U.K., and utilizes a presentational flow-chart based format (Manchester Triage Group, 1997). Nurses first identify the patient's chief complaint, and then choose one of 52 flow charts to conduct a structured interview and then assign a triage level from 1 (immediate care needed) to 5 (care within 4 hours). The system has been endorsed by the Accident and Emergency Nurses Association (Zimmermann, 2001).

There is limited research on the Manchester system. In one study of reliability, triage nurse ratings were compared retrospectively to senior medical staff ratings; agreement was only fair to moderate (Goodacre, Gillett, Harris & Houlihan, 1999).

The Canadian Triage and Acuity Scale (CTAS) was developed by a group of Canadian emergency physicians. (Beveridge & Ducharme, 1997; Canadian Association for Emergency Physicians [CAEP], 2002). The National Emergency Nurses' Affiliation, Inc. (NENA) and the Canadian Association for Emergency Physicians (CAEP) have endorsed the CTAS as the national standard for ED triage. Canadian hospitals are required to submit data to the Canadian government, including CTAS ratings, on all ED visits. The Canadian five-level scale has also been shown to have good interrater reliability in studies in which clinicians rated the acuity of written scenarios taken from actual patient cases (Beveridge, Ducharme, Janes, Beaulieu & Walter, 1999; Manos, Petrie, Beveridge, Walter & Ducharme, 2002).

**History of the Emergency Severity Index (ESI)**

The Emergency Severity Index (ESI) is a five-level triage scale developed by ED physicians Richard Wuerz and David Eitel in the United States (Gilboy et al., 1999; Wuerz, Milne, Eitel, Travers & Gilboy, 2000). The two originators believed that a principal role for an emergency department triage instrument is to facilitate the prioritization of patients based on the urgency of the patients' conditions. The triage nurse determines priority by posing the question, “Who should be seen first?” Drs. Wuerz and Eitel realized, however, that when more than one top-priority patient is present simultaneously, the operating question becomes, “How long can everybody wait?” The ESI was developed around a new conceptual model of ED triage. In addition to asking which patient should be seen first, triage nurses use the ESI to also consider what resources are necessary to get the patient through to an ED disposition. The ESI retains the traditional foundation of patient urgency, and then seeks to

### Table 2-2  Five-level Triage Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Countries</th>
<th>Levels</th>
<th>Patient should be seen by provider within</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australasian Triage Scale (ATS)</td>
<td>Australia, New Zealand</td>
<td>1 - Resuscitation</td>
<td>Level 1 - 0 minutes</td>
</tr>
<tr>
<td>(formerly National Triage Scale of Australia)</td>
<td></td>
<td>2 - Emergency</td>
<td>Level 2 - 10 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - Urgent</td>
<td>Level 3 - 30 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - Semi-urgent</td>
<td>Level 4 - 60 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - Nonurgent</td>
<td>Level 5 - 120 minutes</td>
</tr>
<tr>
<td>Manchester</td>
<td>England, Scotland</td>
<td>1 - Immediate (red)</td>
<td>Level 1 - 0 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - Very urgent (orange)</td>
<td>Level 2 - 10 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - Urgent (yellow)</td>
<td>Level 3 - 60 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - Standard (green)</td>
<td>Level 4 - 120 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - Nonurgent (blue)</td>
<td>Level 5 - 240 minutes</td>
</tr>
<tr>
<td>Canadian Triage and Acuity Scale (CTAS)</td>
<td>Canada</td>
<td>1 - Resuscitation</td>
<td>Level 1 - 0 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - Emergent</td>
<td>Level 2 - 15 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - Urgent</td>
<td>Level 3 - 30 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - Less urgent</td>
<td>Level 4 - 60 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - Nonurgent</td>
<td>Level 5 - 120 minutes</td>
</tr>
</tbody>
</table>

(Australasian College for Emergency Medicine, 2002; Canadian Association of Emergency Physicians, 2002; Manchester Triage Group, 1997)
accomplish a second goal, not just patient sorting but also patient streaming: Getting the right patient to the right resources at the right place and at the right time.

Version 1 (v. 1) of the ESI was originally implemented at two university-based EDs in the spring of 1999. By the fall of 2000, the ESI was revised with input from ED clinicians to include pediatric patient triage criteria, and then version 2 (v. 2) was implemented in five additional hospitals (including non-university teaching and community settings). Based on feedback from nurses and physicians using the ESI at these sites, along with the best available scientific evidence, the ESI was further refined as version 3 (v. 3) in 2001 (Wuerz et al., 2001). Recent work has led to additional revisions to the tool, which is introduced in this edition of the ESI handbook as version 4 (v. 4) (Tanabe et al., in press).

Emergency physicians and nurses in the United States and Canada have conducted several research studies in which the reliability and validity of the ESI has been assessed. The ESI has been directly compared to conventional three-level triage and to the five-level CTAS. These studies will be described later in the chapter. Like the Australasian, Canadian and U.K. scales, ESI triage has five levels. However, it is different in both its conceptual approach and practical application. The underlying assumption of the triage scales from Australia, Canada and the U.K. is that the purpose of triage is to determine how long the patient can wait for care in the ED. Clear definitions of time to physician evaluation are an integral part of both algorithms. This represents a major difference between ESI and CTAS and the ATS. ESI does not define expected time intervals to physician evaluation.

The ESI is unique in that it also requires the triage nurse to anticipate expected resource needs (e.g., diagnostic tests and procedures), in addition to acuity, to determine a triage category for less acute patients. The ESI triage levels are outlined in Figure 2-1. The process of categorizing ED patients using the ESI will be described in detail in subsequent chapters. Briefly, acuity judgments are addressed first based on the stability of the patient’s vital functions and the likelihood of an immediate life or organ threat. Then expected resource needs are addressed for stable patients based on the experienced triage nurse’s prediction of the resources needed to get the patient to an emergency department disposition. Resource needs can range from none to two or more.

### Research on the Emergency Severity Index

In a pilot study of ESI v.1 ratings for 493 triage encounters at two Boston hospitals in 1998, researchers found that the system was both valid and reliable (Wuerz et al., 2000). The patients were triaged simultaneously by the triage nurse using the traditional three-level scale and by the research nurse who used the initial version of the ESI. Then, an investigator triaged the patients again using the ESI. The investigator was blinded to the research nurses’ ESI rating, and used only the written triage note to make the triage decision. Triage levels were strongly associated with resources used in the ED and with outcomes such as hospitalization. Higher acuity patients (ESI levels 1 and 2) consumed more resources and were more likely to be admitted to the hospital than low resource patients (ESI levels 4 and 5). Interrater reliability between the research nurse and the investigator was found to be good, with 77 percent exact agreements and 22 percent within one triage level.
The reliability of the ESI has been evaluated in several studies, using the kappa statistic to measure inter-rater reliability. Kappas can range from 0 (no agreement) to 1 (perfect agreement). At one of the two original ESI sites, a time series design was used to compare the reliability of triage ratings using a three-level scale, then ESI v.1 was implemented and triage ratings were re-examined (Travers et al., 2002). Reliability improved from a weighted kappa of 0.53 for the three-level system to 0.68 for the five-level ESI. In another study, researchers examined the reliability and validity of ESI v.2 during and after implementation of the system into triage practice at seven hospitals in the northeast and southeast. During the ESI triage education program, more than 200 triage nurses at the seven sites were asked to rate 40 case studies using the ESI (Eitel et al., 2003). The study results indicated substantial interrater reliability with kappas ranging from 0.70 to 0.80.

Three hundred eighty-six triage decisions on actual patients were also evaluated and found to have high interrater reliability, with weighted kappas ranging from 0.69 to 0.87. In another study at a Midwestern, urban ED, researchers evaluated the reliability of the ESI v.3 for 403 actual patient triages and found a kappa of 0.89 (Tanabe, Gimbel, Yarnold, Kyriacou & Adams, 2004).

Canadian and American researchers have also directly compared the inter-rater reliability of the ESI and the CTAS in a randomized trial (Worster et al., 2004). They studied the triage assignments of ten Canadian triage nurses experienced with CTAS. The nurses were randomly assigned to initial ESI v.3 or CTAS refresher training, and then rated 200 case studies with the ESI or CTAS, respectively. Both groups had excellent inter-rater reliability, with kappas of 0.89 (ESI) and 0.91 (CTAS).

The validity of the ESI has been evaluated by examination of outcomes for several thousand patients. The studies found consistent, strong correlations of the ESI with hospitalization, ED length of stay, and mortality (Eitel et al., 2003; Tanabe, et al., 2004; Wuerz, 2001; Wuerz et al., 2001). The ESI has also been found to have moderate correlations with physician evaluation and management codes and nursing workload measures (Travers et al., 2002). The ESI has been shown to facilitate meaningful comparisons of case mix between hospitals. A stratified random sample of 200 patients was selected from each of the seven initial ESI hospitals, and case mix was compared (Eitel et al., 2003). As expected, there was a higher percentage of high acuity patients at the tertiary care centers, compared with a higher percentage of low resource patients at the community hospitals.

In a survey of nursing staff at the two original university teaching hospitals, responses to the implementation of the ESI were positive (Wuerz et al., 2001). The nurses reported that the ESI was easier to use and more useful in prioritizing patients for treatment than the former three-level systems in use at the two sites.

In the most recent study of the ESI, the validity of ESI level 2 was examined in detail (Tanabe et al., in press). In an evaluation of outcomes for 571 ESI level-2 patients at five hospitals, it was found that 20 percent of level-2 patients received immediate, life-saving interventions. The authors concluded that such patients would benefit from being classified as ESI level 1. The updated ESI v. 4 presented in later chapters of this book reflects the revisions made to the ESI based upon this recent study.

Benefits of the Emergency Severity Index

To date, the ESI has been implemented by hospitals in different regions of the country, by university and community hospitals, and by teaching and non-teaching sites. The ED clinicians, managers and researchers at those sites have identified several benefits of ESI triage over conventional three-level scales. One benefit of the ESI is the rapid identification of patients that need immediate attention. The focus of ESI triage is on quick sorting of patients in the setting of constrained resources. In part, ESI triage returns to the fundamental purpose of triage as it was originally defined in the days of Napoleon's army. ESI triage is a rapid sorting into five groups with clinically meaningful differences in projected resource needs and therefore, associated operational needs. Use of the ESI for this rapid sorting can lead to improved flow of patients through the ED. Once an ESI triage level is assigned, the patient can be directed to a more complete assessment, registration, initial treatment, or waiting based on their acuity and their presumed resource needs. For example, level-1 and 2 patients can be taken directly to the treatment area for rapid evaluation and treatment, while level-4 and 5 patients can go to registration and then be sent to the waiting room to await an available bed.
An important issue that is independent of ESI triage is the timing of the complete nursing assessment. Many believe that a complete assessment need not be done at the initial triage station, but rather can occur in the main treatment area or secondary triage area as appropriate to the needs of each patient and the current activity level of the ED (Gilboy et al., 1999). Only the assessment necessary to make an ESI assignment is required at triage in order to facilitate the initial sorting of patients. Comprehensive clinical assessments take significant time to complete and, when done at triage, can delay care and reduce satisfaction for patients with more minor emergencies. With increasing patient volumes and complexity contributing to ED overcrowding, it is time to reconsider conventional processes of care to increase efficiency and effectiveness. However, it is always important to gain sufficient information to be able to determine the correct triage category. This is especially true when waits are long to see the physician, as is frequently the case with increased volumes. Triage has become even more crucial with extended waiting room times. Assignment of an inappropriate low triage category can increase the risk of a bad outcome due to the associated long wait.

Other benefits of the ESI include discrimination of patients who do not need to be seen in the main ED, but could safely and more efficiently be seen in a fast-track or urgent care center. For example, in many hospitals, the triage policy stipulates that all ESI level 4 and 5 patients can be sent to either the medical urgent care or minor trauma areas of the ED. The triage policy also allows for some level-3 patients to be sent to urgent care (UC), such as patients needing simple migraine headache treatment. ESI level-3 patients triaged to UC and all patients sent to the acute area from UC for more serious conditions are monitored in the quality improvement program. Nurses using the ESI have reported that the tool facilitates communication of patient acuity more effectively than the former three-level triage scales used at the sites (Wuerz et al., 2001). For example, the triage nurse can tell the charge nurse, “I need a bed for a level 2 patient,” and through this common language, the charge nurse understands what is needed without a detailed explanation of the patient by the triage nurse.

The ESI has also been used as the foundation for ED policies that address specific populations. For example, the psychiatric service at one site is expected to provide consults for level 2 and 3 patients within 30 minutes and for level 4 and 5 patients within one hour of notification. At another site, the ESI has been incorporated into a policy for patients greater than 20-weeks pregnant who present to the ED. Patients rated at ESI levels 1 and 2 are treated in the ED by emergency medicine with an obstetrical consult. Those rated 3, 4, or 5 are triaged to the labor and delivery area of the hospital.

The ESI is also a useful tool for determination of thresholds for diversion of ambulance patients from the ED. The ED Diversion Policy and Guidelines at Brigham and Women’s Hospital in Boston defines maximum capacity as 100 percent of RN-staffed ED beds occupied. ESI is used to determine over-capacity.

Research has shown that the ESI is a reliable, valid tool for rating triage acuity. The system has been adopted by a variety of EDs in different regions of the United States and in both academic and community settings. The participating hospitals have demonstrated the value of the ESI for improved ED operations and patient care. Wider adoption of the ESI by U.S. hospitals could lead to the establishment of a standard for triage acuity assessment, which will facilitate benchmarking, public health surveillance and research.

References


