UNIVERSITY OF MEDICINE AND PHARMACY
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DOCTORAL SCHOOL

PhD THESIS

Complex evaluation of polytrauma in intensive care with multiple severity scores

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Introduction:

- ➢ Trauma continues to be a leading cause of death and disability.
- ➢ The initial assessment and management of seriously injured patients is a challenging task and requires a rapid and systematic approach.
- ➢ The aim of good trauma care is to prevent early trauma mortality.
- ➢ Early trauma deaths occur because of failure of oxygenation of vital organs or central nervous system injury or both.

The Aims of the initial evaluation of trauma patients are:

- ➢ to stabilize the patient,
- ➢ Identify life threatening conditions in order of risk,
- ➢ initiate supportive treatment and organize definitive treatments or organize transfer for definitive treatments.
- ➢ Inadequate or delayed care of the trauma patient not only prolongs the hospital duration, but can initiate the cycle of organ failure and death.
- ➢ **The Advanced Trauma Life Support (ATLS)** Program has established The international standard for initial assessment and management of the trauma patient.
- ➢ The underlying basic principle of this approach is to prioritize management based on the degree of life threat. It emphasizes the concept that resuscitation of the trauma patient can be successfully achieved without a definitive diagnosis.
- ➢ ATLS-recommended guidelines have become the "gold standard" for the first hour of hospital care for trauma patients over the world.

Primary survey:

- ➢ the rapid evaluation and treatment of the immediately life-threatening

injuries.

Secondary survey:

> The more detailed evaluation, diagnosis, and treatment of the occult or non-immediate threats to life.
> The initial assessment begins with the ABCDE of the primary survey.
> Re-evaluation is continuous.
> The ability to predict outcome from trauma (ie, mortality) is perhaps the most fundamental use of injury severity scoring.
> Field trauma scoring also is used to facilitate rational prehospital triage decisions, thereby minimizing the time from injury occurrence to definitive management.

Result:

Injuries according to the nature

Relation between age and severity of injury

Injury according severity

ICU stay according to severity of injury

Summons all the scores for comparison

The Correlation between the Different Scores Applied In ICU

Correlation between the Mortality Rateswith Applied Scores in ER

Interpretation of APACHE II Score:

Average ICU stay duration

Comparisons between the scores from Sensitivity, Specificity, and Accuracy point of view

Discussion:

1-Glasgow Coma Scale (GCS):

This system allows the conscious level of patients to be assessed and recorded using a numerical score. It's advantage is that it is relatively 'universal', in that it enables different health-care professionals to assess the patient at different times in order to make serial comparisons of the patient's conscious level.

Advantages

- ❖ GCS is a simple
- ❖ straightforward and very brief bedside assessment
- ❖ It is the most widely used instrument in the assessment of level of consciousness
- ❖ GCS is a significant predictor of outcome following head injury
- ❖ the prognostic value of the GCS is increased by taking other variables into account as well, such as (mechanism of injury, age, CT findings)

Limitations

- ❖ Rowley and Fielding (1991) reported that the percentage agreement between inexperienced individuals and expert raters ranged from 58.3% to 83.3%. Lower levels of accuracy were most notable in the middle ranges of the scale.
- ❖ Training and the implementation of standard assessment procedures are important to maintain both high levels of reliability and accuracy of evaluation.
- ❖ GCS may reflect the increased and more aggressive use of intubation, ventilation and sedation (Teasdale and Murray 2000, Balestreri et al. 2004)

- ❖ Preresuscitation Glasgow Coma Scale (P-GCS) score is not a good clinical tool for outcome prediction in individual head-injured patients

2-Revised trauma score - (RTS):

RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR

Values for the coded RTS range 0 to 7.8408. (0 = dead 7.8408 = normal) The RTS is heavily weighted towards the Glasgow Coma Scale to compensate for major head injury without multisystem injury or major physiological changes.

Limitations of RTS:

- Calculating coded form in field not practical
- Problems with GCS in intubated patients
- Influence of alcohol and drugs
- **An advantage,** through better patient assessment by using three criteria poly-trauma physiological. Using gravity coefficients can be obtained with RTS prognostic score.
- **As a disadvantage**, having only physiological criteria cannot identify the severity of trauma according to the severity of anatomical injury.
- The **Revised Trauma Score** (RTS) is a physiologic scoring system, designed for use in based on the initial vital signs of a patient.
- A lower score indicates a higher severity of injury.

3-Acute Physiology and Chronic Health Evaluation (APACHE)

- The image below shows that there is a sigmoid relationship between mortality and total APACHE II score. The graph includes a solid red line, which represents mortality without correction for the patient's ICU admission indication. The red gradient encompasses the potential mortality risk depending on the patient's ICU admission indication (drug overdose being the best, respiratory neoplasm with emergent surgery being the worst).

More than 50 score systems are published for classification of trauma patients in the field of emergency or intensive care.
An integral score from 0 to 71 is computed based on several measurements; higher scores imply a more severe disease and a higher risk of death.
Injured patients with hypothermia generally have worse outcomes compared with non-injured patients with hypothermia; however, hypothermia alone is a weak independent predictor of mortality.

Scores	Sensitivity	Specificity	Accuracy
APACHI II	0.88	0.90	0.90
RTS	0.81	0.88	0.85
GCS	0.75	0.84	0.83

In our study the rate of death predicted by Apache II is very close to the standard rates of scale and this indicates two things:
The first is a measure of accuracy in predicting mortality in polytraumatized patients.

The second is that medical procedures which applied for our patients have a good level of accuracy.

Interpretation of APACHE II Score:

apache2 value	0-4	5- 9	10- 14	15-19	20 -24	25- 29	30 -34	>34	Total
patient no	38	12	30	17	6	2	0	1	105
death no	1	1	5	4	2	1	0	0	14
actual death %	2.6	8.3	16.6	23.5	33.3	50	0	0	
official death %	4	8	15	25	40	55	75	85	

The nearest study for Okasha A.S, AbouelelaAmr, Hashish Wald, They have study which carried out on 175 polytraumatized patients who were admitted to Critical Care and Emergency Medicine Departments at Alexandria University Main Hospital

❖ It was found that the most significant sensitive and specific score was the combined score (anatomical& physiological) TRISS (sensitivity 95.0%, specificity 96.0% and accuracy 95.0%), while the grading of the other scores was in the following sequence: APACHEII, RTS, GCS, TISS (All are physiological) and finally ISS score (Anatomical score).

❖ Also they found APACHEII score had higher sensitivity (92%) than RTS but the latter had better specificity (94%) &accuracy (92%) than the former (88% and 90%) respectively. In general, the physiological scores in them study tend to have a better performance than the anatomical one &the combined scores had the best performance.

❖ And the higher APACHEII, the higher the mortality while the higher RTS & GCS the lower the mortality rate.

❖ In the studied sample we noted that the duration of ICU stay is not proportional to the severity of the injury, this is due to several factors, including:
1 – Early DAMAGE CONTROL AND RESUSCITATION:

2-Controlof goodnutritionand Glucose control

3 - Avoid complications:

Deep venous thrombosis (DVT), Pulmonarembolus(PE)

Also the surgical interventions can cause important effect on outcome of polytraumatized patients,

When applied correctly, nonoperative management is associated with shorter hospital stays and improved outcomes

Conclusion

➢ The mortality was matched to a large extent to the standard values of APACHE II score.

The APACHE II score is the best standard score applied in the study, in terms of sensitivity, specificity and accuracy in predicting prognosis in polytraumatized patients, through assessment on the first day when they entered to intensive care unit, also, the standard applicability is easy, even on patients who have polytrauma, but does not include the head.

➢ We felt the necessity for unified system to calculate the gravity and to predict the outcome of the polytraumatized patients, APACHE II system can be used as unified scale to compare the healthcare results and outcomes in different hospitals.

➢ APACHE II can be considered to be a largely accurate and applicable system for the polytraumatized patients.

➢ Time is crucial factor in the pursue for reducing mortality rate in polytrauma patients.

➢ Delayed approach and first aid, results in increased financial burden, to the patient and/or the healthcare system, and also more stress to the health personnel.