EDITOR'S CHOICE

# Emergency department triage revisited

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## ABSTRACT

Triage is a process that is critical to the effective management of modern emergency departments. Triage systems aim, not only to ensure clinical justice for the patient, but also to provide an effective tool for departmental organisation, monitoring and evaluation. Over the last 20 years, triage systems have been standardised in a number of countries and efforts made to ensure consistency of application. However, the ongoing crowding of emergency departments resulting from access block and increased demand has led to calls for a review of systems of triage. In addition, international variance in triage systems limits the capacity for benchmarking. The aim of this paper is to provide a critical review of the literature pertaining to emergency department triage in order to inform the direction for future research. While education, guidelines and algorithms have been shown to reduce triage variation, there remains significant inconsistency in triage assessment arising from the diversity of factors determining the urgency of any individual patient. It is timely to accept this diversity, what is agreed, and what may be agreeable. It is time to develop and test an International Triage Scale (ITS) which is supported by an international collaborative approach towards a triage research agenda. This agenda would seek to further develop application and moderating tools and to utilise the scales for international benchmarking and research programmes.

## INTRODUCTION

A new triage scale was introduced into the emergency department (ED) at Ipswich Hospital, Queensland, Australia 20 years ago. The Ipswich Triage Scale (ITS) was a five category scale similar to one in use at the Box Hill Hospital, Victoria, Australia. However, this scale incorporated a patient "urgency test" to discriminate between triage categories. Validation of the ITS[1 2] led to its adoption as the National Triage Scale (NTS) and subsequently the Australasian Triage Scale (ATS). This in turn formed the basis of the Manchester Triage Scale (MTS)[3] in the UK and the Canadian Triage and Acuity Scale (CTAS).[4]

There are two significant issues in current triage systems. First, recent frustrations with ED overcrowding due to growing demand and access block have brought the ongoing utility and value of triage systems into question.[5 6] Second, other jurisdictions (particularly the USA) are yet to adopt a standardised approach. This limits opportunities for international benchmarking of ED performance and experience.

The aim of this paper is to review the status of ED triage and provide guidance with regard to the future direction. The paper examines the history and evolution of triage systems, addresses the conceptual basis of triage and the research experience and makes recommendations for the future.

## TRIAGE IN EMERGENCY MEDICINE

Triage is an essential element of modern medical care as it is necessary to assign relatively scarce resources to unlimited medical needs. Such assignments become necessary where there is a mismatch in quantum, time or location between the medical needs of patients and available resources.

In emergency medicine this mismatch relates to the timeliness of care and relative resource availability. Emergency medicine, like military medicine, has little control over the rate and number of presentations. Although patient numbers are predictable at the population level, they are not predictable at the individual level. Further description of workloads by triage categories adds weight to the predictability of patient populations. In addition, major events can lead to sudden overwhelming demand. Triage in emergency healthcare is a continuous process, but is also emphasised at key points in the continuum of care. These points include extrication from the scene, on arrival at the ED, upon admission to hospital and on presentation to operating theatres.

Triage systems are designed to serve the value of human life and health with fairness and the efficient use of resources. They do this by determining who will not be disadvantaged by longer waiting times and who requires immediate attention to achieve optimal outcomes. The need for triage is enhanced by the growing imbalance between needs and resources resulting from the twin challenges of access block and growing demand.

Traditionally, the triage process is an intuitive element of ED nursing practice. Nurses have always reorganised queues to ensure that those unable to wait are seen first. The earliest written record of the use of triage in emergency medicine, in a systematic sense, was in the early 1960s at Baltimore, USA.[7] However, this and other early systems lacked formal structure and organisation. In addition, there was no agreement on the categories used. Triage was often performed by clerical staff or by the patients themselves who were asked to choose whether they wished to attend "Medical" or "Surgical Casualty". Over time, many departments began to introduce more formalised systems of triage to meet the demands of modern emergency medicine. Anything from 2 to 10 categories were used to assign patients.[1]

At the same time as more formalised systems appeared, there emerged a focus on ED performance. This led to system-wide performance evaluations of the processes and outcomes. These evaluations aligned the need to ensure patients

received appropriate, timely and high-quality care with an accurate breakdown of ED workload.

### Development of triage scales

In Australia the development of a more formal triage system began with observations of the behaviours of triage nurses. While there was considerable variability in the systems of triage, this observation identified several consistent and distinct actions following assessment. These actions were determined by the urgency of the patient and included:

1. To immediately call for medical attention and commence resuscitation.
2. To assign the patient to the next available doctor.
3. To place the patient's file at the front of the waiting list.
4. To place the patient's file in order in the waiting list.
5. To encourage the patient to seek help elsewhere or at another time.

The core decision underlying these observations was the "urgency" of the patient and the nurse's assessment of the time by which medical assessment should occur. This led to the development of the ITS, which was broadly based on a 5-level categorical scale then in operation at the Box Hill Hospital in Victoria. However, the ITS included a functional urgency descriptor based on the nurse's overall determination of the urgency of the patient (box 1).[1]

Initial studies were used to evaluate the new ITS. Written patient vignettes compared triage assignments by nurses from a variety of institutions and experience. Following this, a detailed analysis was conducted of the use of the scale over 12 months at Ipswich Hospital. These studies showed a relatively high level of concordance in triage assessments between nurses, a direct relationship between the triage assessment and a variety of other severity measures (eg, Trauma Score, Injury Severity Score and Asthma Severity Scores) and a direct association with outcomes such as mortality, time in hospital, time in ICU and resource utilisation.[1]

Further studies by Jelinek confirmed the repeatability and validity of the system, while developing further the resource association and proposing the casemix classification systems Urgency and Disposition Groups and Urgency Related Groups. These provided a means of defining ED workload and providing the grounds for funding and performance evaluation systems.[2]

This work formed the basis of the adoption of the ITS in 1994 by the Australasian College for Emergency Medicine (ACEM) as the National Triage Scale (NTS).[8] However, the NTS modified the urgency descriptor of the ITS by including performance standards which were considered more acceptable to the community. These effectively incorporated a performance standard into the urgency descriptor. For example, the College felt it unpalatable to suggest that it condoned patients waiting days to be seen. The "days" category, however, did not imply that the patients should wait days, but that they could without adverse clinical effect.

**Box 1 The Ipswich Triage Scale: urgency test**

This patient should under reasonable circumstances be seen by a medical officer within:

1. Seconds
2. Minutes
3. An hour
4. Hours
5. Days

**Table 1**

**The Australasian Triage Scale (ATS)**

| Category | Description | Performance standard |
|---|---|---|
| ATS 1 | Immediate | 100% |
| ATS 2 | 10 min | 80% |
| ATS 3 | 30 min | 75% |
| ATS 4 | 60 min | 70% |
| ATS 5 | 120 min | 70% |

The NTS subsequently became the ATS in 2000 and has been extensively validated by both research and operational experience (table 1).[9–11] The ATS also formed the basis of the CTAS in Canada and the UK's MTS.

Attempts to improve repeatability of ATS have been based on the development of educational programmes and an education kit (the Emergency Triage Education Kit, ETEK).[12–14] The development and distribution of these evidence-based triage training programmes has been supported by government at both state and national levels in Australia. However, to date, no comprehensive evaluation has been carried out to measure the impact of this enhanced training on the reliability of the ATS.

The ATS and the associated performance standards are now the basis of performance reporting of EDs throughout Australia and the source of considerable public and political interest.[15] The ATS is used as a clinical indicator, benchmarking tool and funding mechanism.[16] In 1995 the Victorian Government introduced the Emergency Service Enhancement Program to provide bonus payments to hospitals on their performance against the triage-related standards.[17 18]

Several international scales have developed from or been based upon the ATS.

The CTAS was derived from the ATS and was introduced in 1999 and then upgraded in 2004 and 2008.[4 19 20] A paediatric version and a rural implementation standard have also been published.[21] The CTAS is also a 5-level categorical scale which assigns patients into the levels shown in Table 2.

The CTAS uses guidelines based on the presenting complaint which have been computerised to improve ease of utilisation and repeatability.[22–24]

The MTS is also based on the ATS but uses an algorithm approach to improve repeatability.[3] A guide has been produced along with supporting educational programmes. The scale which forms the basis for the MTS has been mandated for use in UK emergency departments and its use extensively validated including for paediatric patients.[25]

Most EDs in the USA continue to use a 3-level scale (emergency, urgent and non-urgent) but, increasingly, 5-level scales are being adopted throughout the country.[26] The most common is the Emergency Severity Index (ESI) which is also a 5-level categorical scale. However, this is constructed in a 3-tier assessment of acuity, resource requirement and vital signs.[27] A joint American College of Emergency Physicians (ACEP)/Emergency Nurses

**Table 2**

**Canadian Triage and Acuity Scale (CTAS)**

| | Time to physician assessment |
|---|---|
| Resuscitation | Immediate |
| Emergency | <15 min |
| Urgent | <30 min |
| Less urgent (semi-urgent) | <1 h |
| Non-urgent | <2 h |

Association (ENA) task force has supported the move to a 5-level scale in the USA.[26 28]

Other countries, or at least individual institutions, have adopted these scales including the CTAS in Sweden,[29 30] Andorra[31] and the Netherlands[32] and the ESI in Greece.[33] However, these scales have been produced in developed countries and it is unclear if they can translate to other countries, particularly developing countries. While some may consider that these scales would have limited applicability in the developing world owing to training requirements, there is good evidence that, even with minimal training, the ITS is used with adequate reliability by nursing staff with a variety of levels of experience.[1]

## A CONCEPTUAL FRAMEWORK FOR TRIAGE

### The principles of triage

The principal purpose of ED triage is to ensure that the patient receives the level and quality of care appropriate to clinical need (clinical justice) and that departmental resources are most usefully applied (efficiency) to this end.[1 34]

Clinical justice is based on the premise that patients presenting to EDs have a variety of complaints—some very urgent and others relatively not urgent. Clinical justice, including clinical efficiency, aims to ensure that the patient receives care appropriate to need and in a timely fashion.

Triage systems facilitate the initiation of further assessment and treatment, comfort and reassurance, documentation of patients and their needs, communication with them and their families regarding the nature of their problem and the process of care likely to follow, initiation of infection control procedures and education regarding illness prevention and control.

Not all patients presenting to EDs require the same level of treatment and resources, so a simple head count of patients tells little of the mix of complexity. The growing demand for emergency healthcare, access block and associated ED congestion adds to the need for a better description of workloads and relative resource requirements. Organisational efficiency is achieved by applying the resources in a timely and appropriate manner, providing information on the diversity of workloads for policy, planning and performance management purposes and providing a means of ensuring quality control, staff support and research. While these may be achieved by less formal approaches, the principal value of formalised triage systems lies in the support provided to staff and the ability to compare and contrast performance over time and with other institutions.

#### The concept of urgency

The concept of urgency is central to triage in emergency medicine. Urgency incorporates concepts of timeliness and is different from severity. Urgent conditions may not necessarily be severe (eg, a dislocated joint), while severe illness (eg, terminal malignancy) may not necessarily be urgent. Both clinical and environmental factors contribute to the urgency of any particular patient.

Clinical factors include the nature of the illness or injury, the severity and symptoms associated with it, the remediability of the condition to successful intervention and the potential impact of time on the outcome. Thus, a dislocated knee joint with compromised circulation is urgent because of the need to relieve pain, the potential adverse outcome if left untreated and the ability of relocation to rapidly improve both the symptoms and outcomes. On the other hand, a patient with terminal malignancy is in need of comfort, dignity and privacy, but little will alter the eventual clinical outcome.

Urgency is also influenced by societal and organisational factors, including the circumstances of the illness, the family circumstances and the resources available to treat the patient. Thus, a small child in pain will be relatively more urgent than an adult as the potential for injury and the difficulties in assessment lead to a higher level of urgency.

### Triage assessment and decision making

Attempts to improve the consistency of triage assignments fall broadly into the following approaches:

- The *recipe* approach in which the assessor uses a combination of assessment elements in a predetermined way. For example, the Glasgow Coma Score accumulates various physiological parameters into a single measure.
- The *dictionary* approach in which the assessor uses a predetermined agreed outcome to allocate urgency. For example, "myocardial infarct" may be listed as "level 2" while "fractured forearm" may be listed as "level 3".
- *Algorithms* which guide the assessor through a decision tree based on a series of predetermined questions. Such an approach is standard in triaging emergency calls to ambulance dispatch centres.
- *Red flags* are lists of circumstances which raise awareness and alert. Mechanisms of injury list high impact circumstances which should raise awareness of the potential for serious injury regardless of physiological abnormalities or anatomical derangement.
- A *global* assessment of the patient, while potentially the most subjective, combines a myriad of factors derived from the experience and observations of the assessor into an overall judgement.

None of these approaches has been shown to be absolutely consistent in the assessment of urgency of any particular patient. The complex interaction of clinical, social and environmental factors makes it difficult to identify a "correct" answer in any individual in all circumstances. The process of assessing urgency is complex. Nurses use a wide variety of strategies including data collection, hypothesis testing and rating allocation in making their assessment, thus reflecting the complexity of the assessment.[35]

### Assessment scales

The variety of triage scales demonstrates the difficulties inherent in developing a consistent approach that fits each circumstance, different health system, funding arrangements and social circumstances.

What is a good scale or, more particularly, what is a good triage assessment? Criteria used to judge a good scale include simplicity, feasibility, flexibility, meaning, validity and repeatability. Validity includes both construct and outcome validity. Construct validity addresses the logic of the structure and its application and comparison with other measures of relevance such as other measures of urgency or severity. Outcome validity describes the ability of the measure to accurately predict outcomes. Repeatability describes the ability of the assessment to be replicated in similar circumstances by other individuals.

Triage scales in use throughout the world have three elements: the number of categories in the scale, the terminology of the categories and the processes used to assign patients to the categories. Often, an indicator of the performance required is added to this.

All scales are categorical. A continuous scale has never been shown to be of value. The purpose of triage is to determine an action from among a selection of alternatives. As the response is categorical (resuscitate, assign to a bed, ask to wait, etc), the scale must be categorical and the categories aligned with the actions.

The number of categories was initially determined intuitively from observations of different actions by receiving nurses. The balance is between too few categories (allowing little discreet action) and too many (where the differences are not sufficiently discreet). Experience has shown that there is a higher level of agreement in 5-category scales than in 3-level scales.[36]

### Addressing validity and repeatability

Research and operational experience with the use of standard triage scales has demonstrated the value of the triage categorisation as a predictor of ED outcomes. These outcomes may include admission rate, time in hospital, time in ICU and in-hospital mortality.[1 2 31] However, the diversity and complexity of health is such that it is never possible to have a *correct* answer for triage of any individual patient. Indeed, there is probably no such thing as a "correct" answer, so there is no gold standard against which to measure triage accuracy.

There will always be diversity in the description of the patient associated with clinical and environmental differences. Any individual patient triaged by a number of "trieurs" will receive a spread of assessments. Many studies have examined repeatability of triage assessment using written or computerised vignettes to test the consistency of triage assessment.[32] These studies have demonstrated weighted kappa scores ranging from 0.34 to 0.84.[37–44] In one study, reliability of the CTAS improved with the use of computerised decision support.[22] Measuring repeatability is a challenge.

There is no gold standard for triage. A number of studies have used retrospective assessment by an "expert or expert group", but retrospective assessment lacks the cues and complexity of the "live" situation and is dependent on the records available. The complex interaction of factors that characterise the triage assessment is difficult to capture or replicate in a written or computerised description. Salk *et al* examined the addition of visual cues but was unable to demonstrate improved repeatability.[45] On the other hand, Worster *et al* showed that the addition of visual and non-written cues significantly improved the reliability of real live cases versus paper-based scenarios[46] Similarly, Considine *et al* noted that the addition of visual cues improves repeatability, implying a significant difference between the paper or even computerised vignettes and the real world interaction.[47] Interactive computer-based triage simulations may be a more effective means of evaluating processes and performance of triage.[48] The mode of interaction is important.[47] In the future it may be possible to use modern technology including video recording of actual or "acting" patients to capture the non-verbal and situational cues that are essential components of the triage assessment.

Variations may be associated with the personality and experience of the individual "trieurs" and the clinical diversity of patients. Differences are also likely to be due to the divergent range of approaches that have been used to determine agreement in these studies.[14 49] At the population level, these variations balance themselves out and result in consistent population descriptions.[48] There may be variability between institutions because of external influences, incentives or policies, or the culture of the work environment.

The challenge is to differentiate real differences in patient urgency from differences derived from culture or policy. This may be assessed by comparison with outcomes (eg, admission rate) which may reflect real differences in urgency, but may also reflect different policies for admission or differences in resource availability.[44] The expectation is that busy departments are more likely to assign a lower level of urgency to a given patient than less busy departments, but studies have failed to demonstrate any such association.[10 22 50]

Attempts have been made to reduce the variability of triage assessment by the education of triage nurses, guidelines for triage, triage algorithms, agreed triage outcomes, audit and moderation or triage assessment. However, there is little consistent evidence that any of these strategies produce any higher level of consistency of triage descriptions.

Education, either alone or in combination with other mechanisms, should reduce variability. Raper *et al* showed that educational preparation of the triage nurses was a significant predictor of patient satisfaction with the triage process.[51] Research conducted as part of the development of the ETEK in Australia has uncovered new evidence to suggest that agreement for the ATS is lower in specific populations of ED users, particularly people presenting to EDs with mental health problems and pregnancy-related conditions.[14] Given this outcome, and the considerable collaborative efforts in the development of these training programmes by government and professional medical and nursing organisations, there is an urgent need to conduct rigorous evaluation studies to determine the effect of these interventions on existing ED performance indicators. The effects of different modes of delivery for triage training are poorly understood. In one of few evaluation studies, Canadian researchers carried out interviews and chart audits to evaluate the impact of a 6-week web-based training programme on nurses' satisfaction with the course and the accuracy of triage decisions.[52] Following training, good levels of satisfaction with the course content and high levels of concordance to the CTAS guidelines were reported.

### Trieur (the one who performs triage)

Most triage systems rely on an experienced nurse to undertake triage. Recent discussion has focused on placing a physician in triage. These papers have demonstrated reductions in length of stay for discharged patients, improved patient processing and reduced waiting times for patients during busy periods.[53–56] However, there is no evidence to suggest that physicians are any better or more cost effective at triage than experienced nurses. Indeed, there is a risk associated with the use of physicians who may begin to treat rather than assess and assign a priority.

There is evidence that the effectiveness of triage is associated with the experience of the nurse, particularly experience in emergency care. Durojaiye and O'Meara demonstrated a higher level of consistency among nurses from paediatric hospitals in the assignment of priority to a paediatric patient, suggesting the value of experience.[57] Worster *et al* showed that, after 3 h of training, experienced general nurses were able to match experienced triage nurses in the use of the CTAS.[39] Goranssen *et al* examined the personal characteristics of the nurses and found that none of them correlated with the ability to triage scenarios except the general and ED nursing experience.[29] The introduction of automated triage systems may help to translate the experienced nurse's capabilities to less experienced nurses.[58] Chung showed that the reliability of the triage assessment is dependent on the experience, information and intuition of the nurse in making the decision. Adverse factors include interruptions, time constraints and lack of training.[59]

### Funding

A number of attempts have been made to use triage descriptions as the basis for funding of EDs.[2 17] In most single-payer environments the funding of EDs is via a fixed grant. Thus, unlimited and uncontrolled demand is confronted by fixed funding. The

cost infrastructure of EDs contains a fixed and variable component. The fixed component represents the standby capability while the variable component is directly related to patient throughput and complexity.[60] On the other hand, private hospitals are mostly funded by patient payments. Incorporation of funding linked to triage assessment creates an incentive to over-triage and the potential for "gaming" to achieve higher returns.[60]

### Performance of triage systems

Much of the public debate, both within emergency medicine and the broader political environment, has focused on the failure of an ED to meet performance criteria associated with the triage assessment. However, there is no evidence base for the performance targets. There is no evidence to show that the outcomes of patients in category 3 would be significantly different if they were not seen within the prescribed waiting time. Patients in category 5 in the ITS are adjudged to be able to wait days, so the decision to assign a waiting time of 2 h has no relationship to the clinical needs of the patient but rather the perceived acceptability of certain waiting times to patients and the community. There is a danger of adopting a sequential approach to management whereby all category 1 patients are seen before category 2 patients, etc. The logical extension of this is that the patients at the end of the priority list may never be seen.

Recent changes in the way emergency medicine is practised and changing patient flows in EDs, particularly in the UK, have raised the possibility that triage can either be simplified or dispensed with altogether. The "4-hour rule" in the UK, soon to be introduced in Western Australia, relies on simplification of patient presentations into major and minor; others have proposed 3-tiered triage scales into resuscitation, urgent and non-urgent.

While some have suggested that we can do away with triage, we do not accept this premise. The purpose of triage is to assign urgency to patients for clinical justice and system efficiency purposes. The obverse of triage is "not-triage", which is unethical and unacceptable. Consumer perceptions are generally supportive of the triage approach, although a lack of knowledge of the system and a desirability of consumer input into their triage assessment was valued.[61]

The question is not whether we should triage, but what we should do with the patients once they have been triaged. Where practicable, strategies should be determined to ensure that all categories of patients are dealt with in accordance with their assigned urgency assessment. Resources should be applied to each of the categories. Fast track and other arrangements are entirely appropriate to ensure the objective of justice and efficiency. New "fast track" initiatives have assigned dedicated resources to manage less urgent patients. Fast tracking has been shown to reduce waiting time and length of stay without impacting on the management of acute patients.[5 62] However, nurses may have a limited ability to predict admission to hospital at the time of triage,[63] and therefore the effectiveness and safety of such assignments requires further study.

Some have suggested that triage assessments identify patients who could be deferred to other services and thus reduce overcrowding in EDs. This misunderstands the purpose and nature of triage. The difference between urgency and severity means that there is no simple association between lower triage categories and "inappropriate" attendance at the ED. Vertesi used the CTAS to note that, while category 4 and 5 patients constituted a very small proportion of patients who used stretchers (trolleys), they still constituted 7% of admissions and that deferral of these patients on triage assessment alone would have little impact on ED capacity and create an unacceptable risk of refusal of care.[64] Schull *et al* showed that low complexity patients were associated with negligible increases in ED length of stay and other performance indicators and were thus not the cause of ED crowding.[65] Field and Lantz used the CTAS to determine the appropriateness of non-urgent visits and found that 34% had been referred to the ED, 49% believed they needed services only available in the ED and 43% perceived that their condition was urgent.[66] In Australia, 15.5% of category 4 patients and 4.2% of category 5 patients arrive by ambulance and 16% and 5%, respectively, are admitted.[16] These are clearly not all "general practice" patients.

**Box 2 The International Triage Scale**

All patients presenting to emergency departments should be assessed in order to determine whether their condition requires medical intervention to avoid unnecessarily adverse outcomes within:

| | Urgency | Performance targets |
|---|---|---|
| 1. Resuscitation | Immediately | — |
| 2. Emergency | Minutes | — |
| 3. Urgent | An hour | — |
| 4. Acute | Hours | — |
| 5. Non-urgent | Days | — |

## FUTURE DIRECTIONS

Although the construct of the triage scale is important, it is not the critical issue. Collective experience and research has reinforced the value of a 5-level categorical scale.[26] The variability between these scales relates to the methods used to improve repeatability and consistency. Therefore, there is value in an international commitment to the 5-level scale based on the broad descriptors and using the urgency test.[67] Given that the three major jurisdictions adopting this 5-point scale have elected to use three different time indicators for the categories, it seems appropriate to return to one universally understood scale, essentially the ITS (retitled), and then apply performance indicators appropriate to each jurisdiction (box 2).

With this consistent assessment, any jurisdiction or, indeed, individual hospital may determine its own performance indicators and its own mechanism to ensure consistency and accuracy in the application of triage assessment. To facilitate this, a major international study would be useful to compare the expression of the CTAS, MTS and ATS in terms of the patterns of population descriptions, the outcomes and the consistency.

The use of triage as the basis of funding will require instruments which ensure that gaming of the triage system does not adversely alter the triage assessment so as to maximise revenue. Attempts to reduce this deliberate or accidental variation may include education, algorithms, guidelines, audit tools or automated decision support programmes. However, we do need an audit mechanism.

To that end, we propose a series of international studies aimed at the development of moderating tools which may be applied to the triage descriptions to ensure comparability. The aim is to distinguish real differences in workload complexity based on demography and epidemiology and between jurisdictions from those associated with culture or manipulation. It would be possible to develop standard scores (or triage footprints) for certain categories of patients. For example, adults with fractured neck of femur should not differ significantly between

institutions and therefore the triage footprint should be similar. A collection of similar patients could constitute a "moderating basket of patients" for which a standard footprint could be obtained. A consistent variation in this standard footprint is likely to reflect consistent variations in triage descriptions on the grounds of either departmental culture or deliberate gaming.

The international efforts to improve consistency and to reduce variability could be better integrated based on the individual learnings of each jurisdiction. Better understanding of the educational needs, staff selection and their experience and the compassion and attitudinal issues are keys to system improvement.[68]

A research agenda should help to guide triage systems in the future. Most genuine research has focused on addressing the issue of variability. Patient characteristics, provider characteristics, site characteristics and triage protocols produce an effect in terms of clinical outcomes, resource allocation and patient satisfaction. Examining inter-rater reliability is meaningless until we determine the clinical outcomes required.[69] A future research agenda for triage should address the consequences, the impact of the application of triage system on resource levels and, in particular, the application in developing and under-resourced countries as well as the cost effectiveness of physician triage, and triage and safety.[28]

## CONCLUSION

Triage has become an integral part of the function of EDs around the world and has demonstrated clinical and organisational value. There is an opportunity for the emergency medicine community to commit to an international triage scale and to use that scale as a basis for collaborative research, comparative analysis and evaluation.

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# Emergency Medicine Questions (EMQs)

## Theme: Arterial dissection

### QUESTION 1

Which of the following are true regarding the diagnosis of acute aortic dissection?

a. Hypertension, male sex, age over 40 years, stimulant use, bicuspid aortic valve, history of cardiac surgery, giant cell arteritis and Marfan's syndrome are all associated with aortic dissection.
b. Pain, typically sharp in nature, is present in 90%, however the 'classic' features of pulse deficits and aortic regurgitation are seen in only 30% and pain migration in less than 20%.
c. Plain chest x-rays are abnormal in the large majority.
d. Conventional aortography is the investigation of choice to confirm the diagnosis.

### QUESTION 2

Which of the following are true regarding the treatment of acute aortic dissection?

a. The most important contributors to continued dissection are the degree of elevation of blood pressure and the rate of change of the pulse pressure wave.
b. Sublingual nifedipine is an important interim antihypertensive agent preoperatively.
c. Consideration for surgery or endovascular stenting in Stanford classification type B dissections (not involving the ascending aorta) include limb ischaemia, refractory pain and progression of the dissection.
d. Almost two-thirds of dissections are Stanford classification type A (involving the ascending aorta), which have a significantly better prognosis than type B.

### QUESTION 3

Which of the following are true regarding carotid and vertebral artery dissections?

a. Dissection of these vessels is one of the most common causes of stroke in those aged less than 45 years.
b. Most carotid dissections present with unilateral pain, a partial Horner's syndrome and cerebral ischaemia within hours or days.
c. Ischaemic stroke as a result of extracranial dissections is usually embolic in nature, therefore anticoagulation or antiplatelet therapy are the mainstays of treatment.
d. Irrespective of the treatment offered, prognosis is universally poor.

***See page 160*** for answers.

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