



MCQ tests in Advanced Trauma Life Support (ATLS®): Development and revision



Jacqueline Bustraan^{a,*}, Walter Henny^b, John B. Kortbeek^{c,1}, Karen J. Brasel^d,
Marzellus Hofmann^e, Inger B. Schipper^f

^a PLATO, Leiden University, P.O. Box 9555, 2300 RB Leiden, The Netherlands

^b ATLS Netherlands, Tilburg, The Netherlands

^c Department of Surgery, University of Calgary and Alberta Health Services – Calgary Foothills Medical Center, Department of Surgery, 10th Floor N. Tower, 1403–29th Street, NW Calgary, AB, Canada T2N 2T9

^d Department of Surgery, Medical College of Wisconsin, Milwaukee, USA

^e Faculty of Health Witten-Herdecke University, Alfred-Herrhausen-Str 50, 584 Witten, NRW, Germany

^f Department of Trauma Surgery, Leiden University Medical Center, Leiden, The Netherlands

ARTICLE INFO

Article history:

Accepted 15 November 2015

Keywords:

ATLS
Assessment
Trauma education
MCQ

ABSTRACT

Background: In Advanced Trauma Life Support (ATLS®) courses, multiple choice question (MCQ) tests are used to assess student's post course knowledge. As part of the ninth Edition Revision Process, existing MCQ tests were reviewed and revised by an International MCQ Revision group. The aim of this study was to evaluate the revision procedure and its effects.

Methods: Based on psychometric data and evidence based guidelines for adequate MCQ item and test development, a detailed stepwise approach was determined and followed to evaluate the existing MCQs, and to guide test item revision or replacement.

Results: The MCQ Revision group composed three new draft test versions comprising of 40 MCQs each. These were beta-tested among ATLS Instructors in various countries involved in ATLS. Psychometric analysis demonstrated that a minority of MCQ items required revision to create three equally balanced tests. After these final adjustments, a new set of three validated MCQ tests was available for use in 9th edition ATLS provider courses. Beta testing was performed using instructors but not students. The failure rate amongst students of ATLS provider courses increased significantly after introduction of the new MCQ tests.

Conclusion: ATLS tests were revised and updated using current evidence based guidelines and psychometric analysis. Difficulty of the tests was not initially beta-tested on students. Increasing test item discrimination and quality resulted in lower test scores by students.

© 2015 Elsevier Ltd. All rights reserved.

Background

Currently, the Advanced Trauma Life Support (ATLS®) course for doctors is taught in more than 60 countries worldwide. It is a widely accepted standard for the initial care of trauma patients [1]. During ATLS courses, the students undergo serial formative assessment during varied skills stations. At the completion of the

course, summative assessment is performed and is based on MCQ testing as well as on performance tests during simulated patient assessments. As knowledge is important in medical competence and a necessary prerequisite for successful problem solving, the main goal of the post course MCQ test is to assess the student's final level of knowledge. It is assumed that students will perform better on this test, as compared to the pre-course test, once they had the opportunity to elaborate on the course content in interactive lectures and were challenged to apply their knowledge in ATLS skills stations and Initial Assessments, using the systematic approach of patients [2].

Each ATLS MCQ test consists of 40 single best-option questions, which can be regarded as the most versatile and widely used multiple-choice question type [3]. For the final testing ATLS

* Corresponding author at: PLATO, Leiden University, P.O. Box 9555, 2300 RB Leiden, The Netherlands. Tel.: +31 71 5268364.

E-mail addresses: j.bustraan@lumc.nl (J. Bustraan), whenny@online.nl (W. Henny), kbrasel@mcw.edu (K.J. Brasel), Marzellus.Hofmann@uni-wh.de (M. Hofmann), b.schipper@lumc.nl (I.B. Schipper).

¹ Tel.: +1 403 944 1697.

employs three different test versions in order to be able to vary the tests between consecutive courses and course-sites. In general, one of the three tests is chosen to serve as initial final test. One of the other two is used as retest for students who failed the first time and occasionally, the third is used as second retest. Since the tests are not publicly available, they can be used repeatedly.

As with any assessment instrument, MCQ tests do have specific limitations and disadvantages. Yet, if well-constructed and peer reviewed, MCQ tests can meet important educational standards. Good quality MCQs can test more than the mere recall of knowledge. Benefits of automated marking and a potentially high reliability at low costs make MCQs a viable option [4]. Although guidelines for developing adequate MCQ items are available, the construction of good MCQ tests remains a challenge.

A pilot study in 2009, analysing data from 190 Dutch ATLS Instructors updating for the 8th edition, demonstrated that the tests used until then were not optimally balanced within and between tests. To determine whether the results were applicable and relevant for ATLS students, a second identical psychometric study was performed in 2010, using student data from Switzerland, Israel and the Netherlands. The data from this study were compared to the data from the extensive students' database of the American College of Surgeons (ACS). The specific methods and outcomes of the psychometric analysis of these studies were presented at several ATLS International Conferences between 2010 and 2013. These results confirmed significant differences in performance and pass rates between existing MCQ tests. They also demonstrated significant differences in the difficulty index (p value) and the point biserial correlation (r_{pb}) values between individual test items.

Since changes in the content and format of the ATLS programme require evidence [5], the American College of Surgeons' International ATLS Subcommittee decided to install an International MCQ Revision group. The objective was to develop an updated and balanced set of three equally difficult MCQ tests that would match the content of the 9th edition ATLS manual and would meet the psychometric quality criteria. This paper describes the review and development process and its outcome.

Methods

The International MCQ Revision group consisted of experienced medical doctors and educators that served also as ATLS faculty, from different ATLS world regions and countries. The combination of various countries and continents, backgrounds and languages, was specifically sought to assure extensive expertise and input from around the world.

A development strategy and time frame were defined. The process was divided into seven steps that follow guidelines from Classical Test Theory (CTT) [6]:

1. Develop a test matrix (also known as a test blueprint or test specification matrix) [7] that addresses the learning objectives and specifies each item at the intended mastery level: knowledge (K) or application of knowledge (A).
2. Screen items from the 8th edition tests on re-usability, using specific quality and content criteria. Match selected items with test matrix.
3. Review a subset of potentially reusable MCQs. Develop new MCQs if necessary. Peer review of all questions by fellow-group members. Adjust MCQs.
4. Present final draft MCQs to the ATLS Subcommittee and collect feedback.
5. Refine questions. Beta-test a new product, in this case, the new MCQs in a limited group of potential users and incorporate

feedback before officially launching the new product. Compose three tests of 40 questions each. Beta-test again.

6. Perform final check on match between the content as presented in the final version of the 9th edition manual and the final MCQs. Make last adjustments if necessary before launching the tests worldwide.
7. Collect international data on test results during 1 year.

All International MCQ Revision group members were provided with literature [8,9] on MCQ construction. They received instructions and feedback at step 1–3 by the Chair and Educator in the group.

Results

Following the MCQ development schedule, the results of the review and development process are presented stepwise.

1. The test matrix for the 9th edition MCQ's had the following characteristics, some of which were based on assumptions:
 - The ATLS manual covers all important topics.
 - All 13 chapters/topics are equally important.
 - Students have to show their mastery of all topics on two levels: knowledge and application of knowledge using an ABCD approach.
 - Each test consists of 40 items. In each test all 13 chapters will be covered by 3 MCQ's: one testing knowledge (K) and two testing application of knowledge (A).
 - The 40th question is used to address/emphasise specific new topics in the 9th edition (for instance: balanced resuscitation).
2. Using the test matrix, all 160 questions from the initial tests were analysed and categorised. 45 items with a p -value (indicating the level of difficulty of a test item) below 0.25 or a negative discrimination index value (meaning that a test item does not adequately discriminate between good and bad overall test performers; also called r -value, or r_{pb} -value) were directly excluded from future review. The quality of the remaining 115 MCQs was assessed. 23 questions were classified as good, 18 as moderate and 73 as questionable. After careful review of the 73 questions of questionable quality, 49 questions were excluded, based on a p -value $> .90$.
3. A subgroup from the MCQ Revision group critically reviewed the remaining 65 questions on content and mastery level (whether a MCQ tested K or A). Table 1 shows the numbers of questions that were left unchanged and were adjusted.

Simultaneously, 78 new questions were formulated, most on application. New MCQs were reviewed and adjusted in several rounds.
4. Combining new with reviewed questions resulted in a set of 143 well-constructed and peer-reviewed items. This set was presented to the ATLS Subcommittee in March 2012 for final review.

Table 1
Results review process on pre-existing MCQs.

$N = 65$	N per quality level	N available questions on knowledge (K) and application (A)	N of questions left unchanged or adjusted
Good	23	K: 13, A: 10	Unchanged: 23
Moderate	18	K: 13, A: 5	Unchanged: 5, adjusted: 13
Questionable	24	K: 13, A: 11	Unchanged: 8, adjusted: 16

Download English Version:

<https://daneshyari.com/en/article/3238696>

Download Persian Version:

<https://daneshyari.com/article/3238696>

[Daneshyari.com](https://daneshyari.com)