Chapter 6. The Role of Vital Signs in ESI Triage

Introduction

In this chapter, we focus on decision point D—the patient's vital signs. To reach this point in the ESI algorithm, the triage nurse has already determined that the patient does not meet ESI level-1 or 2 criteria, and that he or she will require two or more resources. Since the patient requires two or more resources, he or she meets the criteria for at least an ESI level 3. It is at this point in the algorithm that vital signs data are considered, so the triage nurse's next step is to assess the patient's heart rate, respiratory rate, and oxygen saturation, and, when appropriate (for children under age 3), temperature. If the danger zone vital sign limits are exceeded (as illustrated in decision point D, Figure 6-1), the triage nurse must strongly consider up-triaging the patient from a level 3 to a level 2.

During the ESI triage educational program, a considerable amount of time should be devoted to exploring the importance of vital signs in the decision to move a patient from ESI level 3 to an ESI level 2. It should be stressed that it is always the decision of the experienced triage nurse to determine whether the patient meets criteria for ESI level 2, based upon their past medical history, current medications, and subjective and objective assessment that includes general appearance. This decision is based on the triage nurse's clinical judgment and knowledge of normal vital sign parameters for all ages and the influence of factors such as medications, past medical history, and pain level.

What Are Vital Signs?

Vital signs traditionally include simple measurements of physiological parameters including temperature, blood pressure, pulse, and respiratory rate as well as pulse oximetry (see Table 6-1). They frequently

<table>
<thead>
<tr>
<th>Vital Sign</th>
<th>Definition</th>
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<tr>
<td>Blood pressure</td>
<td>The pressure or tension of the blood within the systemic arteries, maintained by the contraction of the left ventricle, the resistance of the arterioles and capillaries, the elasticity of the arterial walls, as well as the viscosity and volume of the blood (Stedman, 1995).</td>
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<tr>
<td>Heart rate</td>
<td>A measure of the heart’s beat, recorded as the number of beats per minute (Stedman, 1995).</td>
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<tr>
<td>Temperature</td>
<td>The degree of temperature, an indicator of the presence of disease, or health threat independent of other signs gathered from simple physical diagnosis.</td>
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<tr>
<td>Respiratory rate</td>
<td>Frequency of breathing, recorded as the number of breaths per minute (Stedman, 1995).</td>
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<td>Oxygen saturation</td>
<td>Oxyhemoglobin saturation according to the absorption of light. It can provide early warning of pulmonary or cardiovascular deterioration (Tintinalli, Kelen &amp; Stapczynski, 2000).</td>
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<tr>
<td>Pain</td>
<td>A noxious sensation transmitted by specialized nervous structures to the brain, where its perception is modified by cognition and emotion (Paris, 1989; Tintinalli et al., 2000).</td>
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prompt a health care worker to follow a particular path of action. Recently, the nursing literature has placed increased emphasis on pain. The American Pain Society adopted the phrase “Pain: the fifth vital sign” to increase healthcare workers’ awareness of the importance of assessment and management of pain. Pain assessment is an important component of ESI and is actually assessed earlier in the algorithm. So, for the purpose of ESI, heart rate, respiratory rate, oxygen saturation and temperature in children under age 3 are the vital sign parameters considered in decision point D. Vital signs represent a set of objective data for use in determining general parameters of patients’ health and viability. The values we obtain influence our interpretation of a patient’s overall condition and, therefore, the path we take in establishing a diagnosis and treatment for the patient. However, vital signs alone do not paint a complete picture of the patient’s condition. Vital signs may be affected by a variety of factors including prescription medications, herbs, and recreational drugs. For example, beta-blockers cause bradycardia and blunt the tachycardic response to shock. Hypothyroidism, common in the elderly, may lead to the finding of low temperature, even in the face of sepsis. A young adult may have an elevated body temperature due to recreational drug use.

Vital signs are variable, dynamic indicators that are an adjunct to a patient’s evaluation. Vital sign measurements may also be operator dependent, and the definition of normal vital signs varies according to the reference consulted. Even under the best conditions, vital signs are not always reliable or accurate (Edmonds, Mower, Lovato & Lomeli, 2002). The patient’s general appearance and clinical picture frequently prove to be of the most value. However, if in a triage nurse’s judgment, knowing a patient’s vital signs would help with risk analysis, then vital signs should be measured. For example, if the patient is using immunosuppressive medications or chemotherapy or is immunosuppressed by an illness such as AIDS, then the body temperature should be measured.

Are Vital Signs Necessary at Triage?

Prior to the advent of five-level triage in the United States, tradition dictated that every patient presenting to an emergency department should have a set of vital signs taken before triage level assignment. Vital signs were considered an integral component of the initial nursing assessment and were often used as a decisionmaking tool. In a traditional three-level triage system, vital signs helped determine how long a patient could wait for treatment (i.e., if no abnormal vital signs were present, in many cases, the patient could wait a longer period of time). Vital signs, therefore, in the past weighted heavily in the patient triage assessment, with variable emphasis placed on the clinical presentation.

More recently, newer triage models advocate selective use of vital signs at triage (Gilboy, Travers & Wuerz, 2000). Initial vital signs are not a mandatory component of other five-level triage systems and in general are not reported during the triage phase of a level-1 or 2 patient (i.e., those patients with the highest acuity). For example, the Guidelines for Implementation of the Australasian Triage Scale in Emergency Departments states that “vital signs should only be measured at triage if required to estimate urgency, or if time permits” (Australasian College for Emergency Medicine, 2000). Similarly, the Canadian Triage and Acuity Scale (CTAS) upholds the need for vital signs if, and only if, they are necessary to determine a triage level (in the cases of levels 3, 4, and 5) as time permits (Beveridge et al., 2002. The Manchester Triage Group uses specific vital sign parameters as discriminators within a presentational flow chart. The vital sign parameter is one of the factors that help the triage nurse assign an acuity level.

Vital signs may not always be the most appropriate tool to determine triage acuity. At least one study has suggested that vital signs are not always necessary in the initial assessment of the patient at triage. In 2002, Cooper, Flaherty, Lin, and Hubbell examined the use of vital signs to determine a patient’s triage status. They considered age and communication ability as factors. Twenty-four different U.S. emergency departments and more than 14,000 patients participated in that study. Final results demonstrated that vital signs changed the level of triage acuity status in only eight percent of the cases. When further examining individual age groups, pediatric patients age 2 or younger showed the largest variation in triage decision with an 11.4 percent change once vital signs were collected.

Vital Signs and ESI Triage

Using ESI triage, the only absolute requirement for vital signs assessment is for patients who don’t initially meet ESI level-1 or 2 criteria, but who are
predicted to need two or more resources. Assessment of vital signs at triage is optional and at the discretion of the triage nurse for patients triaged as ESI level 1, 2, 4, or 5. While the ESI system does not require vital signs assessment on all patients who present to triage, local policies may dictate a different procedure. Factors such as staffing levels, casemix, and local resources influence individual hospital policies regarding vital signs at triage and are beyond the scope of this handbook. In general when triaging a stable patient, it is never wrong to obtain a set of vital signs. ESI requires vital signs for only level-3 patients. (See Table 6-2)

The developers of the ESI and the current ESI research team believe that experienced ED nurses can use vital sign data as an adjunct to sound clinical judgment when rating patients with the ESI. There is limited evidence on vital sign abnormalities as they relate to ED acuity and that are proven to truly represent serious illness. The ESI has been revised over time to reflect changes in the available evidence and recommendations from the literature. The ESI working group initially used the systemic inflammatory response syndrome (SIRS) literature (Rangel-Frausto et al., 1995) in developing the danger zone vital sign box and accompanying footnotes. The first version of the ESI used the SIRS criteria to include a heart rate of greater than 90 (for adults) as an absolute indicator to up-triage from ESI level 3 to level 2 (Wuerz, Milne, Eitel, Traers & Gilboy, 2000). The SIRS research was based on predictors of mortality in an intensive care unit population. Based on an excess of false positives using these criteria for ED patients at the initial ESI hospitals, the heart rate cutoff was changed to 100 in ESI version 2, and nurses were instructed to consider up-triage to ESI 2 for adult patients with heart rates greater than 100 (Wuerz et al., 2001; Gilboy, Tanabe, Travers, Eitel & Wuerz, 2003). Additionally, pediatric vital signs were added to the danger zone vital signs box.

### Table 6-2. ESI Vital Signs Criteria

<table>
<thead>
<tr>
<th>ESI level</th>
<th>Complete set of vital signs at triage (YES/NO)</th>
<th>Evaluation plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO</td>
<td>Patient requires definitive care. Vital signs are either part of the secondary survey or are done simultaneously when a multimember team responds to the patient with a life-threatening condition.</td>
</tr>
<tr>
<td>2</td>
<td>NO</td>
<td>Patient requires definitive care. Vital signs are either part of the secondary survey or are done simultaneously when a multimember team responds to the patient with a high-risk condition.</td>
</tr>
<tr>
<td>3</td>
<td>YES</td>
<td>Nurse determines patient's heart rate, respiratory rate, oxygen saturation (if pertinent), and temperature (children &lt; age 3) to decide if uptriage is necessary.</td>
</tr>
<tr>
<td>4</td>
<td>NO</td>
<td>Patient has a single system problem requiring one of the defined resources. Vital signs are not necessary for triage level assignment but are part of the treatment area evaluation.</td>
</tr>
<tr>
<td>5</td>
<td>NO</td>
<td>Patient has a single system problem requiring none of the defined resources. Vital signs are not necessary for triage-level assignment but are part of the treatment area evaluation.</td>
</tr>
<tr>
<td>2, 3, 4, 5</td>
<td>YES</td>
<td>Vital sign assessment is prudent to ensure patient safety.</td>
</tr>
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</table>
When using ESI as a triage system, vital signs assessment is not necessary in the triage area for patients who are immediately categorized as level 1 or 2. If the patient appears unstable or presents with a chief complaint that necessitates immediate treatment, then transport of the patient directly to the treatment area should be expedited. For these patients, the resuscitation team is responsible for obtaining and monitoring vital signs at the bedside. This would include patients that have clinical appearances that indicate high risk or need for immediate cardiovascular or respiratory intervention. These patients may appear pale, diaphoretic, or cyanotic. However, the triage nurse has the option to perform vitals in the triage area, if an open bed is not immediately available or if he or she feels that the vital signs may assist in confirming the triage acuity level. Some patients may not initially be identified as ESI level 1 until vital signs are taken. For example, an awake, alert elderly patient who complains of dizziness might be found to have a life-threatening condition when a heart rate of 32 or 180 is discovered during vital sign measurement.

As shown in the ESI algorithm in Chapter 3, if patients do not meet ESI level-1 or 2 criteria, the triage nurse comes to decision point C. The nurse then determines how many resources the patient is expected to need in the ED. If the patient is expected to need one or no resources, he or she can be assigned an ESI level of 4 or 5 and no vital sign assessment is necessary. But if the patient is expected to need two or more resources, then the nurse comes to decision point D and vital signs should be assessed. Vital signs can play a more important role in the evaluation of some patients at triage, especially those triaged as ESI level 3. The range of vital signs may provide supporting data for potential indicators of serious illness. If any of the danger zone vital signs are exceeded, it is recommended that the triage nurse consider up-triaging the patient from level 3 to level 2.

Vital signs that are explicitly included in ESI triage are heart rate, respiratory rate, and oxygen saturation (for patients with potential respiratory compromise). Temperature is specifically used in ESI triage for children under age 3 (see below). It is important to note that when considering abnormal vital signs, blood pressure is not included in the ESI algorithm. This does not mean that the triage nurse should not take a blood pressure or a temperature on older children or adults but that these vital signs are not necessarily used to assist in selecting the appropriate triage acuity level.

**Vital Signs and Pediatric Fever**

In this version of the ESI Handbook, version 4 (v.4) of the ESI algorithm has been updated to include more current pediatric fever criteria. As shown in Figure 6-2, note D of the ESI algorithm addresses pediatric fever considerations for ESI triage. This section incorporates recommendations from the American College of Emergency Physicians’ Clinical Policy for Children Younger Than Three Years Presenting to the Emergency Department With Fever (ACEP, 2003).

The ESI Triage Research Team recommends that vital signs in patients under age 3 be assessed at triage. In particular, temperature measurement is important during triage of all children from newborn through 36 months of age, and vital sign evaluation is essential to the overall assessment of a known febrile infant under age 36 months (Baraff, 2000). This helps to differentiate ESI level-2 and 3 patients and minimize the risk that potentially bacteremic children will be sent to an express care area or otherwise experience an inappropriate wait. Remember, if a patient is in immediate danger or
high risk, he or she will be assigned to either ESI level 1 or 2.

Table 6-3 provides direction for the triage nurse in using the ESI to assess the febrile child and determine the most appropriate triage level. The generally accepted definition of fever is a rectal temperature greater than 38.0° C (100.4° F) (Baraff et al., 1993; ACEP, 2003). The infant less than 28 days old with a fever should be considered high risk and assigned to at least ESI level 2. There are no clear guidelines for the infant between 28 days and 3 months of age. The ESI research team recommends triage nurses rely on local hospital guidelines. We suggest that the nurse consider assigning at least an ESI level 2 for such patients.

In v. 4 of the ESI, we have incorporated a different set of pediatric fever guidelines for children ages 3 to 36 months. These pediatric fever considerations pertain to highly febrile children, defined as those with a fever of greater than 39.0° C (102.2° F) (ACEP, 2003). When triaging a child between 3 and 36 months of age who is highly febrile, it is important for the triage nurse to assess the child’s immunization status and whether there is an identifiable source for the fever. The patient with incomplete immunizations or with no identifiable source for the fever should be assigned to at least ESI level 3. If the patient has an identifiable source for the fever and his or her immunizations are up to date, then a rating of 4 or 5 is appropriate. For example, a 7-month-old who is followed by a pediatrician, has had the Haemophilus influenza type b (HIB) vaccine and presents with a fever and pulling on his ear could be assigned to an ESI level 5.

Case Examples

The following case studies are examples of how vital signs data are used in ESI triage.

- “My doctor told me I am about 6 weeks pregnant and now I think I am having a miscarriage,” reports a healthy looking 28-year-old female. “I started spotting this morning and now I am cramping.” No allergies, no PMH, medications: prenatal vitamins. Vital signs: T 98° F, HR 112, RR 22, BP 90/60.

This patient meets the criteria for being up-triaged from a level 3 to a level 2 based on her vital signs. Her increased heart rate, respiratory rate, and decreased blood pressure are a concern. These factors could indicate internal bleeding from a ruptured ectopic pregnancy.

- “The baby has had diarrhea since yesterday. The whole family has had that GI bug that is going around,” reports the mother of a 15-month-old. She tells you the baby has had a decreased appetite, a low-grade temperature, and numerous liquid stools. The baby is sitting quietly on the mother’s lap. The triage nurse notes signs of dehydration. No PMH, NKDA, no medications. Vital signs: T 100.4° F, HR 142, RR 48, BP 76/50.

This patient meets the criteria for at least ESI level 3. For resources he would require labs and IV fluid. Based on his vital signs the triage nurse can up-triage him to an ESI level 2. For a baby this age, both heart rate and respiratory rate criteria are violated.

- “I need to see a doctor for my cough. I just can’t seem to shake it. Last night I didn’t get much sleep because I was coughing so much, I am just so tired,” reports a 57-year-old female. She tells you that she had a temperature of 101° last night and that she is coughing up this yellow stuff. Her history includes a hysterectomy 3 years ago; she takes no medications but is allergic to Penicillin. Vital signs: T 101.4°, RR 28, HR 100, SpO2 90 percent.

At the beginning of her triage assessment, this patient sounds as though she could have

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<th>Table 6-3. ESI Pediatric Temperature Criteria</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>1 - 28 days</td>
</tr>
<tr>
<td>1 - 3 months</td>
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<tr>
<td>3 - 36 months</td>
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pneumonia. She will need two or more resources but her low oxygen saturation and increased respiratory rate are a concern. After looking at her vital signs the triage nurse should up-triage the patient to an ESI level 2.

- A 34-year-old obese female presents to triage complaining of generalized abdominal pain (pain scale rating: 6/10) for 2 days. She has vomited several times and states her last bowel movement was 3 days ago. She has a history of back surgery, takes no medications, and is allergic to peanuts. Vital signs: T 97.8° F, HR 104, RR 16, BP 132/80, SpO2 99 percent.

This patient will need a minimum of two or more resources: lab, IV fluids, perhaps IV medication for nausea, and a CT scan. The triage nurse would review the patient's vital signs and consider the heart rate. The heart rate falls just outside the accepted parameter for the age of the patient but could be due to pain or exertion. In this case, the decision should be to assign the patient to ESI level 3.

- A tearful 9-year-old presents to triage with her mother. She slipped on an icy sidewalk and injured her right forearm. The forearm is obviously deformed but has good color, sensation, and movement. The mother reports she has no allergies, takes no medications, and is healthy. Vital signs: BP 100/68, HR 124, RR 32, and SpO2 99 percent.

This child is experiencing pain from her fall and is obviously upset. She will require at least two resources: x-ray and orthopedic consult, and perhaps conscious sedation. Her heart rate and respiratory rate are elevated, but the triage nurse should feel comfortable assigning this patient to ESI level 3. Her vital sign changes are likely due to pain and distress.

- A 72-year-old patient presents to the ED with her oxygen via nasal cannula for her advanced COPD. She informs the triage nurse that she has an infected cat bite on her left hand. The hand is red, tender, and swollen. The patient has no other medical problems, uses albuterol prn, and takes an aspirin daily, NKDA. Vital signs: T 99.6° F, HR 88, RR 22, BP 138/80, SpO2 91 percent. She denies respiratory distress.

This patient will require two or more resources: labs and IV antibiotics. She meets the criteria for ESI level 3. The triage nurse notices that her oxygen saturation and respiratory rate are outside the accepted parameters for the adult but this patient has advanced COPD. These vital signs are not a concern so the patient will not be up-triaged but will stay an ESI level 3.

**Conclusion**

The information in this chapter provides a foundation for understanding the role of vital signs in the Emergency Severity Index triage system. We addressed the special case of patients under 36 months of age. Further research is necessary to clarify the best vital sign thresholds used in emergency department triage. Further study will also examine pediatric populations presenting to the emergency department. It is our hope that future versions of the ESI will be based on additional evidence regarding the predictive value of triage vital signs for pediatric and adult patients.

**References**


