the emergency department this means speedy responses for requests for specialist consultation, access to diagnostics, enhanced bed availability, and prompt discharge when hospital care has been completed.

Within the wider hospital, delays in decision-making, investigation, discharge planning and discharge will mean that beds are not available to admit patients. This can lead to extensive overcrowding. Emergency departments are seldom staffed or designed to deal with a large group of patients awaiting admission. As a result standards of care deteriorate, key interventions are delayed or omitted, and both morbidity and mortality rise (Forster et al., 2003; Guttmann et al., 2011; Boden et al., 2016).

Effective design

The design of emergency departments needs to support effective and efficient function and many national guidelines exist (Department of Health and Social Care, 2013). Good design can also improve user experience and reduce aggression (Design Council, 2011). But because buildings persist longer than any models of care, it is important to include flexibility in design to allow for increases in attendances but

also to support new and future models of care. This design also needs to address the specific requirements of a range of groups including children, the elderly, those with cognitive impairment, those with mental health problems, and those with infectious diseases.

The future

Prevention measures have had sustained and large effects. Road safety initiatives – including safety belts, crash helmets, speed control, car design, and alcohol limits – have all contributed to the reduction in deaths and injury from vehicle incidents, especially in developed countries. Other health and safety interventions, especially in building design and the workplace, have also reduced the trauma demand in many emergency departments. Trauma is therefore a decreasing component of the workload in many emergency departments and its nature is also changing with the growth of an older population increasing the importance of injuries from falls (Kehoe et al., 2015; Sivarajasingam et al., 2016).

The increase in population size, the current and projected disproportionate increases in the numbers of patients in the ninth decade of life and the consequent importance of managing frailty, co-morbidities, and cognitive impairment are pressing challenges.

Specialization of health care and the growth of new technologies over the past 40 years have delivered extraordinary improvements in patient care and outcomes but this trend now means that seldom can a single inpatient specialist or team deal with the majority of medical or surgical emergencies. Consequently there is a need for more precise diagnosis by the emergency medicine clinician before referral. This has substantial resource implications both for the emergency medicine workforce and the support services of pathology and diagnostic imaging. The development of time-critical interventions similarly requires sufficient resources to deliver such treatments on a 24/7 basis. New staff roles can be developed to help support this – not just as extensions of the roles of nurses and other professionals. Where emergency medicine grows, it will be important to ensure that other specialisms withdraw from offering more general support for emergency care.

Crucially, the need to maintain minimum caseloads to sustain expertise means that often subspecialty services will be reorganized to fewer

centres. In the future it is likely that common non-complex conditions will be treated in most hospitals but for less common/more complex conditions and treatments patients will need to be transferred to larger centres. Inevitably such patients will continue to present to any emergency department. Properly configured and resourced networks (akin to those established for trauma) will need to be established and supported to ensure optimal care and appropriate transfer for all patients.

Approximately 15% of all emergency hospital admissions in England involve the 1% of people in their final year of life. There is more to do to ensure that patients who are at the end of life do not spend their last hours in an emergency department through appropriate advanced planning and ensuring that ambulance and other services have information available about these plans immediately available.

Finally Denmark, the Netherlands and the United Kingdom have all seen significant reductions in the number of emergency departments, with more expected in other countries. In addition, some departments may shut to ambulance attendances overnight. The drivers for these changes include the general trend to hospital regionalization, optimal utilization of the scarce emergency medicine workforce, and the need to ensure on-site provision of many other services to support the delivery of 21st-century care that can deliver optimal outcomes.

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