

## ORIGINAL ARTICLE

# Improvements of the working conditions for physicians and patient safety in emergency departments

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## ABSTRACT

**Background:** A high staff turn-over and crowding are common problems in emergency departments (EDs). These problems coexist with a gradual decrease in hospital beds per capita. Many emergency physicians report burnout and plan to resign. Therefore, mostly inexperienced physicians, early in their career, are responsible for front-line emergency care.

**Methods:** Literature review and analysis of work environment in EDs. Based on this, structural and individual measures were proposed in order to optimize the work environment for physicians.

**Results:** Working conditions in the ED could be improved through modified back-up, checklists/algorithms, increased number of hospital beds, and optimal use of available beds, and a revision of the current shift organization.

**Conclusions:** We hope that this analysis will prompt a debate that may lead to improvements in work satisfaction, resource utilization and quality of care.

**Key Words:** Emergency department, Working conditions, Checklists, Patient flow, Crowding, Shift organization

## 1. INTRODUCTION

The evolution of emergency medicine (EM) as a specialty has concurred with dramatic increases in emergency department (ED) visit rates, in the United States, Canada, Sweden and many other countries in the world.<sup>[1]</sup> There are also signs of increased ED crowding in many countries, and hospitals have therefore implemented different interventions in order to reduce crowding.<sup>[1]</sup>

In Sweden, like in many other countries, emergency care is provided by larger hospitals with EDs staffed with a variety of specialists, including an increasing number of emergency physicians.<sup>[1]</sup> However, after 5 o'clock p.m., EDs are usually staffed only with inexperienced physicians, like interns

or residents in the beginning of their training, with senior physicians not in the hospital, but available over telephone for counselling. Usually, separate physicians are responsible for internal medicine patients, surgery and orthopedic patients, something that is gradually changing as emergency physicians take over more responsibility. To become an emergency physician in Sweden, at least 5 years of training (after becoming a licenced physician), is required, including also service outside the ED, for instance in intensive care and internal medicine wards.

The Public Swedish National Health Care System is funded by taxes, with an additional small copayment at the time of each visit.<sup>[1]</sup> Healthcare coverage in Sweden is univer-

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sal, thus all residents, including expatriates, have access to publically financed healthcare services.<sup>[2]</sup> There is also an extensive general practitioner network in place, taking care of non-urgent care.<sup>[1]</sup>

Many emergency physicians, in Sweden and in other countries, report burnout<sup>[3]</sup> and many plan to resign.<sup>[4]</sup> Different emergency physician projects have been discontinued<sup>[5,6]</sup> due to limited resources. Working conditions have sometimes been considered so poor that assistance from external authorities have been sought.<sup>[7]</sup> We have identified nine factors, partly related, that alone and in combination contribute to reduced work satisfaction in EDs:

- (1) crowding<sup>[8]</sup> and high work load
- (2) inadequate support from senior colleagues<sup>[9]</sup>
- (3) work under time constraints<sup>[10]</sup>
- (4) limited amount of beds for hospital admissions and observation<sup>[11]</sup> and therefore responsibility to identify a large proportion of patients that safely can be sent home
- (5) limited staffing<sup>[12]</sup>
- (6) deficient shift work organization (limited sleep during night shifts,<sup>[13,14]</sup> extended shifts, and limited recovery time and time lag between shifts)
- (7) undersized facilities<sup>[12]</sup>
- (8) inadequate clinical skills<sup>[15]</sup> (also among subspecialists that should act as general backup over telephone but usually work within highly specialized fields)
- (9) requirements for high quality standard of care,<sup>[16]</sup> despite above mentioned limitations.

Perceived stress in the ED can be explained by Karasek's demand control model.<sup>[17]</sup> The model states that high-strain jobs, with high demands and small possibilities to control the work environment, are particularly stressful and increase the risk of ill health, including emotional exhaustion and psychosomatic health complaints.<sup>[18,19]</sup> The situation with little control combined with a genuine effort to deliver high-quality care may cause mental stress.<sup>[20]</sup>

This has created a vicious circle where EDs are mostly staffed by inexperienced physicians. Symptoms of mental distress are also common among physicians early in their career,<sup>[21]</sup> coexisting with compulsory service in EM.<sup>[22]</sup> Despite this, many emergency physicians report high work satisfaction,<sup>[23]</sup> probably because a selection of physicians less vulnerable to existing stressors will continue working as ED physicians. However, in Sweden, most experienced physicians do not continue working in the ED, thus new and inexperienced physicians in need of support, in order to make safe and efficient decisions, are placed there.

Decision-making in the ED differs from decision-making in hospital wards.<sup>[24]</sup> Algorithms and checklists for structured work-up in the ED could therefore improve confidence in decision-making and thereby reducing stress and increasing patient safety and optimizing use of existing resources.

Several structural and individual factors that should be reviewed to improve working conditions for physicians in EDs are presented in Figure 1. Some of these factors and additional points are also discussed below.

## 2. METHODS

Based on the preceding literature review and own experiences the authors conducted an in-depth analysis of factors, presented in the following sections, that could improve working conditions for physicians and patient safety in EDs.

## 3. RESULTS

### 3.1 Patient flow

EDs should be staffed according to predicted inflow.<sup>[25]</sup> Estimations can be done based on the following assumptions, apart from historical data and demographic considerations:

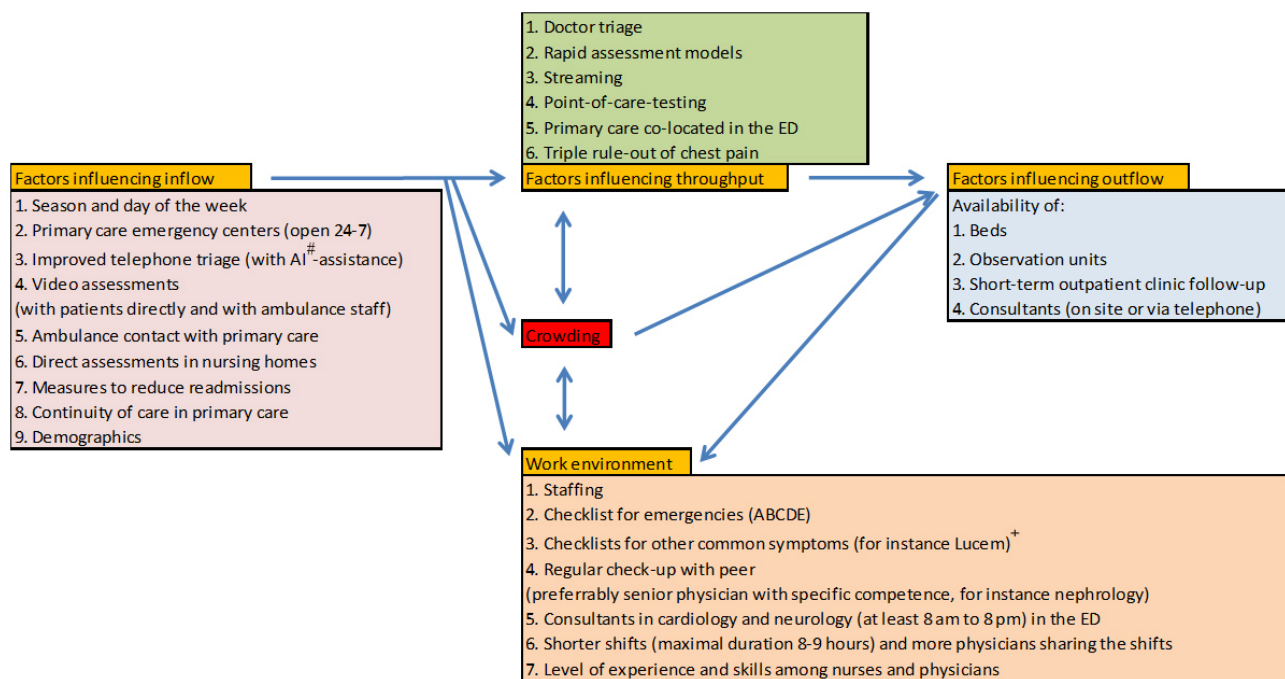
- (1) Patients tend to start to accumulate (causing crowding) in the ED from 11:00 a.m.<sup>[26]</sup>
- (2) Certain diseases like Calicivirus infections and Influenza peak in the winter months, which could then motivate more staff in the ED, due to an increased inflow.<sup>[27]</sup>
- (3) Empirically, it is also common with a higher inflow after certain holidays, like Christmas.

In order to reduce the inflow to the ED, patients should be offered alternatives for evaluation of presumably non-urgent problems. In Sweden, primary care often closes down around 5:00 p.m., and patients also have difficulty getting appointments during office hours, within a reasonable time.<sup>[28]</sup>

It is reasonable to believe that inflow to EDs would be reduced if primary care would offer appointments until 9:00 p.m., also at short notice. Preferably, primary care facilities should be available in close proximity to the ED, and be open around the clock. When patients call an ambulance the ambulance staff should be able to contact primary health care and ideally, together with the patient's regular family physician, decide whether transport to the hospital is necessary or not. Many patients call 1177, a free healthcare advice and referral call service, staffed by nurses.<sup>[29]</sup> It is sometimes difficult to give tailored recommendations by telephone, therefore often patients are recommended to seek emergency care without an imminent need. Although the 1177 service is intended to reduce visits to the ED, it may be the other way around.

Artificial decision support systems<sup>[30]</sup> could potentially assist nurses at the 1177 service and thereby decrease inflow to EDs. Appointments should be available online, for patients to book in primary care, in case of subacute emergencies. Elderly patients in nursing homes could probably often get the care needed without visits to the ED<sup>[31]</sup> which commonly would lead to admissions. A family physician could administer antibiotics at home and, under certain circumstances,

directly transfer the patient to a ward for in-hospital care, bypassing the ED. Improved referral indications could also be discussed with family physicians. But also basic medical education in schools and on television could potentially change patients' seeking behavior. For instance, the population should be informed not to seek emergency care in case of common cold or isolated paresthesia in the chest.



**Figure 1.** Improved working conditions for physicians in the ED<sup>[32]\*</sup>

\* The system is appropriate for moderate to large EDs. Modern emergency care requires advanced technology and investments that are impossible for small hospitals to offer (like catheterization laboratory, thrombectomy facilities and intensive care unit). <sup>#</sup> AI: Artificial intelligence. <sup>+</sup> Lucem (light or clarity, within the field of EM) checklists. These describe in detail what is important to ask for during history taking and what should be included in the physical examination, specifically for common symptoms encountered in the ED

Throughput in the ED is influenced by the number of available staff and, to a certain degree, their competence and decision-making capacity, crowding, waiting-time for imaging and laboratory data, but also free computers and rooms.

Another approach is to reduce unnecessary imaging, and postpone non-urgent investigations until patients are transferred to a ward. For instance, normally only in first-time seizures, acute brain computed tomography (CT) is indicated. Point-of-care testing has been shown to improve patient throughput,<sup>[32]</sup> because shorter time to results, but has to be weighed against quality and recalibration of the laboratory method used. Also streaming, thus a specified physician is responsible only for simple patients, has been shown to speed up throughput and to decrease crowding.<sup>[32]</sup> Finally, outflow is influenced by available beds for admission, risk

taking behavior among responsible physicians (decisions on admission or discharge, fear of incidence reports, amount of data collection before final decision), waiting time for transport (to hospital ward, other hospital or home).<sup>[33]</sup>

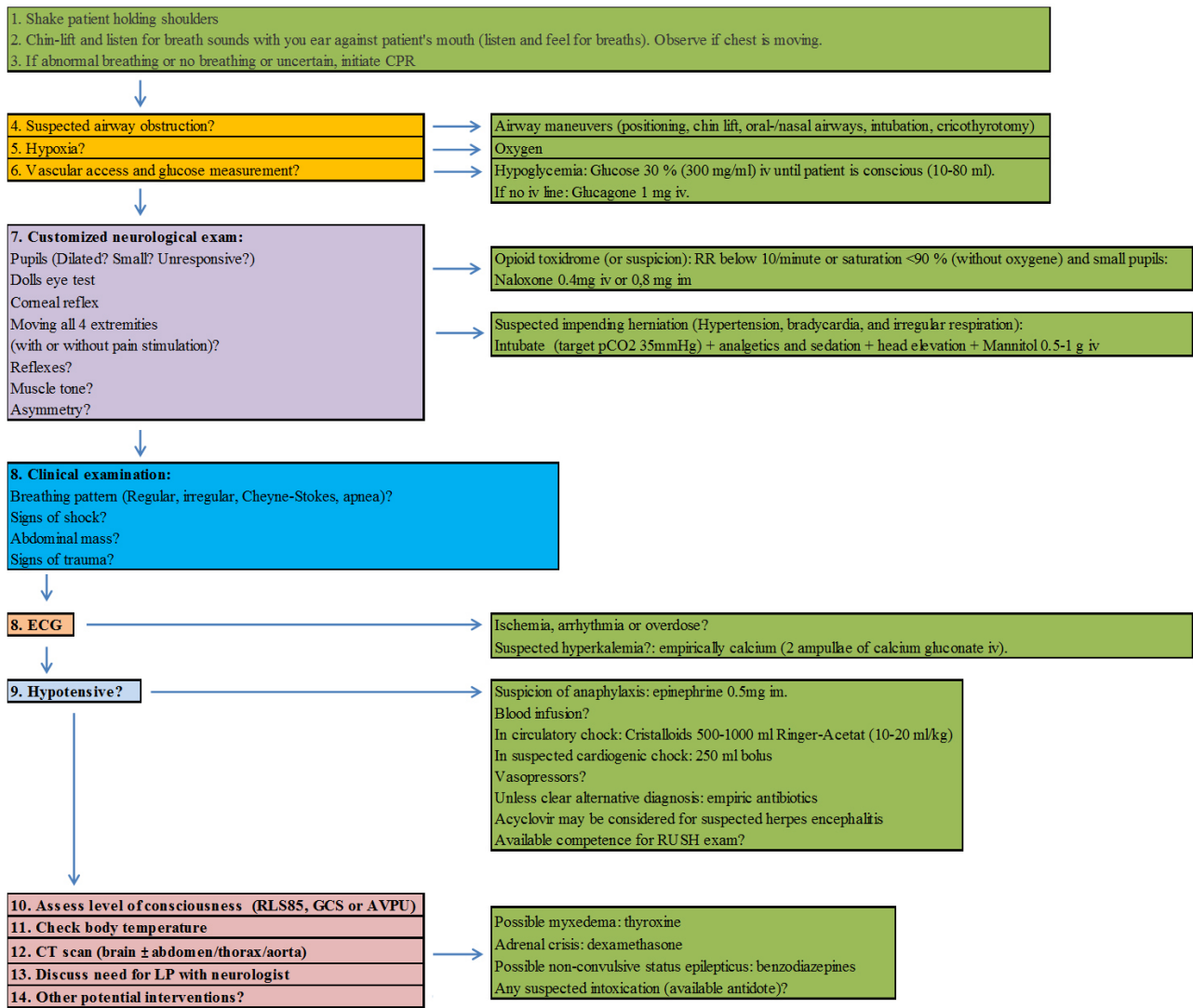
### 3.2 Use of hospital beds

Sweden, like many other countries, has a shortage of hospital beds.<sup>[11]</sup> The goal should therefore be to use available hospital beds in an optimal way.

#### 3.2.1 Alternatives to hospital admission

Potential alternatives to hospital admission could be:

- (1) More observation beds in the ED
- (2) Increased possibility to book revisits to appropriate out-patient clinics
- (3) Increased possibility to book follow-up to primary care



**Figure 2.** Suggested protocol for unconscious patients. Modified after reference<sup>[42]</sup>  
 RLS: Reaction Level Scale; GCS: Glasgow Coma Scale; AVPU: Alert, Voice, Pain or Unresponsive

**3.2.2 Better use of available hospital beds**

Elective patients should be admitted to a degree that does not obstruct predicted emergency inflow.<sup>[34]</sup> Unnecessary admissions could also be reduced by algorithms for safe discharge from the ED, using for example following algorithms:

- (1) PESI-score in pulmonary embolism<sup>[35]</sup>
- (2) CRB-65 in pneumonia<sup>[36]</sup>
- (3) Recurrent seizure does usually not require admission<sup>[37]</sup>
- (4) Triple-Rule-Out CT Angiography<sup>[38]</sup> and troponin algorithms in chest pain<sup>[39]</sup>
- (5) Easily available consultations with subspecialists – is there a better solution than admission in the specific patient?
- (6) Treatment/Work-up finished in ED? Could reduce need for admission, but there is potential for increased

crowding and resource utilization for example imaging.

Patients that are ready for discharge and are waiting for health care planning, establishment of home care or relocation to a nursing home should preferably be transferred to an allocated ward, to free beds on regular wards.

**3.2.3 Increase of available hospital beds**

Different types of beds that are needed are:

- (1) More rooms with better monitoring in the ED (can allow for a short observation period, without the need for admission).
- (2) Units with observation beds, without highly selective criteria for use, to avoid empty beds.
- (3) More general beds in different specialties (can probably reduce readmissions<sup>[40]</sup>) in combination with am-

bition for early discharge before noon, which would require enforced staffing in the wards, preferably a

special discharge physician scheduled only for that purpose to reduce ED crowding in the afternoons.

**Table 1.** Suggested cABCDE protocol for critically ill patients in Swedish EDs.<sup>[44-46]</sup> Can be modified for use in other countries

Abbreviation	Check-up	Measures
Cardiac arrest	Shout at the patient. If no response: Pitch arm or shake patient	Initiate cardiopulmonary resuscitation
	Put ear against nose or mouth and listen and feel for breaths <i>Unconsciousness, without breathing is cardiac arrest!</i> Observe! Pulse palpation is excluded in updated algorithm	30 chest compressions: 2 breaths  Connect automated defibrillator In VT/VF defibrillate once and then CPR for 2 minutes and renewed ECG analysis  Adrenaline 1 mg i.v./i.o. immediately in asystole/PEA, and after third defibrillation in VF/VT. Then every 4 <sup>th</sup> minute* If intubated: Continuous compressions while ventilations are given 8-10 times per minute Stop CPR if patient is breathing normally (or signs of spontaneous circulation) or no longer medically or ethically motivated <sup>#</sup>
Airway and spinal control	Neck inspection Mouth inspection (foreign body or oedema?) Tracheal deviation Breath sounds (stridor? obstructivity?)	Remove foreign body Oxygen therapy 10-15 litre/minute Stable patient: Target pox 94%-98% (In COPD 88%-92%) Chin-lift or nasopharyngeal airway (size: distance from the tip of the patient's nose to the earlobe) Oropharyngeal airway in unconscious patient (size: distance from corner of the mouth to the angle of the mandible) If stridor/oral edema: Adrenaline 0.3-0.5 mg i.m. Airway obstructed by the tongue or oral secretions? Position patient on his/her side, suction of the oropharynx and/or insert a nasal airway. Betamethasone 10 pills p.o. or (4 mg/ml) 2 ml i.v.
Breathing	Respiratory rate Pulseoximetry Breathing movements (symmetry? depth? accessory muscles used?) Breath sounds (prolonged expirium? ronchi? rales?) Thorax (subcutaneous emphysema? flail chest? penetration?) Blood gas? Waveform capnography (normal ETCO <sub>2</sub> is 35 to 45 mmHg)	Oxygen therapy (see above) Respiratory depression? Ventilation via bag mask or laryngeal mask/intubation? Salbutamol 2.5-5-10 mg, Ipratropium 0.5 mg or Terbutaline 0.5 mg s.c. Suspected tension pneumothorax: Needle decompression, by inserting a 14 or 16 gauge needle into the 2 <sup>nd</sup> intercostal space in the midclavicular line followed by tube thoracostomy.
Circulation	Pulses (frequency? filling? regularity? different strength?) Blood pressure? Heart sounds (rate? murmurs? distant tones?) ECG	Two large needles  Raise legs In anaphylaxia: Adrenaline 0.3-0.5 mg i.m. + Betamethasone 8 mg i.v. + Antihistamine p.o./i.v. In circulatory chock: Cristaloids 500-1,000 ml Ringer-Acetate (10-20 ml/kg) In suspected cardiogenic chock: 250 ml bolus Inotropes? Atropine 0.5 mg + 0.5 mg or external pacing in bradycardia In chest pain/pulmonary oedema: consider nitroglycerin, CPAP, loop diuretics och morphine
Disability	Neck stiffness? Pupil reactions? Body position, lateralization? Consciousness (AVPU or RLS) Glucose	Seizures (after 3-5 minutes: diazepam 10 mg i.v./p.r. ) 30 ml 30% glucose × 2 Glucagon 1 mg s.c./i.m./nasally Antibiotics? Antidote?
Exposure	Petechia (meningococcus infection?), urticaria, wounds, signs of trauma Temperature	Recovery position  Blankets

Note. \* Cordarone 300 mg i.v./i.o. if continuous VF/VT after third defibrillation and add 150 mg i.v./i.o. if VF/VT after fifth defibrillation; # Coronary angiogram if suspected cardiac etiology and ROSC. Emergency angiogram only in STEMI, LBBB or chest pain in association with cardiopulmonary standstill and concomitant ECG changes indicating ischemia

**Table 2.** Exclusion of serious conditions (A)<sup>[48]</sup>

Chief complain	What should be excluded?*
<b>Possible cardiovascular cause?</b>	
Chest pain	Acute coronary syndrome (compare with previous ECG and troponin level)
	Pulmonary embolism
	Aortic dissection
	Pneumothorax
	Caused by infection?
	Abdominal cause?
Dyspnea	Upper airway obstruction (sputum-suction?, foreign body, anaphylaxis)
	Acute coronary syndrome
	Heart failure
	Pneumonia
	COPD-exacerbation
Syncope	Pulmonary embolism
	Asthma
	Differentiation, based on history/observations from bystanders between syncope and seizure
	Cardiovascular etiology (ischemia, arrythmia, valve disease, tamponade, pulmonary embolism)
	Orthostatic etiology (medications, drugs, hypovolemia)
<b>Possible infectious cause?</b>	
Fever	Sepsis
	Neutropenic fever?
	Influenza
	Infectious focus (erysipelas, pulmonary, uninary tract [pyelonefritis], upper airways, oral/teeth, ears, brain, needles, wounds, abdomen [peritonitis, diverticulitis, colecystitis, appendicitis], infectious endocarditis)
	Pulmonary embolism
	Drug-induced fever
Diarrhea	Gastroenteritis (contagious? dehydrated?)
	Invasive bacterial syndrome
	Sepsis
	Gastrointestinal bleeding

*Note.* \* Patients without confirmation or suspicion of these conditions can usually be safely discharged from the ED. Some of the mentioned conditions, depending on severity, might only need initiation of treatment and/or observation in the ED before safe discharge. Do not forget symptom relief!

**3.3 Scheduling**

**3.3.1 Improved shift organization**

- (1) Shorter shift duration (we suggest max 8-9 hours), also night-time, so that physicians can make better decisions and feel more satisfied at work.
- (2) During night-shift, staffing should be planned in the way that physicians can be allowed to go to bed for an hour of sleep in the middle of the night.
- (3) More physicians should serve in the ED during work peaks, for example in afternoons, evenings and winter season.
- (4) Pay should be offered per patient for a “streaming” physician taking care of simple patients.<sup>[41]</sup>

**3.3.2 Improved back-up**

Senior physicians probably make better decisions than un-experienced and could potentially avoid unnecessary admissions. However, this implies that they have maintained their competence in general EM and have, themselves, gone through a structured EM education. The problem is that today’s specialists are usually highly specialized in narrow fields.

We therefore suggest that subspecialists, for common and potentially life threatening conditions (cardiology, neurology, intensivists/emergency care physicians for high priority patients according to triage), when possible, are placed in the ED and infectious disease specialists are available around the

clock, at least over telephone. Senior colleagues, that should support young inexperienced physicians, should regularly attend emergency courses and also work a couple of weeks each year in the ED. Better back-up also leads to better ed-

ucation of new physicians and improved work satisfaction. This might lead to more young physicians pursuing a career in EM in the future.

**Table 3.** Exclusion of serious conditions (B)<sup>[48]</sup>

Chief complain	What should be excluded?*
Neurology	
Neurological deficit	Stroke/TIA (Indication for thrombolysis or thrombectomy? Assess if carotic or vertebrobasilaris territory and if cortical or subcortical) Dissection (aorta, carotis, vertebrobasilaris) Compressive myelopathy (usually asymmetrical and gradual symptom onset). Usually more pronounced symptoms in lower extremities. Bladder and bowel function? MRI scan? Non-compressive myelopathy (inflammatory). May be acute. Usually more pronounced symptoms in lower extremities. Bladder and bowel function? B12 deficiency? MRI scan? LP? Sinus thrombosis (CT-angio with venous phase or MRT-angio?) Borreliosis Temporal arteritis Guillain-Barr é Syndrome (Relative symmetry + hypo- or areflexia)
Progressive weakness in more than one extremity	Myositis
Headache	Subarachnoidal bleed Bacterial meningitis Serious intracranial pathology (tumour?) Temporal arteritis
Vertigo	Stroke ± dissection Vestibularis neuritis or bacterial labyrinthitis (inspect ears)
Visual disturbance	Stroke? Retinal detachment Central retinal artery occlusion? Temporal arteritis?
Seizures	Etiology (tumour on CT or MRT, drugs, infections, subtherapeutic doses of antiepileptica) Structural (bleedning, stroke ± basilaristhrombosis)
Altered mental status	Infectious (sepsis, meningitis, herpes encephalopathy) Electrical (non-convulsive status) Metabolic (Wernickes encephalopathy or drugs)

*Note.* \* Patients without confirmation or suspicion of these conditions can usually be safely discharged from the ED. Some of the mentioned conditions, depending on severity, might only need initiation of treatment and/or observation in the ED before safe discharge. Do not forget symptom relief!

**3.4 Structured approach to patients**

We suggest that physicians usually go through the following 9 steps (with additional sub steps) to ensure uniform, standardized and high-quality care in the ED.

- (1) Has the patient cardio-pulmonary arrest (unconscious and no or highly abnormal breathing)? Start immediate CPR according to country-specific guidelines.
- (2) Is the patient unconscious (but without cardio-pulmonary arrest)? Use algorithm, modified for your country, for unconsciousness (see Figure 2).<sup>[42]</sup>
- (3) Has the patient another potentially life threatening condition or is the patient deteriorating (or difficult

to obtain medical history due to dementia etc.)? Use ABCDE algorithm, with appropriate modifications depending on country (see Table 1).<sup>[43-46]</sup>

- (4) Evaluation of vital signs and ECG: Need for immediate percutaneous intervention or immediate therapy (oxygen, fluid, antibiotics [observe allergy], adrenaline).
- (5) Background history according to MAPLES (medications, allergies, past medical history [diseases?], life circumstances [for instance living in a nursing home? home alarm?], drug abuse and smoking).<sup>[43]</sup>
- (6) Has the patient pain? Pain history according to OPQRST (onset, position, quality, relieving/aggravating, severity, time).<sup>[43]</sup>

- (7) Lucem checklists according to chief complain.<sup>[47]</sup> These describe in detail what is important to ask for during history taking and what should be included in the physical examination, specifically for common symptoms encountered in the ED.<sup>[47,48]</sup> These checklists are developed in Sweden, but are available in English for international use.
- (8) Routine physical exam + (neurological exam? + special tests)
- (9) Checklists to exclude serious conditions (see Tables 2-4),<sup>[48]</sup> common in EDs in Europe, Canada and the United States.

**Table 4.** Exclusion of serious conditions and management of organ failure<sup>[48]</sup>

Chief complain	What should be excluded?*
<b>Musculoskeletal apparatus</b>	
Joint pain	Septic arthritis?
	Gout attack?
	Trauma
Swollen or painful extremity	Deep vein thrombosis
	Arterial Insufficiency
	Infection
	Compartment syndrome
	Ruptured Achilles tendon
Muscle exhaustive symptoms	Myasthenia gravis (Increased ptosis during 2 min looking upwards or nasal speech during 2 min reading)
<b>Other reasons</b>	
Intoxikation	Call Swedish Poisons Information Centre? Exclude conditions with available antidotes. Evaluate risk for aggressiveness or self-inflicted injury. Children?
Allergy	Anaphylaxia Angioedema
Acute heart failure (with pulmonary edema)	Immediate PCI if suspected myocardial infarction. Furosemide i.v., 10-20 mg in patients not on diuretics, 40-80 mg in patients on diuretics. 120-160 mg if no response. Morphine 5-10 mg i.v. if anxiety or pain. CPAP 5-10 cm H <sub>2</sub> O (caution if systolic BP < 90 mmHg). Nitroglycerin sublingual pill or spray (if systolic BP > 100 mmHg). Remove nephrotoxic drugs and drugs contraindicated at low GFR. Routine tests: Hb, leucocytes, thrombocytes, white blood cell (WBC) differential, CRP, sedimentation rate, P-glucose, liver enzymes och coagulation parameters. Blood gas analysis.
Acute renal failure	Bladderscan, creatinine (compare with previous level), urea, urat, albumin, Ca, phospat, PTH och p-standard bicarbonate, urinary dip stick, U-sediment, U-albumin/creatinine ratio, U-osmolality and FENa. Pulmonary x-ray, renal ultrasound (size – hydronephrosis – parenchyma) Diuretics only if overhydrated. Need for fluid? Urinary catheter (urinary output). Blood pressure regulation?

*Note.* \* Patients without confirmation or suspicion of these conditions can usually be safely discharged from the ED. Some of the mentioned conditions, depending on severity, might only need initiation of treatment and/or observation in the ED before safe discharge. Do not forget symptom relief!

#### 4. CONCLUSIONS

Working conditions in the ED could be improved through modified back-up, checklists/algorithms, increased number of hospital beds, and optimal use of available beds, and a revision of the current shift organization. The included treatment protocols in this article reflect what could be considered Swedish high-quality care, and, when used in other countries, have to be adapted to local circumstances, and country specific treatment traditions.

As most EDs have the same main objectives, primarily to take care of patients seeking emergency care, our collected ideas could certainly be applied to emergency care in most countries, striving for improved quality, logistics, and cutting of costs.

#### CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.



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