Advanced trauma life support (ATLS®): The ninth edition

The ATLS Subcommittee, American College of Surgeons’ Committee on Trauma, and the International ATLS working group, Chicago, Illinois

The Advanced Trauma Life Support (ATLS) course was introduced in 1978 and is currently taught in more than 60 countries. It continues to be a widely accepted standard for the initial care of the trauma patient. Begun as a consensus view of recognized experts on safe initial management of a trauma patient, it combines didactic information with procedural skills, culminating with management of simulated patients. Evidence of its effectiveness includes ascertainment and retention of both knowledge and skills as well as reduced morbidity and mortality after introduction of the ATLS program.1-3

The ATLS course undergoes revision approximately every 4 years, with early editions primarily revising old and incorporating new content. The eighth edition, published in 2008, established a new process for incorporating change.4 All content changes in that edition and all subsequent editions required evidence rather than opinion for change. Suggestions for change are submitted directly to the ATLS revision Web site, with the opportunity to provide references and the level of evidence.

The ninth edition continues to rely on evidence to support changes in ATLS content.5 However, the major changes in the ninth edition are format and delivery changes rather than content changes. The drivers for format changes come primarily from the increasing understanding of adult education along with the educational preferences of the next generations.

In both content and format, two principles in addition to level of evidence continue to guide any changes to the ATLS course. The course continues to emphasize one safe way to care for the trauma patient during initial assessment; it is not meant to incorporate the most advanced, cutting edge information or technology. In addition, with the increasing penetration of ATLS around the world, there is increasing variation in local resources and practice. The ATLS vision is to embrace those differences that do not affect the ultimate delivery of safe care and allow flexibility for course directors to choose safe options that reflect their local practice.

CONTENT CHANGES

Consistent with the precedent established during the revision process for the eighth edition, all content changes are evidence based, with a review of the levels of evidence in the accompanying references provided in Table 1.

Team Training

ATLS began as a means to provide education to individual practitioners who cared for trauma patients. Although this concept is still important and there are many areas of the world in which a single provider does render care, there are many other areas where a provider leads a team of health care practitioners who care for a single trauma patient. Preparation of the team, along with team dynamics and debriefing, are important parts of team-based care that are highlighted in the Initial Assessment chapter.6-12

Airway

The use of additional advanced airway techniques is highlighted, along with the use of videolaryngoscopy.13-20

For pediatric patients, the use of cuffed endotracheal tubes for all children (with the exception of infants ≤1 year of age) is suggested.21-23

Balanced Resuscitation

The concept of balanced resuscitation is further emphasized, and the term aggressive resuscitation has been eliminated. The standard use of 2 L of crystalloid resuscitation as the starting point for all resuscitation has been modified to initiation of 1 L of crystalloid.

Early use of blood and blood products for patients in shock is also emphasized, without mandating or suggesting any specific ratio of plasma and platelets.24-45

Heat Injury

There is optional expanded content on heat injury provided for those courses that are taught in areas where heat injury is either a primary problem or has the potential to significantly compromise the care of injured patients.46-50

FORMAT CHANGES

Pelvis

Although there is no new content related to the pelvis, more emphasis is placed on the pelvis as a source of blood loss. This has been done by moving all of the content to the abdomen and pelvis chapter and the shock and surgical skills stations.

Skills Stations

Both diagnostic peritoneal lavage and pericardiocentesis have been made optional skill stations.60-68 If the course director chooses not to teach diagnostic peritoneal lavage, the new Focused Assessment with Sonography for Trauma (FAST) skill station must be taught; one way of assessing the abdomen as...
TABLE 1. Levels of Evidence for Content Changes in the Ninth Edition

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Subject</th>
<th>Eighth Edition</th>
<th>Ninth Edition</th>
<th>Level(s) of Evidence, References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial assessment</td>
<td>Team training</td>
<td>No mention</td>
<td>Preparation of the team in addition to team debriefing are important aspects of</td>
<td>2–5, 6–12</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>team debriefing are important aspects of trauma care in instances where a</td>
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<td></td>
<td></td>
<td></td>
<td>team, rather than an individual health care practitioner provides care.</td>
<td></td>
</tr>
<tr>
<td>Airway</td>
<td>Videolaryngoscopy</td>
<td>No mention</td>
<td>Videolaryngoscopy is a useful adjunct in patients with potentially difficult</td>
<td>1–3, 13–20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>airways. Cuffed tubes appropriate for all children except infants &lt;1 y of age.</td>
<td></td>
</tr>
<tr>
<td>Airway, Pediatric</td>
<td>Cuffed endotracheal tubes for</td>
<td>Uncuffed tubes should</td>
<td>Cuffed tubes appropriate for all children except infants &lt;1 y of age.</td>
<td>1, 2, 21–23</td>
</tr>
<tr>
<td></td>
<td>children</td>
<td>be used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial assessment, shock,</td>
<td>Balanced resuscitation</td>
<td>Aggressive resuscitation,</td>
<td>The phrase aggressive resuscitation has been eliminated. Balanced</td>
<td>1–4, 24–45</td>
</tr>
<tr>
<td>pediatric, initial assessment</td>
<td></td>
<td>initial 2 L of crystalloid</td>
<td>resuscitation covers permissive hypotension before control of bleeding, less</td>
<td></td>
</tr>
<tr>
<td>scenarios</td>
<td></td>
<td></td>
<td>crystalloid (1 L instead of 2), and early use of plasma and platelets in patients</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>requiring massive transfusion or with significant anticipated blood loss.</td>
<td></td>
</tr>
<tr>
<td>Thermal injuries, appendix</td>
<td>Heat injury</td>
<td></td>
<td>Expanded content on heat injury provided for areas where heat injury is a</td>
<td>2–4, 46–50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>primary problem or has the potential to significantly compromise care of injured patients.</td>
<td></td>
</tr>
</tbody>
</table>

a source of potential blood loss remains mandatory. The new FAST skill station uses the same case scenarios as the diagnostic peritoneal lavage portion of the surgical skills station and provides examples of positive and negative FAST views. It is not possible to teach ATLS students to perform a FAST examination during the allotted time during ATLS; this skill station is only to introduce the concept of the use of FAST to evaluate the abdomen and to provide example images for the student to recognize.

**Initial Assessment Scenarios**

There are several new initial assessment scenarios, emphasizing geriatric patients, blunt trauma, rib fracture treatment, and pelvic fractures. The initial assessment scenarios, in addition to the skills stations and text, contain multiple new images.

**INSTRUCTOR COURSE**

The instructor course has been revised, with a greater emphasis on the importance of providing feedback along with more opportunities for instructor candidates to practice their teaching and receive feedback. The philosophy of the instructor course is clearly articulated in the goal that an ATLS instructor will “Stand behind the ATLS concepts, Walk with the learner and Support the Team Teaching process.” An evidence-based approach to the instructor course has been adopted with the experiences and expertise of an international education faculty influencing the final course resources. The instructor course has been developed to provide flexibility with both 1.5- and 2-day program options. The ATLS instructor course continues to rely on faculty role modeling of best educational principles and a team approach to developing high quality new instructors.

**MCQ REVISION**

Following a scientifically substantiated procedure, an international working group of content and educational experts carefully reviewed the currently used multiple choice questions (MCQs) with the eighth edition. Several new questions were developed. In the preimplementation beta-testing phase, psychometric analysis focused on the difficulty index ($p$ value) and the discriminative quality (rpbi-value) per question and for the overall three tests of 40 MCQs. Difficulty of the individual questions, both new and revised questions, and discriminative capacity were sufficient and similar for different topics. The three tests had a comparable level of difficulty.

As of November 2012, a new set of three validated MCQ tests is available, testing the content of the ninth edition of the ATLS.

**MYATLS**

One of the biggest changes in the ninth edition is the incorporation of electronic media into the ATLS course. A multidisciplinary team was assembled, and the defining criteria of the were app established, mobile, practical, and on demand. MyATLS is a native app compatible for both iOS and Android devices. As of November 2012, there have been more than 7,000 downloads in more than 100 countries, many of which do not have established ATLS courses.

A favorites feature allows the user to bookmark and personalize the app specific to their specialty requirements. A built-in robust search engine including voice recognition facilitates easy navigation through the app content. Concise, high-definition “just in time” videos are included, which effectively communicate practical procedures without the need for Internet streaming, and a useful collection of resources and calculators serve as a to-hand aid when, for example, calculating fluid resuscitation for burns patients and recalling dermatomes.

**REFERENCES**

The reference list has been updated, with new references supporting the content and format changes as well as content and format present in the eighth edition. The updates have attempted to include relevant recent references (published in the last 10 years) as well as keeping classic references that support basic ATLS principles.
REFERENCES


Additional references can be found in Supplemental Digital Content 2, http://links.lww.com/TA/A245