

Introduction

Intensive care is appropriate for patients requiring or likely to require advanced respiratory support, patients requiring support of two or more organ systems, and patients with chronic impairment of one or more organ systems who also require support for an acute reversible failure of another organ (*Smith and Neilson 1999*).

Scoring systems for use in ICU patients have been introduced and developed over the last 30 years. They allow an assessment of the severity of disease and provide an estimate of in-hospital mortality. This estimate is achieved by collating routinely measured data specific to a patient. A weighting is applied to each variable, and the sum of the weighted individual scores produces the severity score (*Bouch and Thompson 2008*).

A large number of severity of illness scoring systems have been developed and they are widely used in intensive care practice. However, they are complex systems with their basis in mathematics. To use such systems effectively, it is important to appreciate what factors influence their performance so that they can be compared fairly and used most appropriately (*Dr S. Ridley, 1998*).

As ICU populations change and new diagnostic, therapeutic and prognostic techniques become available, all the scoring systems will need to be updated. Importantly, the different scoring systems have different purposes and measure different parameters. They should be seen as complementing each other, rather than competing with one another (*Moreno and Vincent 2010*).

Scoring systems may guide us but clinical judgement and sensitive communication remain core skills when dealing with end-of-life events and decisions. (*Williams and Wheeler 2009*).

The fourth-generation Acute Physiology and Chronic Health Evaluation, Simplified Acute Physiology Score and Mortality Probability Model III adult prognostic models, perform well in predicting mortality (*Keegan et al., 2012*).

Aim of work

To evaluate three scoring systems in predicting severity of illness and outcome in Al - Abbasia chest hospital RICU patients in six months.

Chapter (1)

Critically ill patient

Critical illness is any disease process which causes physiological instability leading to disability or death within minutes or hours. Perturbation of the neurological and cardiorespiratory systems generally has the most immediate life-threatening effect. (*Robertson and Al-Haddad 2013*)

Clinical assessment of the severity of illness is an essential component of medical practice to predict the mortality and morbidity of critically ill patients, especially in the ICU. (*Saleh et al., 2015*)

The goal of ICU is to diagnose and treat life threatening patients and to restore their previous health and quality of life. Modern technologic advances now enable us to manage previously terminal conditions and patients can be kept alive for weeks or months, even when their prognosis is dismal. Another purpose added is to help the dying achieve a peaceful and dignified death (*Suter et al., 1994*).

Life expectancy has increased substantially in the past half century due to significant advances in healthcare prevention alongside improvements in diagnosis and treatment approaches. (*Patil et al., 2014*)

Patients in the intensive care units (ICUs) have a heterogeneous disease processes and illness severity. *(Kao et al., 2016)*

Various factors have been shown to increase the risk of mortality after admission to ICU, including increasing age, severity of acute illness, certain pre-existing medical conditions (e.g. malignancy, immunosuppression, and requirement for renal replacement therapy), and emergency admission to ICU *(Bouch and Thompson, 2008)*.

During the last 3 decades, critical care has matured to a distinct medical specialty. Sepsis, respiratory failure and the care of the complicated postoperative patient are now perceived as the purview of the intensivist. Concomitant with this evolution in critical care medicine has been a growing focus on health care outcomes. *(Dasta et al., 2005)*.

The heterogeneity and complexity of the ICU patient have generated interest in systems able to measure severity of illness as a method of predicting outcome, comparing quality-of-care and stratification for clinical trials *(Strand and Flaatten, 2008)*. So that a significant amount of work has already been done to develop tools to assess ICU performance. This work has focused primarily on the

development of general predictive models to compare observed versus expected mortality rates across a wide range of patients (*Parker et al., 2004*).

Table (1): recognition of critical ill patient.

Patient category	Apperance	Neurological	Respiritory	Cardiovascular
Potentially critically ill	Sweaty Anxious Pale	Agitation,confusion Eye opening to voice only	RR 20–30 /min	HR > 100 b/min SBP < 90 mmHg UO < 0.5 ml/kg/hr
Critically ill	Grey Blue Mattled skin	Unresponsive or eye opening to pain only. Fitting	RR < 8 > 30 b/min Agonal respirations	HR < 50 b/min HR > 150 b/min Blue SBP < 60 mmHg Anuric
Cardiac arrest or death				

British Journal of Hospital Medicine, October 2007. (Intensive Care Society Standards © 2009)

I. COPD

Classification of severity of airflow obstruction:

Table (2): Classification of airflow limitation severity in COPD(Based on post-bronchodilators FEV1 In patients with FEV1/FVC less than 0.7:

GOLD 1:	Mild	FEV1 ≥ 80% predicted
GOLD 2:	Moderate	50% ≤ FEV1 < 80% predicted
GOLD 3:	Severe	30% ≤ FEV1 < 50% predicted
GOLD 4:	Very severe	FEV1 < 30% predicted

Spirometry should be performed after the administration of an adequate dose of at least one short-acting inhaled bronchodilator in order to minimize variability. It should be noted that there is only a weak correlation between FEV1, symptoms and impairment of a patient's health status. so, formal symptomatic assessment is also required.

Assessment of symptoms:

Measure of breathlessness such as the Modified British Medical Research Council (mMRC) Questionnaire

Table (3): Modified MRC dyspnea scale:

mMRC Grade 0 :get breathless with strenuous exercise
mMRC Grade 1: breathless when hurrying on the level
mMRC Grade 2: walking slower than people of the same age on the level because of breathlessness
mMRC Grade 3: stop for breath after walking about 100 meters.
mMRC Grade 4: get breathless when dressing or undressing

(Gold 2017)

An exacerbation is a sustained worsening of the patient's symptoms beyond normal day-to-day variations, and is acute in onset. Commonly reported symptoms are worsening breathlessness, cough, increased sputum production and change in sputum colour. ***(NICE 2010)***

In all patients with an exacerbation referred to hospital:

Chest x ray, ABG,CBC, a theophylline level should be measured in patients on theophylline therapy at admission, if sputum is purulent, a sample should be sent for microscopy and culture, blood cultures should be taken if the patient is pyrexial. (*NICE 2004*)

The presentation of COPD exacerbation could be :

Acute respiratory failure -non-life-threatening: Respiratory rate: > 30 breaths per minute; using accessory respiratory muscles; no change in mental status; hypoxemia improved with supplemental oxygen via Venturi mask 25-30% FiO₂; hypercarbia i.e., PaCO₂ increased compared with baseline or elevated 50-60 mmHg.

Acute respiratory failure - life-threatening: Respiratory rate: > 30 breaths per minute; using accessory respiratory muscles; acute changes in mental status; hypoxemia not improved with supplemental oxygen via Venturi mask or requiring FiO₂ > 40%; hypercarbia i.e., PaCO₂ increased compared with baseline or elevated > 60 mmHg or the presence of acidosis (pH < 7.25). (*Gold 2017*)

II. Asthma

More recent descriptions of asthma, in both children and adults, have included airway hyperresponsiveness and airway inflammation as components of the disease reflecting a developing understanding of the diverse subtypes (phenotypes and endotypes) of asthma and their underpinning mechanisms. (*NICE 2016*)

It's defined by history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation (*GINA report, 2017*)

Many of the deaths occurred in patients receiving inadequate treatment with ICS or steroid tablets and/or inadequate objective monitoring of their asthma. Deaths continue to be reported following inappropriate prescription of β -blockers and non-steroidal anti-inflammatory drugs; all asthma patients should be asked about past reactions to these agent. (*NICE 2016*)

Asthma exacerbation is an acute or subacute worsening in symptoms and lung function from the patient's status; occasionally it may be the initial presentation of asthma. (*GINA 2017*)

Identifying patients at risk of asthma-related death

- A history of near fatal asthma requiring intubation and ventilation.
- Hospitalization or emergency care for asthma on last 12months.
- Not currently using ICS, or poor adherence with ICS.
- Currently using or recently stopped using OCS
- Over-use of SABAs, especially more than 1 canister/month
- Lack of a written asthma action plan
- History of psychiatric disease or psychological problems
- Confirmed food allergy in a patient with asthma.

(GINA 2017)

III- Pulmonary embolism

Venous thromboembolism (VTE) is a condition in which a blood clot (a thrombus) forms in a vein, most commonly in the deep veins of the legs or pelvis. This is known as deep vein thrombosis, or DVT. The thrombus can dislodge and travel in the blood, particularly to the pulmonary arteries. This is known as pulmonary embolism,

or PE. The term VTE includes both DVT and PE. (***NICE 2016***)

Clinical prediction rules (e.g., Wells or revised Geneva) should be used to assess the pretest probability of a PE diagnosis before laboratory or imaging procedures.

- Age-adjusted cutoff levels increase the specificity of D-dimer testing and may decrease the overuse of imaging procedures and PE diagnosis for low pretest probability patients.
- Imaging studies (usually computed tomography angiography) are recommended as first-line tests for intermediate-high pretest probability patients.

High-risk patients (massive PE) present with shock or persistent arterial hypotension as a result of overt right ventricular failure.

- Management usually includes systemic fibrinolysis (both full-dose and half-dose regimens appear effective).
- Catheter-directed techniques are an option for patients with hemodynamic decompensation and high bleeding risk for whom systemic fibrinolysis may not have a favorable risk-benefit ratio.

Intermediate-risk patients (submassive PE) have hemodynamic stability upon presentation, but evidence of right ventricular dysfunction and positive biomarkers (troponin or B-type natriuretic peptide).

- Primary systemic fibrinolysis has an unfavorable risk-benefit ratio in intermediate-risk PE. (*Barco et al., 2016*)

It has been estimated that 25,000 people in the UK die every year from preventable hospital-acquired VTE. Non-fatal VTE is also important because it can post-thrombotic syndrome and chronic thromboembolic pulmonary hypertension. (*NICE 2016*)

IV- Pneumonia

Severe pneumonia is a common disease that intensive care physicians have to face. (*Bello et al., 2012*)

Direct admission to an ICU is required for patients with septic shock requiring vasopressors or with acute respiratory failure requiring intubation and mechanical ventilation. In addition to the 2 major criteria (need for mechanical ventilation and septic shock), an expanded set of minor criteria (respiratory rate, 130 breaths/min; arterial oxygen pressure/fraction of inspired oxygen (PaO₂/FiO₂))



ratio, <250; multi-lobar infiltrates; confusion; blood urea nitrogen level, 120 mg/dL; leukopenia resulting from infection; thrombocytopenia; hypothermia; or hypotension requiring aggressive fluid resuscitation. (*Dhar, 2012*)

Chapter (2)

Severity of illness scores in ICU

During the last 3 decades, critical care was matured to a distinct medical specialty. Sepsis, respiratory failure, and the care of the complicated postoperative patient were perceived as the purview of the intensivist. Concomitant with this evolution in critical care medicine had been a growing focus on health care outcomes (*Dasta et al., 2005*).

Over the past 20 years, substantial resources were committed to the development of scoring systems that's flexible enough to predict outcome among critically ill patients. Through repeated testing with large numbers of patients, these refined scoring systems reached a point at which they represented the scientific foundation for describing severity of illness and for describing and comparing groups of critically ill patients treated in different hospitals and countries. (*Becker and Zimmerman, 2005*).

Clinical assessment of the severity of illness is essential to predict the mortality and morbidity in ICU. Physiologically based scoring systems are more applicable than diagnosis-based scoring systems and can estimate the

risk based on the degree of variation from the normal function of major organ systems .**(saleh et al,2015)**

Scoring systems allowed an assessment of the severity of disease and provide an estimated of in-hospital mortality. Through collecting routinely measured data specific to a patient. Then weighing each variable and the sum of the weighted individual scores produced the severity score. Various factors affected the risk of in-hospital mortality after admission to ICU, including increasing age ,severity of acute illness, certain pre-existing medical conditions (e.g. malignancy and immunosuppression), and emergency admission to ICU. ***(Bouch and Thompas, 2008)***

Multiple organ failure is a leading cause of morbidity and mortality in critically ill patients. As such, serial measurements of the incidence and severity of organ failure during the ICU stay were used to predict the outcomes of critical illness ***(Boots et al., 2005)***.

The heterogeneity and complexity of the ICU patient generated interest in systems able to measure severity of illness as a method of predicting outcome, comparing