



**2009 OTA Annual Meeting
Manchester Grand Hyatt
San Diego, CA**

(#S11): Mini Symposium:

Orthopaedic Traumatologist as Educator

America's Cup C/D, Level IV

**1:15pm – 2:45pm
Saturday, October 10, 2009**

Moderator: J. Tracy Watson, MD

**Faculty: Piet de Boer, FRCS
Richard E. Buckley, MD
Robert D. Fox, Ed.D
Susan Scherl, MD
Paul Tornetta, III, MD**

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Disclosure: Faculty disclosure can be found starting on page 67 of the 2009 OTA Annual Meeting program.

Who Are The Residents?

Orthopaedic Traumatologists as Educators OTA Annual Meeting San Diego, CA 10/10/09

Susan A. Scherl, MD
The University of Nebraska
Department of Orthopaedics

Generations:

■The Greatest Generation:

–Fought and won WW II.

■The Silent Generation:

–Born between the world wars.

■Baby Boomers:

–Born just after WW II.

–14 year increase in birthrate worldwide.

–Large diverse group.

–Dramatic social changes.

–Aging and end of life issues.

■Generation Jones:

–Also known as “cuspers”

–Born between 1954 and 1965.

–Children of the optimistic 60s, but came of age in the pessimistic 70s.

■Generation X:

–Born between 1965 and 1976.

–Shaped by the end of the cold war, the advent of the home computer, AIDS, grunge and hip-hop cultures.

–“Latch-Key Kids”.

■Millennials:

–Born 1977-1998.

–Born into computer technology.

–“Trophy Kids” with “Helicopter Parents”.

Trends which have shaped Millennials:

■Focus on family.

■Scheduled, structured lives.

■Multiculturalism.

■Terrorism.

■Heroism.

■Patriotism.

■Parent advocacy.

■Globalism.

Messages that have shaped Millennials:

- “You’re special.”
- “Be inclusive.”
- “Make connections.”
- “Achieve, right now!”
- “Serve.”

Characteristics of Millennials:

- Confident.
- Hopeful.
- Goal-oriented.
- Civic-minded.
- Inclusive.

What Millennials want in the workplace:

- Strong leadership.
- Challenge.
- To work with friends.
- Fun.
- Respect.
- Flexibility.
- High pay.

What Millennials reject in the workplace:

- Not having their high expectations met.
- Having their input discounted because of their relative inexperience.
- “Negativity.”
- Lack of control over schedule and lifestyle.

Millennials at Work:

LIABILITIES	ASSETS
Dislike “menial” work	Multitasking
Deal poorly with criticism	Collaboration
Impatient	Goal-oriented
Inexperienced	Technically savvy
Over-confident	Positive Attitudes

Millennials in Orthopaedic Residency:

■Challenges:

- “Lifestyle” issues.
- “Paying Dues.”
- Dealing with error and criticism.
- Issues of motivation and “work ethic.”

■Opportunities:

- Teamwork.
- Technology.
- Structure.
- Entertainment & excitement.
- Experiential activities.

■Communication:

- Positive.
- Respectful.
- Motivational.
- Goal-focused.
- Electronic.

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The Trauma Curriculum
Paul Tornetta III, MD
Boston University Medical Center

1. Orthopaedic trauma overlaps with other areas
 - a. Hand
 - b. Upper extremity
 - c. Reconstruction
 - d. Foot and ankle
 - e. Spine
2. Care of the injured patient
 - a. General trauma
 - b. Resuscitation
 - i. Physiology of injury
 - ii. Serum and other markers
 - c. Injury scoring
 - d. Mortality and general outcomes
 - e. Brain injury
 - f. Chest injury
 - g. Spine injury
 - h. Vascular injury
3. Major orthopaedic injury
 - a. Pelvis, acetabulum
 - b. Long bones
 - c. Open fractures
 - d. Axial skeleton
4. Acute fracture care
 - a. Multiply injured
 - i. Timing
 - ii. Staging
 - iii. Effects on overall physiologic status
 - iv. Damage control
 - b. Isolated
 - i. Simple
 - ii. Host assessments
 1. IDDM
 2. Nutrition
 - iii. Periarticular
 1. Timing
 2. Staging
5. Management of complications
 - a. Nonunion
 - b. Infection
 - c. Amputation

The Trauma Curriculum

Paul Tornetta III, MD
Boston University Medical Center

Sources: JOT, OTA website...

Orthopaedic Trauma Education

Born, Christopher T.; Barrick, E. Frederick; Cramer, Kathryn E.; Miller, Michael E.; Sims, Stephen H.; Stephen, David J.; Tornetta, Paul III; White, Raymond R.; Whittle, A. Paige; OTA Committee on Fellowship and Career Choices

Journal of Orthopaedic Trauma. 13(6):432, August 1999.

Resident Education Curriculum for Orthopaedic Trauma

Born, Christopher T.; Orthopaedic Trauma Association, Fellowship and Career Choices Committee

Journal of Orthopaedic Trauma. 13(6):441-455, August 1999.

Guidelines for Orthopaedic Trauma Fellowships

Born, Christopher T.; Orthopaedic Trauma Association, Fellowship and Career Choices Committee

Journal of Orthopaedic Trauma. 13(6):437-440, August 1999.

Resident lecture syllabus, available for all in PPT format:

http://www.ota.org/res_slide/index.html

OTA Resident Course Lectures, archived:

http://www.ota.org/education/resident_lectures.htm

LEARNING ASSESSMENT TOOLKIT
de Boer P, B Buckley R, Schmidt P, Fox B & Jupiter J.

Abstract

Background – Most commonly used methods of assessing the results of an educational event do not give evidence of learning outcomes for participants. New standards for accreditation of CME events will be introduced in the next three years in the United States. **Methods** An educational tool to meet these standards incorporating pre and post course objective and subjective needs assessment. Also included is carefully designed faculty evaluation by participants and by a trained faculty member. **Results** – The results of using the system on 912 participants in eleven countries are described together with practical examples of how the data collected influenced teaching. **Conclusions** – More comprehensive evaluation of education events using the assessment tool kit will result in improved learning outcomes which should contribute to better patient outcomes.

Introduction

Modern surgical education is evolving with changes in the academic environment. Surgeons, surgical educators and administrative associations need to know what to teach, how to do it and whether or not it succeeded. Whereas surgeons have many tools to help them see what is needed for better patient care and to measure patient progress, surgical education is just beginning to develop techniques of interpreting the needs of students and to assess outcomes of learning in their practice. (1, 2) The

absence of surgical education assessment techniques has made it necessary to guess what is needed to improve education. We have estimated the success or failure of teaching by attempts to score faculty performance rather than upon more valid data. This has led surgical educators to use mistaken assumptions based on their personal experience or reasoning without evidence. (3)

Surgical education should be based upon needs assessment, efficient program planning and a strong curriculum. Motivation of learners would be high and learner's needs would be met. This is dependant upon measurable outcomes with objective data demonstrating knowledge acquisition that meets surgical learner needs. (4)

In the last ten years, the providers of educational resources – governments, training boards, charitable foundations and commercial companies have been increasingly interested in whether surgical education, as it is delivered, has had a measurable effect. (5, 6, 7)

Through a series of piloted steps, we have developed a set of instruments, providing insights into the effectiveness of surgical education in the field of orthopaedic trauma. We termed the instrument the Learning Assessment Toolkit. It was developed to supplement the judgement of surgical educators before and after a teaching event with real evidence of need, motivation and outcomes of educational programs in orthopaedic trauma surgery .

The primary goal of this paper is to outline the elements of a Learning Assessment Toolkit, and its developmental steps. The secondary goal of the paper is to show

how its use can change the nature and content of surgical educational events to improve learning outcomes. It will also suggest what further instruments are necessary to achieve the desired end result, education that significantly improves patient care.

Materials and Methods

The educational event used to design and test the assessment toolkit is a fracture course, the AO principles of operative fracture management. The course is aimed at residents in their first few years of training. The participant groups are homogenous in North America and Western Europe but heterogeneous in the developing world in terms of their needs and experience. The course has evolved over the past 49 years, but has been taught in a standardised form for the past decade.

The “key competencies” guide the development of the Learning Assessment Toolkit, and the teaching and learning in the course. (Table 1) A “key competency” was defined as a piece of knowledge and/or skill that educators expected the course participants must know or to be able to do after the course. (8,9.) “Key competencies” are statements describing what behaviours are necessary to address problems related to successfully providing gold standard patient care. These responses were collected from three experienced course chairmen, all with greater than 10 years teaching experience acting as a panel of experts.

How the Learning Assessment Tool Kit Works (Table 2)

Pre-course assessment

Two weeks before the educational event, course participants were contacted online. They were presented with the fourteen “key competencies” and asked two questions about each competency. The first question was “How important was this competency to them in their daily practice?” Participants were asked to score from 1 to 5 (with 5 being the highest score) on a Likert scale. They were then asked to “Evaluate their own ability” relating to the individual competencies using the same scoring system.

Three pieces of information were obtained from this survey and passed onto the faculty of the course and fed back to the individual course participants.

1. Which competencies were rated as being the more important from the participant’s point of view – an indication of where they thought they ought to be in their practice.
2. How capable did the participants feel they actually were in each competency.
3. What was the difference between these two measures for each “key competency”, the “gap” score. This is an indication of the difference between where the participants felt they were and where they ought to be in their practice.

The “Gap score” is a reasonable measure of the motivation of the course participants to learn at the course. Discomfort over perception of where an adult learner believes they are and where they believe they ought to be as indicated in this case by the measure of the importance of a given competency creates discomfort in the learner and spurs the drive to learn and change . (10).

At the same time that the course participants were contacted online with regards to their needs assessment, they were also given two multiple choice questions relating to each “key competency”. The multiple choice test questions were developed by the surgical educators through an expert panel (11) consisting of existing experienced faculty members and a small group of senior North American orthopaedic surgical residents following best practice guidelines of multiple choice item writing . (Fig 1)

The test questions were put into assessment software for on-line piloting to collect statistical data as to how the learners were answering the individual questions. (Question mark TM Perception TM). After piloting these questions on three courses, the expert panel was reassembled to study the data obtained and to eliminate or refine questions which were too easy, too hard or too confusing. Following further piloting of the adapted questions, they were reviewed again and became part of a library of test questions. The response patterns for each pilot have been continually assessed to build up evidence as to the validity and discriminatory capacity of each individual test item.

The objective assessment enables the faculty to have insight as to whether the course participant's assessment of their current performance was or was not accurate and enables the learner to have an understanding as to his true level of knowledge. Previous studies have shown that a doctor's perception of his own level of knowledge or skill is not accurate with a tendency for doctors to overestimate their own abilities (12,13,and 14)

Evaluation during the Course

The course participants were asked to evaluate each presentation – lecture, discussion group or practical skill session. The evaluation system for each presentation was on a 5 point Likert scale using an audience response system. Two questions were asked:

1. How relevant is the presentation to your daily practice?
2. How effectively was the presentation given?

The course participant rating was collected electronically after each session with participation rates in excess of 80%. To ensure validity as to whether the course participant's assessment of faculty performance was or was not accurate, two faculty members were also assigned to assess each presentation based on a group of ten criteria that had been agreed upon by the faculty before the educational event and which were supported by the available literature (15,16,17).

Post course assessment

Two weeks after the course the course participants were contacted on-line. They were asked to repeat the on-line questionnaire. They were also tested using two multiple choice questions for each competency. The set of questions was new to each individual participant but had been asked before the course to the other half of the course participants. Four questions were allocated to each course A, B, C & D. Half the course participants answered questions A&B before the course and C&D afterwards. Half the participants answered questions C&D before the course and A&B afterwards. Participants were not asked the same questions before and after the course to avoid test / re-test bias of their answers, which would have tended to improve their post course scores, giving a false impression about knowledge transfer occurring as a result of the course.

Source of Funding

This project was funded entirely by the AO Foundation, Davos Switzerland.

Results:

The assessment tool kit has been used on 20 courses in 8 different countries involving 1,812 participants originating from 47 different countries. However, only data collected from courses that took place after finalization of the assessment questions is presented – 11 courses in 6 countries involving 912 participants from 46 countries. Response rates varied from 41% to 98% with an average of 62% for the pre-course assessments and 51% for the post-course assessments.

Pre course subjective needs assessment

Overall gap scores were high for an educational event.(10) The average gap score was 2.25 with a fairly narrow range between 1.9 and 2.4. Certain competencies were consistently ranked as being more important than others and this pattern was independent of the geographical location of the course. The “emergency management of a haemodynamically unstable patient with a pelvic fracture” was consistently the highest need as identified by the course participants.

High gap scores can occur in one of two ways – either the participant ranks the competency to be very important or the participant feels that his/her ability is poor for the competency tested. Similarly a low gap score can be explained in two ways . – either the participant feels that the competency is not important for his/her practice or they feel that their ability is reasonable for the competency tested . Those competencies which consistently showed high and low gap scores are listed in Table3.

Pre Course knowledge assessment

The level of knowledge of the course participants varied from course to course. On average, the questions were answered correctly by 59% of the course participants (range 51% to 67%). Those courses held in the developing world were attended by

surgeons with greater experience and this was reflected in their higher knowledge scores.

The correlation between knowledge as measured by objective testing and by self assessment was very variable. On three courses, participants who rated their need to learn about “compartment syndrome” as low because they had good existing abilities of the subject were incorrect in their self assessment , scoring low on their objective assessment. On two courses, participants rated their need to learn about “compartment syndrome” as low because of good existing abilities and objective testing showed them to be correct .

Course evaluation.

Electronic evaluation of faculty performance by the course participants was carried out on 4 courses. The other courses were evaluated used a paper based system. 45,600 responses were analysed. There was a very strong correlation between the participants perception of the relevance of the presentation to their practice (Average score 4.04 Range 3.88 – 4.21) and to their perception of faculty performance (Average score 3.99, Range 3.77 – 4.17). When presentations are given about the same subject to differing audiences by different faculty there is not surprisingly a wide variation in the participant’s assessment of performance. The participant’s perception of relevance also changes following the change in performance perception. Basing changes in curriculum upon analysis of perception of relevance in isolation from faculty performance is probably invalid.

The evaluation of faculty performance by a trained faculty assessor based on agreed criteria correlated very weakly with the participant’s evaluation of either relevance

or performance. (Calculation of the Pearson correlation coefficient - a correlation test to assess the null hypothesis that this correlation was equal to zero. Correlation R equals 0.54; P- value less than 0.0001.) On those occasions when the performance and relevance scores were not closely related, the faculty assessment closely followed the gap between the two different evaluation criteria. For example, a presentation ranked very effective by the faculty evaluator was very likely to have a performance score considerably higher than the relevance score.

Post course subjective evaluation

All courses evaluated showed marked falls in the gap scores measured 2 weeks after the course. (Average 1.17, Range 0.55 to 1.645). The gap scores of all competencies fell with the biggest decreases being seen in those competencies that had the highest precourse needs. These figures reflect the belief that the course participants felt that they had learned as a result of the course. Learners highest residual needs varied from course to course but the “management of open fractures” and “the treatment of a haemodynamically unstable patient with a fractured pelvis” were the commonest areas of residual perceived need.

Post Course objective assessment

Most competencies showed an improvement in their objective assessment scores. (Average 73% Range 69% to 77%). There was considerable variation in learning outcomes for each of the competencies. Problem areas were in the teaching of “reduction techniques”, “pre-operative planning” and “compartment syndrome” where improvements in learning outcomes were modest.

Discussion – Explaining the Learning Assessment Toolkit

Precourse assessment

Before the course, course chairmen and faculty are given the following information:

1. How motivated are the participants to learn?
2. What are the priorities of the participants with regard to their learning needs?
3. What are the course participants perceived level of ability and how does that compare with an objective measure of that ability?

This information allows the faculty to modify the course and modify how they will teach it. For example, on several courses, course participants had low “gap” scores with regard to the competency “diagnosis and treatment of compartment syndrome”. The “gap” score was low because the participants felt they had reasonable abilities to treat patients with this condition. Objective testing showed poor knowledge, especially concerning the use of compartment pressure monitoring. Faculty decided to raise the level of motivation by starting the lecture with a discussion of this question which most participants had incorrectly answered. The participants level of discomfort was immediately acknowledged as they realized that they had not really understood this aspect of patient management.

We feel that evaluating a participant before a course and providing objective, anonymous data as how he/ she is performing is a powerful motivator in itself. (19, 20)

Course Evaluation

Course assessments filled in by surgeons during and after the course have been the normal form of course assessment for many years. The subjective assessment of an individual surgeon/teacher performance when taken in isolation is of very little value in either assessing an educational event or setting out the agenda for change.(21) The assessment by the course participants of the relevance of a particular presentation, however, may be useful for course planning but only if combined with needs assessment data.

Post –course Evaluation

After the course the course organizers and faculty are given the following information:

1. Change in “gap” scores relating to each competency. A reduction in “gap” scores suggests that the course participants felt their educational goals had been met.
2. 2. Change in the participants level of knowledge relating to each competency.

Collecting both objective and subjective data allows accurate evaluation of the success of a given course. It allows changes in course design to be made on objective evidence. Our data has shown that the “gap” scores decline significantly on nearly every competency on all courses that have been

assessed. This data correlates well with the conventional course evaluation data that we have collected which suggests a high level of satisfaction from the participants. However, on all courses that have been assessed, at least four competencies have been shown to have poor learning outcomes as measured by objective knowledge testing .i.e course participants frequently feel that they have learned something as evidenced by a reduction in the gap score caused by a perceived increase in their level of competence but when they are subjected to objective testing their self assessment is shown to be false.

As well, our results have shown that each course produces some results which are unique to that course, This requires a solution precisely tailored to that course. Its value is best demonstrated by two examples:

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In 2007

The competency “ability to apply a reduction technique in fracture management” was taught on two lectures. Both lectures were very well received by the course participants both in terms of their relevance and in terms of faculty performance. Before the course, motivation to learn was very high as measured by the gap score and the pre-course knowledge of this competency was low, as measured by the multiple choice questions. Despite the high scores given by the course participant to the presentations the level of knowledge of the course participants after the course had not improved significantly and their subjective evaluation confirmed this objective result. The changes that were recommended were to design practical exercises to demonstrate the reduction techniques and ensure that in the small

group case discussions the reduction technique was discussed with regards to each of the fractures under consideration.

The following year after introduction of more discussion group material and a policy that all cases discussed in small discussion groups must include an introduction of reduction techniques, the learning outcomes were improved (2007 45% correct , 2008 64% correct).

In 2007, pre-course assessment of participants showed low motivation to learn with respect to “compartment syndrome”. Objective testing showed that the participant’s knowledge was in fact poor. Two presentations were given which were well received by the course participants both with regard to relevance and performance. After the course, objective testing showed no improvement in knowledge.

What are the possible explanations? Possibly the participants were poorly motivated to learn because they felt their knowledge base was good. It could be that their assessments of the presentation represented the fact that they had enjoyed the lecture but possibly not have learned anything.

The findings were discussed with the Chairmen of the 2008 course before the course. It was decided to introduce a question that the course participants had gotten wrong at the start of the presentation to make them aware of the false perception of their level of knowledge. It was also decided to emphasize the

possibility of compartment syndrome in cases presented in the case discussion sessions.

The assessments of the 2008 course showed very similar precourse data but considerably improved learning outcomes (2007 – 54% correct, 2008 – 76% correct).

Conclusion

With accreditation changes, continuing education for surgeons must meet new requirements. In addition to using well prepared faculty who present education in a thoughtful and organized manner, new standards for the accreditation of CME specify that programs must be based on gaps in knowledge, performance or patient health status. Course administrators must document learner processes for assessing outcomes in terms of gaps in knowledge; performance or patient health must also be used as part of the educational process. This presents a formidable challenge because tools for assessing needs, motivation and outcomes in terms of gaps in knowledge and performance have not been available. The learning assessment toolkit provides a short practical system for discovering objective and self assessed gaps in performance of key competencies before and after programs.

Before and after a course, what the learner and the educator need is accurate information to verify their perceptions. The toolkit data is designed to provide

accurate information related to level of competencies for surgeon performance by using case based multiple-choice questions to test clinical judgements, decisions and observations. Objective evidence and perception together provide feedback to the learners and teachers of the learners' level of motivation and their gaps in knowledge and skill before and after a learning experience. With this kind of data, educators can understand the level of motivation before and after instruction and also assess gaps in knowledge and skill related to solving clinical problems before and after instruction. The educator learns how learners perceive themselves, how accurate these perceptions are and to what extent an educational activity has changed perceptions and actual knowledge.

This information of needs and outcomes of instruction can provide the learner with information to self correct their assessments of self and guide them in educational and self directed learning activities. After the educational experience, the learner is given personal data regarding their perceptions and their individual scores on objective questions related to clinical cases. This improves the accuracy of their self-assessment and can help learners plan for future participation in CME events.

The education of doctors has one major purpose. It is to produce changes in knowledge translation that result in improved patient care. The Assessment Toolkit provides objective evidence as to the success or failure of an educational event in producing improved levels of knowledge.(22) It provides information to educators as to the strengths and weaknesses of their program and provides evidence to allow effective future changes to be made.

Future Developments:

This evaluation system provides a useful guide to enable educationalists to design appropriate educational offerings to meet the needs of surgeons. But if individuals learn knowledge and skills in an education event but after the event cannot put their skills into practice, then the event has clearly not been successful. Assessment of the barriers to knowledge implementation after a course is therefore critical. We are presently conducting a study on identification of “barriers” that are encountered by doctors in implementing what they have learned at courses and how educators can help them overcome these barriers (23).

Assessment and feedback to an individual surgeon forms the basis of a life long learning relationship between an educational provider and a surgeon learner.

The assessment toolkit provides valuable information to allow educators to design and monitor these educational events. When complete, the “barriers” part of the toolkit will allow educators to modify their educational offerings to fit in with the real life experience of the participants.

We hope the future will provide many new developments allowing educational providers the ability to actually say that their courses have resulted in improved patient care.

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Figure 1 legend

Sample question from pre/post course objective assessment used to assess Competency1

– Assess fracture related soft tissue injuries and apply strategies to treat these injuries