



Standards for Emergency Department Design and Specification for Ireland 2007

SEPTEMBER 2007

Introduction:

The evolution of Irish Emergency Departments (EDs) has been influenced by a myriad of factors; national, local, historical and political. It is now accepted that many departments cannot be considered to be “fit for purpose” ⁽¹⁾. Many General Hospital EDs were designed prior to the appointment of a Consultant in Emergency Medicine and as such did not benefit from any specialist expertise when they were designed. At times, the delay between the design and building phases meant that EDs were already out-of-date by the time they were opened. In recent years there has been some improvement in ED design prompted by input from recently appointed Consultants in Emergency Medicine and previous standards produced by the Irish Association for Emergency Medicine in 1999 and 2001⁽²⁾. Unfortunately, many recently opened departments are still substandard both in design and size and fail to fulfil the requirements of 21st century Emergency Medicine.

There is now a very urgent need to significantly enhance Irish Emergency Department design so that it accords with the best international standards. The purpose of this document is to support Emergency Department staff, the Health Services Executive (HSE) and the Department of Health and Children (DoHC) in developing new Irish EDs or refurbishing existing ones. Our shared aim should be to ensure that all Irish EDs are not only “fit for purpose”, but can be seen as flagships for excellence in Irish Emergency Care and enable the provision of services of which the Health Service and the public can be truly proud.

We have drawn upon International ED Design and Specification Guidelines from the UK, the USA and Australasia to develop guidelines appropriate to modern Irish Emergency Medicine. Many Irish Consultants in Emergency Medicine, who have become experienced in ED development and refurbishment in Ireland and in other countries, have contributed to this document.

Patient care in the ED is uniquely time-dependent. The length of time spent by patients waiting for, or receiving care, the number of patients attending and the scope of services offered will influence the design requirements for each department. Design recommendations from other countries tend to reflect more

efficient processes of Emergency Care delivery available there, such as in the UK where a four hour target time for transit through an ED means that fewer patients will be in the ED at any one time and less space is required to accommodate them. This does not reflect the current experience in Irish EDs where overcrowding is all too prevalent. The causes of this and the necessity of a whole hospital and whole healthcare system approach to this problem have been elucidated in detail in the recently published *ED Task Force Report* ⁽¹⁾. Notwithstanding this, we recommend that Irish teams planning ED development projects review the UK National Health Service (NHS) ^(3, 4, 17), Australasian College of Emergency Medicine (ACEM) ⁽⁵⁾ and American College of Emergency Physicians (ACEP) ⁽⁶⁾ guidelines for further detail on design recommendations. Specific issues relating to engineering, electrical services, building regulations and lighting considerations are not included in this document. The IAEM standards for ED Health and Safety, *Health and Safety Standards for Irish Emergency Departments – providing and optimum environment for both patients and staff*, have recently been published and must be adhered to ⁽⁷⁾. National standards in relation to building and safety regulations must also apply in all cases.

We anticipate that these guidelines for ED design, allied with improvements in ED staffing, safety and service delivery will support the provision of the highest possible standards of care for patients who attend Irish EDs.

Executive Summary:

- Patient care is the key focus of ED Design.
- ED design should engender a sense of caring, efficiency and safety. The patient's right to confidentiality and privacy must be protected.
- Good design will promote efficient workflows and ensure an optimal environment for patients and staff alike.
- The current practice of obliging a patient, who requires emergency admission to wait in the ED for a hospital bed for a prolonged period of time, after the decision to admit has been made, is undoubtedly the most significant controllable impediment to the efficient working of an ED.
- The length of time spent by patients waiting for, or receiving care, the number of patients attending and the scope of services offered will influence the design requirements for each ED.
- There must be adequate space provided for direct patient care, clinical support areas and non-clinical ED activity.
- Where adults and children are seen in the same ED, specific design requirements must be adhered to in relation to children, their parents and siblings. There should be clear separation of facilities between both groups.
- Minimum sizes for clinical areas are described.
- Involvement of the multi-disciplinary ED team in the design process is crucial.
- Emergency Medicine is constantly evolving and all EDs will need to be updated or replaced in time to support the provision of the highest standards of contemporary emergency care.

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Principles:

EDs are designated clinical areas in which patients receive immediate and urgent care, ideally provided by specialists in Emergency Medicine, with support from other specialties as required. This involves the diagnosis and management of a broad spectrum of undifferentiated acute illness and injury, including both physical and behavioural disorders.

ED design is influenced by the needs of patients, ED staff requirements and the characteristics of Emergency Medicine

The Needs of Patients:

The ED should be a welcoming environment in which patients can access the highest contemporary standards of Emergency Care. The department design should promote a sense of caring, efficiency, safety and wellbeing. A patient's rights to confidentiality and privacy must be protected. The needs of the patient's relatives, friends and visitors must also be considered. Patients and visitors with special needs must be accommodated. Cultural factors may also influence patients' needs and should be considered in the design. The process of patient care, sometimes termed the patient's journey, should be facilitated by good design and the availability of appropriate equipment and services.

Most Irish EDs see both children and adults, with services in Dublin structured to provide Paediatric-only or Adult-only care. Typically, 25-30% of patients attending mixed EDs are children. Where children are seen it is essential that appropriate facilities are provided. This document makes recommendations, where appropriate, relating to the care of children (and accompanying parents and siblings) in EDs that see both adults and children. Separate guidelines for the design of exclusive Paediatric EDs, such as will be required in the proposed National Children's Hospital, are currently being developed by the IAEM.

Emergency Department Staff requirements:

Emergency medicine requires relatively high levels of staffing, provided by a multi-disciplinary team, working on a 24/7 basis. Staff should have a pleasant, safe, ergonomically efficient work environment with adequate support areas. The ED must provide a suitable environment for ED staff and also for those who work episodically in the department. This includes clinical staff from other hospital specialties (e.g. admitting teams) and workers from other agencies (e.g. Ambulance Staff or Gardai) who may attend with patients.

Characteristics of Emergency Medicine:

Emergency Medicine is a near-unique specialty based upon the requirement for time-critical care delivered on a 24 hour, 7 day basis. The unique characteristics of this practice which influence departmental design are outlined in *Table 1*.

Characteristics of Emergency Medicine:

- High levels of activity
- High patient turnover
- Varied casemix
- Large multi-disciplinary workforce
- Need for efficiency of process
- Infection control requirements
- Access issues
- Interface with pre-hospital services
- Multiple interactions with in-hospital specialties / patient transfers
- Communications issues
- Potential for growth
- Teaching activities
- Major Incident capacity
- Responsiveness to local service demands / social issues
- Administrative functions – EM specific
- Possibility of aggression/assault – security issues

Table 1: Characteristics of Emergency Medicine which influence ED design

Temperature and Lighting:

Where possible natural (ambient) light should be used and colour schemes chosen should be appropriate given the stressful environment of many, if not all, EDs. Both patients and staff require an environment in which the ambient temperature is controlled within an appropriate range. Air conditioning should be provided to maintain this.

Site of the Emergency Department:

EDs need to be placed in an area of the hospital that is easily accessible to Emergency vehicles entering the site. The situation must allow ease of access and egress from the department. ED clinical areas should be on the ground floor.

On-campus and Off-campus signage:

The hospital campus of any hospital having an Emergency Department should be well-signposted from major roads entering the locality. This is a matter for the relevant local authority and/or the National Roads Authority. At all entrances to the hospital campus there needs to be clear signposting of the route to the ED, distinguishing between ambulance/vehicular access and pedestrian access as appropriate. Furthermore, signposting of the route to the ED from within main hospital corridors/ internal thoroughfares is also required. All on-campus signage should follow the convention of “Emergency Department” being in white lettering on a red background to distinguish it from signs to other locations.

Interface with other clinical areas:

The ED must have ready access to those critical care areas and diagnostic facilities necessary for modern Emergency Medicine to be practiced. Clinical areas which should be adjacent to the ED include:

- ED Inpatient Facilities
- Intensive Care / High Dependency Units
- Coronary Care Units
- Diagnostic Imaging Department
- Emergency Operating Theatres
- Interventional Cardiology, if on-site
- Inpatient Wards (including Observation Ward)

Acute Medical Units (AMUs) / Primary Care Centres:

Where such facilities are on the same campus, it makes sense that the ED and these facilities be located adjacent to one another with common entry, registration point and triage areas. This will allow patients whose needs are best met in an area other than the ED to be redirected, depending on their clinical condition and local operational policies. Conjoint triage ensures that patients who require resuscitation, for example those referred from Primary Care who may deteriorate between the time of referral and their arrival in hospital, have the quickest route to the care they need, rather than being subsequently redirected from another access point or clinical area. In addition, overall triage function will be more effective and efficient if highly trained triage staff can be focussed in a single triage unit.

Functional Requirements:

This includes Infrastructure, Equipment, IT support, Security and Administration.

Infrastructure Overview:

Infrastructural requirements can be considered in terms of clinical areas (including direct clinical care and clinical support areas) and non-clinical areas, as outlined in *Tables 2 to 4*. These tables list the components of each infrastructural area. Good infrastructural design is critical to effective patient care. Lack of appropriately placed storage facilities, for example, can result in difficulty accessing vital equipment and avoidable delays in patient care or inappropriate storage can interfere with hygiene in clinical areas.

Patient access:

Ambulance facilities
Ambulance entrance
Ambulance equipment storage area
Decontamination area
Walking entrance
Reception area

Patient care areas:

Triage area
Ambulance patient triage area
Waiting room
Paediatric waiting area
Sub-wait areas
Resuscitation area
Isolation rooms (negative pressure rooms)
Treatment area / Majors area / Urgent area
Special function treatment rooms
Ambulatory care area / Minors area
Nurse Practitioner area
Paediatric treatment areas (incl. Adolescent Crisis Suite)
Interview rooms for social care
Therapies area
Quiet rooms / Disturbed patient rooms
Patient toilets (waiting room / treatment areas)
Baby changing and breast feeding facilities

Inpatient facilities:

Observation Ward / Clinical Decision Unit
Chest Pain Assessment Unit
Relatives interview room for in-patients
Staff duty base
Inpatient showers and toilets

Table 2: **Clinical Areas**

Clinical support areas:

Reception area

Drug Preparation areas

Drug Storage areas

Equipment storage

Portable x-ray equipment storage

Staff duty base

Communications base

Near-patient testing area

Supplies storage area

Medical gas storage area

Cleaner's room

Clean and Dirty utility areas

Major Incident Storage area

Security area

Laboratory specimen transport system

Spare trolley storage area

Table 3: Clinical Support Areas

Non-clinical areas:

Staff facilities:

- Staff changing rooms*
- Staff shower and toilets*
- Staff dining area*

Office accommodation:

- Administrative support*
- Multi-person offices*
- Individual offices*

Education and training facilities:

- Seminar room*
- Library/ computer access*
- Storage area*

Support services:

- Switch cupboard*
- Area for fire alarm control board*
- Electrical systems*
- IT equipment*
- CCTV system equipment*

Table 4: Non-clinical areas

Total Size of the Emergency Department:

The overall size of the ED will depend on the volume and scope of services provided. It is not the overall department floor space which is important but the space critical to the efficient functioning of the services provided (i.e. the critical dimension ⁽³⁾). Factors which influence overall floor space requirements include:

- attendance numbers and patterns,
- patient acuity,
- overall length of stay,
- admission rates and practices (e.g. whether speciality teams assess patient for admission in the ED, AMU or other wards),
- turnaround times for imaging and laboratory investigations,
- the proportion of patients aged over 65 years (> 20% of attendances being elderly increases space requirements ⁽⁶⁾),
- academic activities,
- the range of imaging undertaken within the ED (e.g. CT scanning),
- requirements for Paediatric Care including playrooms, family areas etc ⁽⁴⁾,
- number of patients with Mental Health needs who attend.

Generous space provision should allow for changing work patterns, such as increased simultaneous multi-disciplinary team working in patient cubicles, changing service needs, ageing of the patient population with increased prevalence of mobility problems, new medical interventions and monitoring requirements for patients.

Anticipated occupant loads will also influence the required floor space according to International Occupant Load formulae ^(8, 9). These calculations are based upon net floor space, i.e. excluding fixed walls, equipment etc. Adequate exit calculations will be necessary to ensure compliance with Fire Regulations. Health and Safety requirements have been previously outlined by the IAEM ⁽⁷⁾.

No Irish ED should have less than 50m² per 1000 new patients overall floor space. New EDs should be considerably larger than this to include critical functional capacity and adequate clinical, clinical support and non-clinical areas (5).

The size and specification of new EDs should be dictated by the requirements outlined in this document and should not be compromised by existing sub-standard infrastructure and equipment. The size and ultimate layout of the new ED will have implications for staffing and operational procedures in the ED.

Access issues:

There should be separate entrances to the ED for walking and ambulance patients. The ED entrances must never be used as general entrances to the hospital or as thoroughfares for staff and non-ED patients moving within the hospital, as this has a detrimental effect on ED patient care and privacy and potentially compromises patient and staff safety. Security personnel must be deployed on a 24/7 basis to ensure that all access routes remain clear. The ED clinical areas should not be accessible to medical, nursing or other staff that are not in the ED on specific patient care business.

The access needs of young children are similar to those of disabled people. Free car parking spaces, reserved for disabled people and for carers with babies and young children, should be allocated beside the ED.

Ambulance access:

Appropriate provision for a number of ambulances to park close to the ED entrance and allow for safe patient disembarkation is required. The ambulance access area should be designed in conjunction with the Ambulance Service and facilitate appropriate turning circles etc. Considerations will include ambulance design and engineering issues, requirements for the urgent and discrete cleaning

of ambulances; major incident planning and ambulance equipment storage e.g. storage of spinal boards. IT developments (e.g. faxing of Electrocardiographs [ECGs], shared hospital and pre-hospital IT systems) may determine the need for additional space for pre-hospital services within the ED footprint.

The Ambulance Entrance should be close to the ED Resuscitation Room to minimise the interval between the ambulance and the Resuscitation facilities. The route to arrive at a resuscitation bay should be direct and minimise the number of corners ambulance personnel have to push trolley-based patients around. It should also be private. There should be a canopy to keep patients dry while disembarking. The entrance should be well illuminated with an automated mechanism rapidly opening the outer door. Rapid access by emergency personnel must be achieved without compromising department security. Close collaboration with local ambulance personnel at the design phase is advised. A route may also be required for relatives arriving with ambulance patients to register patients or to be directed to an appropriate waiting area. A designated reception/triage area for ambulance patients may be effective.

Security personnel should control this area to maintain a car free ambulance bay.

Walk-in access:

The walk-in entrance should be discrete from the Ambulance entrance to protect patient privacy. The entrance must be well signposted. Access must also be possible for patients arriving by private transport to be dropped off close to the ED entrance. Patients arriving by car may require a wheelchair to gain access to the ED and such facilities need to be adjacent to the entrance.

Decontamination area:

It is critical that ED clinical facilities are not allowed to become contaminated in the event of an incident involving chemical, biological or radiation hazards. Best practice guidelines in relation to decontamination practice are constantly changing as new threats emerge. Current international standards should be

applied at the time of ED design and facilities should be regularly reviewed to ensure appropriateness. Decontamination facilities may involve use of external facilities, such as inflatable units, or internal decontamination may be an option. If external facilities are used it is vital that the means and appropriately trained personnel are available to assemble the equipment in the event of a major incident. Services for decontamination facilities and storage areas for decontamination equipment are required. Water drainage of this area requires specific engineering specification and will need to be separate from the main hospital drainage system.

Reception area:

Each ED should have a dedicated Reception area that should be staffed by trained, dedicated staff 24 hours a day. There should be immediate access to ED records for each of the 2 previous calendar years ⁽²⁾. Where ED Medical Records are scanned and stored electronically, access to previous records needs to be immediately available.

Patient confidentiality must be protected while registration takes place. There is also a requirement for adequate security for reception staff. Balancing these needs will require the use of appropriate communications systems. Seats for waiting patients must be an appropriate distance from the reception desk. It is advisable for the reception area and waiting areas to be separate. A wheel-chair accessible reception booth should be provided and the needs of other disabled patients (including those with hearing and vision impairment) should be considered in the design. Patients may need to sit when registering because of injury, illness or disability. Registration facilities for patients arriving by ambulance will need to be considered in the design in relation to the reception function.

The department's main administrative function should be situated in a "non-clinical" area separate from reception, such that only functions directly related to clinical care are located in the most operationally active zones in the department.

Triage/ Initial Assessment area:

Triage is the sorting of patients for prioritisation according to clinical acuity. At present there is a move from “traditional” triage to a more dynamic form of assessment and near simultaneous treatment. Adequate facilities need to be in place to ensure that modern models of care can be employed. Such models of care provide different pathways for ambulant and non-ambulant patients as well as other groups such as Paediatric patients and patients with Mental Health problems.

Triage may occur before or instantaneously upon patient arrival (pre-hospital notification), within minutes of arrival, at the bed-side or in a designated area. Triage may occur before or after patient registration, depending on local practice. Where “traditional” triage is in use, there is a necessity to ensure that there are two exits from each triage cubicle (to ensure the safety of the assessment nurse) and that each triage cubicle is fitted with a dedicated alarm.

The Triage /Assessment area may include a designated area for ambulance patients and an area for ambulant patients. Patient movement between Triage/ Assessment and the following areas should be considered: Reception, Waiting area, Resuscitation, Treatment & Ambulatory Care, patient toilets and Diagnostic Imaging. Workflows may include access to ECG and Diagnostics, Registration/ Administrative functions, access to faxed information, immediate drug therapy (e.g. provision of analgesia). Administrative functions such as the printing of patient name-bands or the commencement of patient tracking may be required at triage.

Each triage/ assessment cubicle should have:

- A service panel
- Examination light
- Desk
- Chair on wheels
- Patient chair
- Trolley

- Computer console with nearby printer access
- Ophthalmoscope / otoscope
- Equipment for physiological measurement (e.g. to check vital signs, oxygen saturation, temperature, near-patient blood sugar testing)
- Sharps containers
- A foot stool
- Waste bins
- Access to a weighing scale
- Hand-washing facilities
- Storage for wound dressings etc.
- Access to paper-based documentation, if used.

Each Triage/Assessment space should be of not less than 16m² in size and should be trolley and wheelchair accessible. Department practice will determine whether a trolley is required in each triage/assessment cubicle, e.g. for *Rapid Assessment and Treatment* or immediate ECG testing for ambulatory patients.

The initial assessment of a baby, child or adolescent with non-life threatening injuries or illnesses should take place in one of the triage/assessment cubicles. A number of these spaces should be suitably decorated, furnished and equipped for children. While there should be rooms specifically designated for babies and children, every initial assessment room in a mixed department should have the capability of receiving patients of all ages.

The minimum acceptable floor area per Triage/Assessment Cubicle is 16m². Minimum floor area: the minimum combined Reception and Triage area must be 1.8 m²/1000 patient attendances per annum. There should be a minimum allocation of one triage/assessment cubicle per 10,000 annual attendances.

Waiting room:

The waiting room should be a pleasant area and provide an environment which maximises patient comfort, safety and wellbeing. The waiting room must be considered a clinical area and should be overseen by ED staff. Good communication with waiting patients is essential and patients should not feel isolated in the waiting area. An electronic board should be available to update patients in relation to triage processes and waiting times. Patients and accompanying friends and relations need toilet access and baby changing facilities should be provided. Access to health-promoting material is recommended. There should be controlled access between the waiting room and the rest of the ED. It should be possible to access the waiting room from the treatment and ambulatory areas of the ED.

There should be a public telephone with a privacy hood. A direct line to a taxi-service may also be advisable. Vending machines may also be considered. Staff should be cognisant of waiting times and aware of patient requirements for refreshment if waiting times are prolonged.

Children usually prefer being in a larger waiting room with more space, than being in a cubicle. There should be a separate supervised paediatric waiting area with a play area. This may be located within the existing main waiting area but placed slightly away from the main section of the seating. Consideration should be given to the use of laminated one-way view glazing so that people can see in but children cannot see out. Toilet facilities, baby change and infant feeding should be located close to the children's waiting area.

Minimum floor area: the waiting area should measure at least 4.4 m² / 1000 attendances per annum. The children's waiting area should measure at least 6 m² / 1000 paediatric attendances per annum. As a rule of thumb there should be a minimum of three seats per patient treatment cubicle.

Sub-wait areas:

The use of sub-wait areas for patients awaiting diagnostic imaging, diagnostic test results, in-house team assessment, discharge planning, transport or transfer should be considered. A sub-wait area may also be useful in accommodating patients who require supervision or separation from the general waiting room (e.g. patients in Garda custody).

Patient treatment spaces:

Individual cubicles with walls are recommended in the interest of patient confidentiality and noise reduction. In resuscitation areas, an open plan design with moveable cubicle dividers may be more appropriate. Visual and acoustic privacy for patients must be balanced by the need for patient observation, care requirements and staff safety in all areas. In the main treatment areas, optimal infection control and patient considerations favour the use of ED cubicles with doors, over more traditional “curtained” cubicles. The use of clear doors, or windows, with inbuilt optional screening, is advocated in US guidelines. Where curtains remain the preferred option, e.g. in higher acuity areas, procedures for cleaning and replacement of curtains are required to minimise hygiene risks associated with their use. All cubicles should be of identical layout and “mirroring” of cubicle layout is to be avoided. Ceiling suspended equipment must be carefully placed. Careful consideration of ceiling heights in all areas is recommended.

All non-Resuscitation Room patient cubicles should be of the minimum standard cubicle size (16m²) and equipped identically, irrespective of whether the cubicle is likely to be used for ambulatory care or “majors” patient care. This will allow the flexible use of the cubicle in the immediate term to respond to clinical demand. In the longer term the space will be of adequate size if re-designation to higher acuity care becomes necessary. Resuscitation cubicles require additional space because of the numbers of personnel working simultaneously in these spaces and the space taken up with resuscitation equipment.

Children's treatment areas require space for medical equipment, floor space for the child, toys and space for family members.

Minimum floor area: the minimum acceptable floor area per patient cubicle is 16m².

Design for process efficiency and safety:

Undoubtedly, the design of EDs contributes significantly to whether or not patient "flow" is facilitated or obstructed. Greater care needs to be taken to ensure that department design maximises efficiency and minimises the number of conflicting patient journeys. Design should accommodate existing and anticipated staff and patient work-flows and processes. Workflow analysis and modelling based upon peak and average attendances and duration of ED care episodes may be helpful early in the design stage.

The needs of attendant and ambulance staff moving patients on trolleys must be considered. Door specifications should facilitate ease of movement of patients on trolleys. Automatic door opening systems are essential for trolley movement.

All corridors and entrances or exits should allow two trolleys to pass unhindered.

Resuscitation area:

All Emergency Departments should have an adequate Resuscitation Room. The number of resuscitation bays required will depend on patient attendance, patient acuity and case-mix, local clinical practice and services offered, the requirement for dedicated Paediatric Resuscitation bays in mixed departments, the availability of monitored step down bays in the general treatment area etc. In general, there is a trend towards greater use of Resuscitation bays for assessment and stabilisation before patients are moved to a less acute setting within the ED, which will require additional capacity provision.

An ED with an average case-mix seeing 20,000 patients per year should have a minimum of two Resuscitation bays with one additional bay per 10,000 patients per year.

There should be easy access between the Ambulance bay and the Resuscitation area. Radiation protection must be incorporated in the design including wall lining and staff and patient protection during portable x-ray. The environment must be climate controlled environment and there should also be controlled lighting.

It has been found from experience that *equipment storage* in Resuscitation Rooms is often deficient with consequent adverse patient consequences. As a result many US ED developments are now including up to 9m² for additional equipment storage within the Resuscitation Area.

Each Resuscitation Area patient space must:

- Have sufficient space to ensure 360 degree access to the patient on an appropriate high specification resuscitation trolley
- Have a high-specification patient trolley suitable for portable x-ray acquisition
- Maximise visual and auditory privacy for patients, relatives and staff.
- Have full individual physiological monitoring including ECG, NIBP, Oxygen saturation, core temperature, invasive monitoring, end-tidal CO₂ monitoring etc
- Ventilators: There should be one ventilator for each resuscitation bay.
- Be fitted with three oxygen outlets
- Be fitted with wall mounted suction
- Have resuscitation equipment in each space for intubation, defibrillation with external pacing capabilities, cannulation etc
- Have an appropriate service panel with a minimum of twelve electrical sockets and four Category 5 sockets
- Have equipment or an overhead rail to hang IV fluids
- Have hand-washing facilities

- Have a clock with timing facilities. All ED clocks should be synchronised against an accurate time-source.
- Have an operating theatre quality light
- Include a wall mounted ophthalmoscope / otoscope
- Have overhead X-ray gantry or alternative immediately accessible imaging system.
- Clinical waste facilities: sharps and clinical waste.
- A dedicated computer terminal with access to Laboratory and Diagnostic Imaging results and the ability to request clinical investigations.

Within the Resuscitation area there should be access to:

- Resuscitation equipment sets for advanced airway management including surgical airway, emergency surgical procedures, urinary catheterisation, central line placement etc.
- Two transport monitors for patient transfer to imaging and other clinical facilities,
- Two transport ventilators for patient transfer to imaging and other clinical facilities,
- Facilities for non invasive ventilation,
- At least two twin diagnostic imaging monitors,
- A standard Anaesthetic Machine,
- Medical air,
- Nitrous oxide,
- Emergency Ultrasound,
- Hands-free telephone,
- A locked cupboard for controlled drugs,
- Facilities for warming of resuscitation fluids,
- Equipment to warm patients and the ability to create an appropriately warm environment for the assessment of patients with major burns.
- A Rapid infusion device,
- Area for patient documentation / note-keeping / IT system access,

- Sterile procedure preparation area,
- Access to O-negative blood for urgent transfusion,
- Resuscitation equipment storage with re-charging capabilities,
- A utility area,
- Paediatric resuscitation equipment, including a Resuscitaire i.e. Neonatal Resuscitation and warming equipment, in case of unexpected obstetric delivery. See *Paediatric Considerations* section below.
- Refrigerator,
- An adequate number of intravenous pump devices, in stacks of three for each bay
- Adequate worktop space for PCs, monitors, documentation etc.

Other clinical equipment which must be easily accessible for patients in the Resuscitation area includes:

- Near-patient testing facility including testing of blood glucose, Arterial Blood Gas measurement and other tests as appropriate.
- An Ultrasound machine for resuscitation scanning.
- A hand-held Arterial Doppler machine

Adjacent to the Resuscitation area should be

- A dedicated Relatives Room
- A Viewing Room for family member viewing of very recently deceased patients whose resuscitation in the Emergency Department has been unsuccessful prior to their transfer to the hospital Mortuary.

Minimum floor area: there should be a minimum of 25 m² per resuscitation bay excluding storage space. An additional one quarter to one third of this figure should be allowed for storage.

Single/Isolation rooms (negative pressure rooms):

The requirement for the respiratory isolation of patients in a negative pressure room is supported by evidence of the transmission of SARS to ED healthcare workers in Canada ⁽¹⁰⁾. Isolation rooms are also advocated for the routine accommodation of patients who are potentially infected with other contagious agents such as *Novovirus* or tuberculosis. Isolation rooms should have en-suite toilets. Every ED should at least two isolation rooms so that patients can be transferred directly from the ambulance or triage and assessed therein. Larger departments should have 1 per 10,000 yearly attendances ⁽⁵⁾. At least one room should be designed for children while also being suitable for adult patients. Infection control staff should contribute to the needs assessment, design and operational policy for isolation rooms and for the entire ED build. The rooms should have physiological monitoring, linked to the centrally monitored ED system. These rooms should be near outer walls to facilitate the ventilation requirements.

Treatment area / Majors area / Urgent area:

The optimal number of treatment cubicles will depend on the factors outlined in relation to the overall size of the ED. Estimating the number of treatment cubicles required will involve careful consideration of the volume and scope of services provided.

The total number of treatment areas should be at least 1/1100 yearly attendances or 1/400 yearly admissions, whichever is greater in number ⁽¹¹⁾. At least 50% of treatment cubicles should have centrally monitored physiological monitoring. **Special function treatment areas are not considered in the calculation for treatment area cubicle numbers.** Each Adult patient treatment area should be at least 16m² in area. The treatment areas should be directly observable from the Staff Duty Base.

Each treatment area should have:

- 2 oxygen outlets
- Wall mounted suction
- A service panel with a minimum of ten electrical sockets and four Category 5 sockets
- A patient trolley
- Patient relative chair
- Swivel chair/stool
- Hand-washing facilities
- Patient documentation equipment (writing boards/desk)
- Computer terminal and diagnostic image viewing facilities
- A surgical light
- An ophthalmoscope and otoscope
- A panic button
- Access to dressings and wound care equipment
- Sharps bin
- Clinical Waste disposal bin

All treatment areas should have an identical lay out.

Minimum floor area: the minimum acceptable floor area per patient cubicle is 16m².

Special function treatment rooms:

These include:

- Designated room for ENT examination with full ENT set, head light, tuning forks, endoscopes, ENT chair etc.
- Quiet rooms (see below)
- Ophthalmology assessment room with slit-lamp, black-out capability, Snellen chart etc
- Interview room for social care

- Private room for gynaecology / intimate examination.
- Plaster application room, with appropriate waste disposal
- Procedure room with operating theatre standard lighting for suturing and wound care.

Minimum floor area: the minimum acceptable floor area per treatment room is 16m². Additional space may need to be allocated to the ENT and Ophthalmic assessment rooms due to the extra equipment required.

Where EDs either offer additional services e.g. provide a room for forensic examination of victims of sexual violence dedicated facilities ^(11, 12) need to be provided which do not double as routinely used clinical areas and therefore run the risk that these specialised facilities will not be available when the need arises. Where an ED employs Advanced Nurse Practitioners appropriate office and clinical facilities need to be provided ⁽¹³⁾.

Quiet rooms / Disturbed patient rooms:

All EDs may receive patients who are suffering from mental illness. Appropriate facilities according with the standards laid down by the British Association for Emergency Medicine / Royal College of Psychiatrists ⁽¹⁴⁾ and endorsed by the IAEM ⁽⁷⁾ need to be available. These include a panic button, 2 exit routes, fixed furniture and fittings that cannot be used as weapons. The room should be decorated in calm colours and well lit with non breakable glass lighting. The room should have an observation window and be viewable from outside.

Ambulatory care areas/consultation rooms:

Patient examination cubicles should be identical to those in the major treatment area. This will facilitate the safe immediate management of patients in the event of unexpected deterioration in a patient's clinical status or re-designation of this clinical area in the event of a Major Incident.

There should be a sub waiting area, nursing station and ease of access to the Diagnostic Imaging Department and Procedure Room from this area. Local operational procedures and staffing resources may determine whether overall department efficiency and safety is optimised by having this area congruent with the main treatment area or physically separated by doors or a corridor.

Minimum floor area: the minimum acceptable floor area per patient cubicle is 16m².

Each consultation room should have:

- 2 oxygen outlets
- Wall mounted suction
- A service panel with ten electrical sockets and four Category 5 sockets
- A patient trolley
- Patient chair
- Swivel chair/stool
- Hand-washing facilities
- Patient documentation equipment (writing boards/desk)
- Computer terminal and diagnostic image viewing facilities
- A surgical light
- A wall-mounted ophthalmoscope and otoscope.
- A panic button
- Access to dressings and wound care equipment
- Sharps bin
- Clinical Waste disposal bin

All treatment cubicles should have an identical lay out.

Patient toilet and shower facilities:

Patients in waiting areas and in clinical areas require access to toilets. In addition, baby changing facilities should be provided. A patient shower area is also required for each 12 cubicles. Disabled toilet facilities are mandatory. All toilets should be fitted with alarms and allow emergency access to and patient retrieval from each toilet cubicle in the event of patient collapse. Toilets with patient access should be appropriately equipped to deter and minimise the risks from anti-social behaviour or substance misuse which may occur in toilet areas (e.g. appropriate light fittings, ceilings and immovable fixtures). There should be an en-suite toilet with each of the isolation rooms, the gynaecology room and any room for forensic examination of victims of sexual violence.

Relatives' room:

The nature of Emergency Medicine requires that the relatives or friends of patients may require private accommodation in designated rooms when dealing with bereavement or sudden illness. These rooms should have comfortable furnishing, access to telephones and facilities such that refreshments can be provided. Departments with more than 30,000 attendances require two such rooms at a minimum.

Viewing rooms:

There should be a private room provided for deceased patients' relatives to view their remains. This room should be situated close to the resuscitation room to allow the transfer of the deceased, in private, out of sight of other patients. The room should also be adjacent to the relatives' room, such that relatives and friends can have privacy as they enter and leave the viewing room. The room must be adaptable to and equipped to meet the needs of a broad range of religious denominations.

Staff duty base:

The staff duty base should be at least 10m² or 1m² for each 1000 patient attendances per year, whichever is the larger ⁽⁵⁾. The area should ensure staff safety and patient confidentiality. The base should also allow direct visualisation of the main treatment area. There must be an enclosed “write-up” area to facilitate clinical discussion adjacent to the main staff base. Facilities for staff consulting episodically in the ED must be considered. Lighting requirements for the use of Image viewers must be considered. This base area will also require:

- An emergency communication base, with pre-hospital radio and telephone communications
- Patient alarms and call signals from all clinical areas.
- Computer terminals
- Designated telephone lines: Paging system, Internal and external lines
- A Fax machine
- Printers
- At least three imaging viewers
- Patient call display
- Writing areas for medical, nursing and the multidisciplinary team
- Patient case-note storage area, if electronic systems are not in use
- Stationary storage
- Controlled drugs storage

Minimum floor area for staff base: the minimum acceptable floor area is 1m²/1000 patient attendances per annum.

Communications:

There should be an intercom system and public address system covering all clinical and non-clinical areas. A patient call system should also be installed.

Telephone console:

A considerable number of calls are made to Emergency Departments. A central control or station would co-ordinate calls more efficiently, enhancing the operational capacity of the facility.

Clean preparation areas / Drug infusion preparation room:

The allocation of one dedicated room for drug infusion preparation is essential for the appropriate management of the delivery of pharmaceutical products to patients. This should have appropriate pharmacy storage systems, workspaces, disposal facilities and have security swipe card controlled access. Drug storage areas should conform to national standards.

Storage:

This includes sterile and non-sterile supplies, stationary supplies, storage of hazardous materials, a medical gas storage area, linen storage, wheelchair and trolley storage, electronic equipment storage with re-charging capabilities, clinical and non-clinical waste disposal and Major Incident Equipment storage. Historically storage facilities in EDs have been very limited, leading to the use of inappropriate areas as storage and the use of unsecured areas for the storage of materials which should be secured. Adequate storage facilities need to be included in any ED development or redevelopment. In addition EDs must have a major incident store to carry the equipment needed in the event of a major incident.

Minimum floor area for storage: the minimum acceptable floor area for storage is 2.2m²/1000 patient attendances per annum.

Plaster rooms and Splinting storage:

Plaster of Paris splinting is commonly used for the ED management of fractures. Special sink facilities are required for this material. The storage of pre-formed Orthopaedic Splints takes up considerable space and a designated area, close to the ambulatory care should be provided. Plaster of Paris and splinting equipment which may be required in the Resuscitation room may need to be stored in this area.

Utility and cleaning areas:

The disposal of waste materials requires designated dirty utility areas with ease of access from all clinical areas. EDs, being operational on a 24/7 basis, require ongoing cleaning and facilities for the storage of cleaning materials are required.

Infection control:

Specialist input from infection control is required for the design project. Adequate hand-washing facilities must be provided. Patient flows within the ED, cubicle capacity and specification, and pathways of patient movement to other clinical areas should be designed to minimise the risk of cross-infection between patients.

Patient refreshment supply area:

Patients and relatives may require minimal refreshments to be provided during their time in the ED. Such facilities must conform to both national health and safety and food preparation guidelines.

Non-clinical areas:

In the interests of staff security, such areas must have controlled access. Many ED designs place such work-areas on the first floor above the ED to facilitate staff access to clinical areas, while at the same time protecting the ground floor space for clinical functions. Non-clinical areas include:

Staff facilities:

At least one room should be provided within the department to enable staff to relax during rest periods. TV, radio and other facilities should be available.

Food and drink should be able to be prepared and appropriate table and seating arrangements should be provided. It should be located away from patient care areas and have access to natural lighting and appropriate floor and wall coverings. There must also be adequate Staff changing, locker, shower and toilet facilities. There must be adequate access for disabled staff.

Minimum floor area: the minimum acceptable floor area for staff refreshment room is 0.8m²/1000 patient attendances per annum.

Administrative functions:

Extensive administrative functions are required in support of Emergency Department clinical work. This includes the archiving of clinical material, clinical audit, the preparation of medical reports, patient discharge support, liaison with primary care and other services. A fully equipped office for designated administrative and secretarial staff is required. This area should be adjacent to the Emergency Department. Secretarial accommodation should reflect the requirement for each Consultant in Emergency Medicine to have a dedicated secretary. Each individual secretary's office should be 10m². Shared secretarial support is only likely to be feasible in future with significant increases in consultant numbers and changes in work practices.

Consultants in Emergency Medicine currently require individual offices, though it is likely that with extended working hours and out-of-hours rostering that shared office spaces may be used also in the longer-term. Certainly many Consultant activities such as staff appraisal and mentoring, counselling, risk management, dealing with complaints etc and other confidential matters require access to individual offices. Each individual office should be a minimum of 12m². The administrative area should also include small meeting rooms for team meetings.

The Senior Nurse in the ED (usually a Clinical Nurse Manager 3) will require individual office accommodation (12m²) and a multiperson office (at least 12m²) should be provided for the Clinical Nurse Manager 2 grades.

Minimum floor area: the minimum acceptable floor area for administrative function is 4m²/1000 patient attendances per annum.

Education and Training facilities:

A Seminar room should be situated within the administrative area of the ED. The necessity for this room to be within the ED arises because senior doctors and nurses, while teaching, may be required to attend the Resuscitation area without delay. Teaching facilities within the ED should be comparable to that available elsewhere on site and should include: audio-visual aids (LCD, slide & OHP Projectors), computer access, PACS viewing facilities, emergency library access and storage for teaching materials. Facilities for skills teaching and assessment are an essential requirement for the delivery of current educational programs and will need to be provided. With national training bodies moving to tele-education, consideration should be given to videoconferencing facilities within EDs.

EDs which provide Higher Specialist Training will require a study room and office space to accommodate Specialist Registrar trainees. This should meet the minimum requirements set down by the training body.

Minimum floor area: the minimum acceptable floor space for Training facilities is 27.5m² or 0.8m²/1000 patient attendances per annum, whichever is the larger number. Study room minimum requirement is 20 m².

Support services:

The ED will have to include a switch cupboard, an area for a fire alarm control board and other electrical support systems. The situation of such systems must not impede clinical function.

Inpatient facilities:

There is increasing evidence of the clinical and cost effectiveness of EDs having designated in-patient care areas. ED management of a variety of patient cohorts is now seen as safe and an efficient use of beds and resources ⁽¹⁵⁾. Such facilities may include an Observation Ward, a Clinical Decision Unit or a Chest Pain Unit. Any such area should be as close as possible to the ED to allow Emergency Medicine staff to work across both areas, as required. The Observation ward will need the facilities of a standard ward including a Relatives/ Interview room, a duty station, dirty utility, drug preparation and storage area and patient showering and toilet facilities. The ED communications system should cover the Observation ward and an alarm system should operate to call ED staff in case of emergency. Absolute bed capacity required will depend on the scope of in-patient services offered and the projected length of stay. Hospital beds offer increased patient comfort over ED patient trolleys and are recommended for ED in-patient facilities.

Such ED in-patient care areas should not be part of the general hospital bed-stock. It is not acceptable that inpatient boarders be accommodated in this area.

A designated Chest Pain Unit will require central ECG and physiological monitoring in addition to the ward facilities described. An exercise stress testing area will also be required.

Minimum number of ED beds is 1/ 5000 yearly attendances.

The patient accommodation element of a 4 bedded ward should be a minimum of 70m². Larger EDs will require a pro rata increase in provision.

See Appendix C for details of the space which will need to be allocated to these areas. A fuller consideration of these additional ED services, their structuring, operational policies etc will be provided in the IAEM position paper on *Extended care in the Emergency Department*, currently being drafted.

Areas for Multi-disciplinary Patient Assessment:

Designated space for patient assessment by Occupational Therapists and Physiotherapists may be required within the ED to allow mobility assessments and falls prevention interventions to be undertaken. This work is especially important to support the safe ED discharge of elderly patients.

Security:

EDs should have a dedicated Security presence with adequate numbers of visible security staff on a 24/7 basis and comprehensive coverage with CCTV. The latter should have the capacity to record images to support a prosecution should a criminal offence occur within the department. An absolute minimum of two security personnel deployed in the ED on a 24/7 basis, with potential for back-up from elsewhere in the hospital is required. Personal attack alarms or panic buttons should be available to all staff and operate in all areas within the department. Panic buttons should result in a rapid pre-determined response by security and other appropriate personnel.

Information Technology:

EDs require high quality information technology systems. Access to these facilities needs to be available within patient care areas, in the administrative areas of the department and also in the triage and reception areas. There must be ready access to computer systems in all clinical areas. There must be sufficient terminals in every patient treatment cubicle, bearing in mind that many monitoring systems require three computer access points for this purpose alone. Alternatively handheld devices using wireless technology may be considered.

The provision of an appropriately specified picture archiving and communication system (PACS) should be regarded as an absolute necessity for an ED. PACS terminals must be of diagnostic quality (i.e. be of identical standard to that used by Radiologists). This higher specification arises because imaging diagnosis in the ED determines immediate patient care and potential discharge. There must be a PACS viewing station in every patient treatment cubicle.

The use of wireless technology and portable IT systems should be considered in the design of the ED. Technology to support patient tracking systems may be advisable. The need for seamless integration is an absolute necessity in the design and procurement of electronic systems such as PACS, Laboratory Information Systems, Hospital and ED Information Systems, Physiological monitoring, ED tracking etc. There is a need to ensure synergy between the physical infrastructure and IT element of ED function.

Telemedicine:

Where a particular ED provides clinical support to a peripheral unit, a dedicated telemedicine suite should be provided within the ED to ensure that senior clinical staff are not removed from the ED when assisting with patient care at a satellite unit.

Diagnostic Imaging:

All EDs need access to dedicated digital plain imaging facilities as well as easy access to CT scanning. Both need to be available on a 24/7 basis. These facilities need either to be provided as part of the development of the Emergency Department or in very close proximity to the Emergency Department where the Diagnostic Imaging Department is immediately adjacent. Access to MRI and Interventional Radiology should to be considered in larger centres and regional units. One general radiology room is required for every 20,000 to 25,000 patients per annum ⁽⁵⁾. There needs to be a specific area for ED patients to wait adjacent to the dedicated general radiology room(s). An alarm system and a means of communication with the ED duty base are also required. There must be a PACS viewing station in every patient treatment cubicle. There must also be at least three twin monitor viewing systems at the staff duty base with ease of access for medical and ANP staff.

Laboratory specimen transport:

Large numbers of laboratory investigations are undertaken in the ED and systems for the rapid transport of samples to the laboratory must be accommodated in the ED design.

Patient information:

It is important that the ED and patient treatment areas are clearly signed to enable patients and their relatives find appropriate areas. It may be helpful to mark out patient paths to particular areas, such as the Imaging area. An electronic communication board in the waiting area is recommended. Consideration also needs to be given to other forms of patient information, such a copy of the Patients' Charter and health promotion information which may need to be displayed in the ED. The need for appropriate signage for disabled patients

and any local language requirements must be addressed. The use of graphic imaging may assist, given the increasing range of languages encountered.

Art in the ED:

Art in the ED may contribute to the environment and enhance the patient experience in the department. Art work should conform to local infection control and health and safety policies. Advice regarding the optimal use of art in a clinical environment should be sought.

Durability:

All ED facilities need to be of a high quality with surfaces capable of withstanding the day-to-day demands placed on them. Such facilities need to be easy to keep clean so that infection control risks are minimised. Cubicles should be bounded by walls rather than curtains. High quality trolley impact protectors are required along every centimetre of wall and to protect any door aperture that a trolley may traverse. Doors must be electronically controlled by wall paddle activation.

Engineering Allowance:

A factor of 3% should be applied to the calculated total floor area of the ED i.e. after including all cubicles, rooms etc in accordance with international design practice.

Planning Allowance:

A factor of 5% should be applied to the calculated total floor area of the ED i.e. after including all cubicles, rooms etc in accordance with international design practice.

Circulation Allowance:

A factor of 30% should subsequently be applied to the amended total floor area of the ED i.e. the calculated floor area plus the engineering and planning allowances to reflect the need for adequate circulation space within the ED. This requirement accords with international design practice.

Expansion:

Given the rapid pace of change in Emergency Medicine, ED design should include an expansion factor. This will allow departments to continue to be “fit for purpose” with increasing numbers and complexity of new patient attendances. Furthermore EDs need to be sufficiently flexible in their design to allow development and improvement of services. The inclusion of an expansion factor is routine in ED design in countries against which Irish Emergency Medicine should be benchmarked.

Major Incident Planning:

ED design must be proofed for fitness for purpose for a Major Incident response. This will require areas appropriate for mass triage and the capability to re-designate clinical areas for more seriously ill or injured patients. Communication with hospital control areas will be critical. Local Major Incident plans should be considered at the ED design stage.

On-site Private Hospitals:

The proposed development of Private Hospitals on public hospital sites is likely to have implications for the ED. For example, ED patients who elect to be admitted as private patients may need to be transferred to the Private Hospital. The interface between EDs and the proposed Private Hospitals will require

careful planning and management, to ensure that the all patients receive high quality emergency care which is delivered in an equitable manner.

Paediatric Considerations:

Where an ED provides a service for adults and children, international best practice advising the audiovisual separation of adults and children should be followed ⁽¹⁰⁾. Ideally, children should be provided with waiting and treatment areas that are audiovisually separated from the potential stress caused by adult patients. Although this is not possible at all times, every effort must be made to find a reasonable compromise. All grades of staff should be able to, and should aim to, communicate with children of all ages at an appropriate level.

Parents will have practical needs such as food and drink for children or breast-feeding, nappy-changing, and bottle-warming facilities. They may also need to care for other children.

In general, children's treatment areas require more space per patient than adult areas, for medical equipment, floor space for the child, toys, and space for family members. Children usually prefer being in a larger waiting area with more space, than being in a cubicle.

The ambience and furniture of the children's area should be child-friendly. Murals, mobiles, posters and colourful decoration help allay anxiety and make clinical assessment and treatments much easier for all concerned. Wherever possible, consideration should be made for older age groups.

Adolescents may prefer quieter and more private surroundings. Provision of appropriate DVDs, CDs or electronic toys for this age group is as important as age-appropriate toys for younger children. EDs should use the opportunity to offer wide-ranging advice for older children's wellbeing.

Children's areas should be monitored securely and zoned off to protect children from harm. Toys and books must comply with health and safety regulations and the hospital's play specialists or children's wards can provide appropriate advice.

In addition to these basic elements, EDs treating more than 16,000 children per year should have:

- a waiting area dedicated to children
- provision of facilities for children of all age groups
- one or more child-friendly clinical cubicles or trolley spaces per 5,000 annual child attendances.
- a route to the imaging department which avoids other areas of the ED
- an area suitable for breast-feeding and nappy-changing
- a trained play specialist to cover peak times, including weekends

In smaller departments the play specialist service may be shared with in-patient services. Larger EDs should recruit play specialists in sufficient numbers to cover peak times. There should be links between smaller EDs and Regional paediatric centres for specialist advice and support on play and play materials.

The role of a play specialist in the ED includes:

- providing distraction therapy for potentially distressing procedures
- enhancing nursing and medical skills to involve play in the management of procedures in children
- maintenance of a child-centred environment, including advising on safe and appropriate toys and facilities
- supervision of play in the department

Necessary paediatric equipment and supplies are listed in Appendix A and include age-appropriate and size-appropriate equipment for use for children of all ages and sizes from premature infants through adolescents.

Planning and consultation:

Preparation and planning are crucial to the success of an ED design process.

Stages in the planning process are outlined in *Table 5*.

Project Stages

- Instigation of the project
- Preparation of a case of need
- Submissions for and negotiations around funding
- Formation of a steering committee
- Selection of the design professional
- Needs assessment
- Pre-design, scoping of project
- Physical design
- Construction
- Identification of appropriate equipment
- Commissioning of building and equipment
- Maintenance of emergency services during the design project
- Staff training

Table 5: Stages in the ED design process

Consultation with key stakeholders from outside the ED is important. Compatibility of design and equipment chosen with ambulance service requirements and other hospital services must be considered. There should be involvement of the entire ED Multidisciplinary team in the design process. Project budget should include staff time allocation for participation in the project. One key role which may be particularly invaluable is that of a project clinician, possibly a senior ED nurse, who will liaise with the design, project management and on-site building teams to coordinate stages in the build process such that service provision is not disrupted and patients and staff minimally inconvenienced.

It is crucially important that future development of Irish EDs is conducted according to modern project management principles. There should be close and productive collaboration between ED staff, hospital administration and the HSE.

The historical approach of granting approval to new ED projects based on what had previously been approved elsewhere, even if the latter would be regarded by experts as seriously deficient, is unacceptable. Likewise the experiences of many, where both the final ED commissioned is far smaller than what is required for modern patient care and the development has taken far longer to complete than appropriate, will hopefully become a thing of the past.

Modern Emergency Medicine practice and our patients' legitimate expectations require that Irish EDs should conform to the highest international standards of design, infrastructure and service provision. We look forward to working with the HSE to ensure that these expectations are realised in the near future.

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Appendix A: Guidelines for Equipment and Supplies for Paediatric Patients

Adapted from *Care of Children in the Emergency Department: Guidelines for Preparedness*. American Academy of Pediatrics ⁽¹⁶⁾

Monitoring equipment

- Cardiorespiratory monitor with strip recorder
- Defibrillator with paediatric and adult paddles (4.5 cm and 8 cm) or corresponding adhesive pads
- End tidal CO₂ monitor
- Paediatric and adult monitor electrodes
- Pulse oximeter with sensors and probe sizes for children
- Thermometer or rectal probe
 - This must be suitable for hypothermic and hyperthermic measurements with temperature capability from 25°C to 44°C*
- Sphygmomanometer
- Doppler blood pressure device
- Blood pressure cuffs (neonatal, infant, child, and adult arm and thigh cuffs)
- Method to monitor endotracheal tube and placement
 - May be satisfied by a disposable CO₂ detector of appropriate size for infants and children. For children 5 years or older who are >20kg in body weight, an oesophageal detection bulb or syringe may be used in addition*
- Stethoscope

Airway management

- Portable oxygen regulators and canisters
- Clear oxygen masks (standard and non-rebreathing: neonatal, infant, child and adult)
- Oropharyngeal airways (sizes 0–5)
- Nasopharyngeal airways (12F through 30F)
- Bag-valve-mask resuscitator, self-inflating (450- and 1000-mL sizes)
- Nasal cannulae (child and adult)
- Endotracheal tubes: uncuffed (2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, and 6.0 mm) and cuffed (6.5, 7.0, 7.5, 8.0, and 9.0 mm)

- Stylets (infant, paediatric, and adult)
- Laryngoscope handle (paediatric and adult)
- Laryngoscope blades: straight or Miller (0, 1, 2, and 3) and Macintosh (2 and 3)
- Magill forceps (paediatric and adult)
- Nasogastric/feeding tubes (5F through 18F)
- Suction catheters—flexible (6F, 8F, 10F, 12F, 14F, and 16F)
- Yankauer suction tip
- Bulb syringe
- Chest tubes (8F through 40F)
- Laryngeal mask airway (sizes 1, 1.5, 2, 2.5, 3, 4, and 5)

Vascular access

- Butterfly needles (19–25 gauge)
- Catheter-over-needle devices (14–24 gauge)
- Rate limiting infusion device and tubing
- Intraosseous needles
- Arm boards (*desirable, not essential*)
- Intravenous fluid and blood warmers
- Umbilical vein catheters (*Size 5F feeding tube may be used*)
- Seldinger technique vascular access kit

Miscellaneous

- Infant and standard scales
- Infant formula and oral rehydrating solutions
- Heating source (*may be met by infrared lamps or overhead warmer*)
- Towel rolls, blanket rolls, or equivalent
- Paediatric restraining devices
- Resuscitation board
- Sterile linen (*Available within hospital for burn care*)

- Length-based resuscitation tape or pre-calculated drug or equipment list based on weight
- Specialised paediatric trays
- Tube thoracotomy with water seal drainage capability
- Lumbar puncture
- Paediatric urinary catheters
- Obstetric pack
- Newborn kit
- Umbilical vessel cannulation supplies
- Venous cutdown
- Needle cricothyroidotomy tray
- Surgical airway kit (*may include a tracheostomy tray or a surgical cricothyroidotomy tray*)
- Fracture management
- Cervical immobilisation equipment

Many types of cervical immobilisation devices are available, including wedges and collars. The type of device chosen depends on local preferences and policies and procedures. Chosen device should be stocked in sizes to fit infants, children, adolescents, and adults. Use of sandbags to meet this requirement is discouraged, because they may cause injury if the patient has to be turned.
- Extremity splints
- Femur splints
- Medical photography capability

Appendix B: Minimum floor requirements for main ED areas

AREA	MINIMUM REQUIREMENTS
Waiting area.	4.4 m ² / 1000 attendances per annum
Paediatric waiting area	6 m ² / 1000 attendances per annum
Wheelchair parking area (walk-in entrance)	4m ^{2*}
Trolley and wheelchair parking ambulance	12 m ^{2*} (3 trolleys and 3 wheelchairs)
Waiting room toilets – ambulant – per toilet	2.5 m ²
Waiting room toilets – disabled – per toilet	4.5 m ²
Nappy Change Room	4m ²
Infant Feeding Room	5m ²
Combined Reception and Triage	1.8 m ² /1000 attendances per annum.
Reception area	10 m ² for two receptionists
Triage / Assessment cubicle	16m ²
Paediatric Triage / Assessment cubicle	16m ²
Resuscitation bay excluding storage space	25 m ²
Near patient testing area	8.5m ²
Clean utility / drug preparation	14 m ²
Dirty utility for resus	12m ²
Mobile x-ray parking bay	2m ²
Ultrasound machine parking area	1m ²
Standard patient treatment cubicle	16m ²
Standard paediatric patient treatment cubicle	16m ²
Minimum number of treatment cubicles	1/1100 yearly attendances or 1/400 admissions, whichever is greater
Ambulatory care area cubicle	16m ²
Room for disturbed patients	16m ²
Isolation rooms	2 or 1/10,000 attendances
Viewing room	10m ²
Relatives room	16m ²
Staff base	1m ² /1000 patient attendances per annum
Minimum floor area for storage areas	2.2m ² /1000 patient attendances per annum
Major Incident storage	6m ²
Medical gas cylinders	9m ²
Ambulance equipment	6m ²
Equipment service /storage room	21m ^{2*}
Sterile supplies	15m ^{2*}
Equipment and supplies	36m ^{2*}
General Radiology rooms	One per 20,000 to 25,000 attendances
Staff refreshment room	0.8m ² /1000 patient attendances per annum
Staff changing area	10m ² for 15 staff to 25m ² for 50 staff, with 2.0m ² for each WC and 2.5m ² for each shower (disabled facilities extra)
Training seminar room	0.8m ² /1000 patient attendances per annum, with a minimum of 27.5 m ²

AREA	MINIMUM REQUIREMENTS
Study room	20 m ²
ED beds for Observation Medicine / CDU.	1/ 5000 attendances
Floor area per in-patient cubicle excluding storage	16m ²
Cleaners' room	7m ² *
Single person office	10 or 12m ² (see text)
Meeting room	14m ²
<i>Planning, circulation and engineering allowances will need to be added to the total floor areas in addition to above specifications</i>	
<i>*Based upon a department with 12 treatment cubicles</i>	

Appendix C: Minimum requirements for ED inpatient areas

ED inpatient facilities may include an Observation Ward, a Clinical Decision Unit or a Chest Pain Unit. The exact requirements will depend on the case-mix of patient admissions and the nature and scope of clinical services provided. Planning of the Emergency Medicine in-patient facility should consider the potential functionality of this clinical area within the hospital's Major Incident response.

Inpatient beds:

The minimum recommended number of ED beds is 1/ 5000 yearly attendances. All units should have at least one single room space, for patient privacy in special circumstances. Increasingly, it is recommended that single rooms should be considered for all patients for reasons of infection control and patient comfort. All beds should have centrally monitored physiological monitoring.

Each bed area should have:

- An oxygen outlet
- Wall mounted suction
- A service panel with a minimum of ten electrical sockets and four category 5 sockets
- Patient relative chair
- Hand-washing facilities
- Patient locker
- Nurse call system
- A panic button

Minimum area per bed space: 16m²

A Resuscitation Trolley and Defibrillator must be easily accessible for all beds. Oscopes and ophthalmoscopes must be available.

Patients' facilities:

There should be one toilet and one shower for every five beds (or part thereof). These facilities must be wheelchair accessible and of an appropriate safety standard. There should be secure storage for patients' property. The ward area should be climate controlled. An area for informal socialisation of patients and access to TV, music or hospital radio should be considered. The particular needs of paediatric and adolescent patients must be incorporated in the design, if these age groups are to be admitted for in-patient care ⁽¹⁷⁾.

Relatives/ Interview room:

This room will be regularly used to interview patients or their relatives. The room should be of not less than 16m² in size and should be wheelchair and trolley accessible, in case of sudden patient deterioration. The room should be decorated in calm colours, with comfortable furniture, which complies with Safety Standards and should be well lit with non breakable glass lighting. There should be a panic button for staff security. The room should have an observation window, with adjustable blinds so that the room may be viewable from outside or completely private.

Staff Duty station:

The staff duty base should be at least 10m². The area should ensure staff safety and patient confidentiality. The base should also allow direct visualisation of the beds. There must be an enclosed "write-up" area to facilitate clinical discussion adjacent to the main staff base. A nurse office is also necessary. There must be a means of rapidly contacting the main ED duty base, to summon medical assistance in case of emergency. The ward should be linked to the ED/ hospital public address system.

The base area will also require:

- At least two computer terminals
- Designated telephone lines: Paging system, Internal and external lines
- Printers
- A PACS imaging twin viewer
- Patient call display
- Writing areas for medical, nursing and the multidisciplinary team
- Patient case-note storage area, Stationary storage
- Controlled drugs storage

Clinical Support Areas:

Dirty utility and clean drug preparation areas are required. The dirty utility and specimen testing area should be not less than 9m² in size and the clean preparation area must be at least 14m² in size. These must comply with hygiene standards. Adequate storage for bed linen and other ward materials is required. The scope of services provided will determine whether an area for near-patient testing is required within the CDU/Observation ward or if a room for Exercise Stress Testing for Chest Pain patients is necessary. Access to Diagnostic Imaging, digital X-ray and CT should be facilitated. A specimen transport link will be necessary.

IT systems:

Consideration of the interface or integration of clinical data relating to ED in-patient care with the ED IT system or EPR will be important. Interface with hospital patient administration and bed management systems will also be necessary.

Further details on the operation of these facilities will be provided in the position paper *Extended care in the Emergency Department* (currently in development).