INTRODUCTION

Injury is a serious problem that is common to all societies .Traumatic injuries are an important cause of morbidity and mortality for all age groups, and especially important for the aged person. [1]

An injury can best be defined as damage to any part of the body due to the application of mechanical force. [2]

Injury occurs consequential to a disproportionate energy transfer. The energy that produces an injury can be described as kinetic-causing fractures, contusions, and lacerations; thermal-producing burns and scalds; and electrical- resulting in electrocution.[3]

Injuries have been classified by type (a fracture, laceration, or burn), by intent (unintentional or intentional), by circumstances (accidental or non-accidental), and by mechanism 'cause' (a road traffic accident, a fall, or a gunshot injury). [4]

Approximately five million persons die worldwide as a result of injuries annually. [5]

The Arab world in particular has a set of historical, geopolitical, social, cultural, and economic characteristics and has been involved in several wars that typically increased the burden of injuries in the past few years. [6]

In Egypt, injury-related mortalities comprised a total of 19,731 deaths between the years 2000 and 2010 and road traffic accidents is the first leading cause of injury related deaths. [7]

Definition of an elderly person:

The current definition of elderly is arbitrary and there is no accurate biomarker of aging. Since aging is a progressive biological process, old age can be considered to begin when active contribution to society is no longer possible. [8]

The definition of elderly quietly differs between the developing and developed countries; in developing countries, social role is the predominant means of defining old age. Recent socio-economic studies suggest that a multidimensional definition that combines chronological, functional and social factors would be preferable. [8, 9]

In most developed countries, the chronological age of 65 years that coincides with the retirement age is the accepted cutoff for defining the elderly and is also regarded as the onset of old age because the future elderly population can be expected to contribute more and more meaningfully to society. [10, 11]

Conventionally, “elderly” has been defined as a chronological age of 65 years old or older, while those from 65 through 75 years old are referred to as “early elderly” and those over 75 years old as “late elderly”. [11]

Elderly is a growing population:

In recent years, there has been a sharp increase in the number of older persons worldwide and more old people are alive nowadays than at any time in history. [12]

The proportion of the population aged 60 and over, is growing each year. By the year 2025, the world will host 1.2 billion elderly persons who are 60 years old and over and the number is even rising to 1.9 billion in the year 2050. [13, 14]

The demographic transition with ageing of the population is a global phenomenon which demands international, national, regional and local action. In recent years there has been an increasing international awareness of health issues relating to aged populations. Accordingly, the traditional perceptions of old age have been challenged during the past few years. Nowadays, elderly people are not taken as a burden on society, but rather as an assist. [15, 16]

Impact of aging on the occurrence and outcome of injury:

Aging is a natural biologic process and is sometimes referred to as a process of 'biologic reversal' or diminished physiological reserve that begins during the years of early adulthood. It is generally characterized by slower cognitive processes, impairment of psychological functions, diminished energy, the appearance of chronic/degenerative diseases, and a decline in sensory acuity. [17]

Advances in medicine allow the elderly to live in better health during the latter years of their lives. Better health promotes a more physically active and mobile lifestyle than those seen in previous elderly populations. [18]

Nevertheless, many of the physical changes that occur with ageing affect the ability of the elderly to react quickly to environmental hazards. These changes, when combined with pre-existing medical conditions (PMC) and the medications taken by many old people, increase the vulnerability of old people to trauma and make them less able to respond to a traumatic insult and hence their worse prognosis. [19, 20]

Trauma is the fifth leading cause of death in persons more than 65 years of age. The elderly suffer the same types of injury as younger patients. However, they suffer more complications, higher mortality, longer lengths of stay and poorer outcomes than do their younger counterparts. [18]

The human costs among survivors of injuries are considerable, leading to; disabilities, loss of independence, institutionalization and psychosocial consequences including fear of further injuries, loss of confidence, low self-esteem, isolation, and depression. [21, 22]

Classification of the most commonly encountered injuries among elderly population:

1) According to the injury types and sites
2) According to the possible causes of injury
3) According to the circumstances; whether injuries are accidental or non accidental

1) According to the injury types and sites

Elderly trauma patients usually sustain blunt trauma rather than penetrating trauma and special attention should be made for certain injury sites such as head, chest and musculoskeletal injuries that probably produce fatal outcomes. [23]

A. Head injury

As a person ages the brain progressively atrophies and decreases in size by about 10% between the ages of 30 to 70 years. This is accompanied by changes that occur to the cognitive, memory and data acquisition functions of the brain. [24]

As the brain size becomes smaller it also becomes denser. The resulting change in size places tension on the vascular structures supplying the brain. This combined with the increase in available space within the skull cavity makes the injuries such as subdural hematomas (SDH) are more common in the aged patient. [24]

- **Traumatic brain injury**

Traumatic brain injury (TBI) is a significant problem in older adults. Traumatic brain injury results from an impact to the head that disrupts normal brain function. Traumatic brain injury may affect a person's cognitive abilities, including learning and thinking skills.[25]

Falls are the leading cause of traumatic brain injury followed by motor vehicle traffic crashes. Older age is known to negatively influence outcome after TBI. Geriatric and neurotrauma investigators have identified the prognostic significance of preadmission functional ability, co-morbidities, sex, and other factors such as cerebral perfusion on recovery after illness or injury. [26, 27]

Traumatic brain injury is classified as mild, moderate or severe, depending on whether the injury causes unconsciousness, how long unconsciousness lasts and the severity of symptoms. Although most traumatic brain injuries are classified as mild because they are not life-threatening, even a mild traumatic brain injury can have serious and long-lasting effects. [28]

Traumatic brain injury is a threat to cognitive health in two ways: [29]

1. Traumatic brain injury's direct effects, which may be long-lasting or even permanent, can include unconsciousness, inability to recall the traumatic event, confusion, difficulty in learning and remembering new information, trouble in speaking coherently, and problems with vision or hearing.
2. Certain types of traumatic brain injury may increase the risk of developing Alzheimer's or another form of dementia years after the injury takes place.

B. Chest injuries

Thoracic trauma in the elderly is most likely to be blunt, and most likely to be from a motor vehicle accident. [23]

Even minor chest injuries can be life threatening in the aged patient, as there is an increased incidence of rib fractures due to the effects of osteoporosis and the loss of the elasticity of the chest wall. [30]

Elderly patients are likely to develop pulmonary contusions or pneumonia from rib fractures, even isolated rib fractures. Pneumonia following a rib fracture can be a devastating complication for an elderly patient who, at baseline, does not have the pulmonary reserve and ability to generate a forceful cough that a younger patient may have. Injury to the chest producing adult respiratory distress is the leading cause of increased morbidity and mortality in the aged patient. [31]

C. Musculoskeletal

The musculoskeletal system is the most commonly injured system in the aged patient following trauma. Aged patients are predisposed to fractures due to the effects of osteoporosis. [17]

Approximately 10-20% of falls result in fractures. Most fractures occur at home. Falls that occur indoors are likely to result in hip fracture, whereas those that occur outdoors are likely to result in distal forearm fracture. [32]

- **Hip fractures:**

Fractures of the neck and trochanteric regions of the femur, the major bone in the hip joint, are currently one of the most serious health care problems facing aged populations.[33]

Not only is the acute injury accompanied by severe hip pain, and an inability to stand or walk on the fractured leg, but there may be significant vascular damage to the femoral head ultimately leading to avascular necrosis and secondary osteoarthritis that affects healing. The fracture is intra-articular, with synovial fluid preventing coagulation of the fracture haematoma. [34]

- **Cervical spine fractures:**

In general, a ground level fall (GLF), is considered minor trauma and patients sustain less traumatic injury. However, in geriatric patients, severe injuries due to a GLF are relatively common. Cervical spine fractures and intracranial hemorrhage are most commonly seen in the geriatric trauma patients with GLF. [35] This could be partially attributed to the unique patho-physiological changes in geriatric population including degenerated joint changes, lesser mobility of vertebral spines, and less muscle or ligament support. [36] In addition, the presence of co-morbidities including osteoporosis, osteopenia, and degenerated osseous changes could synergistically impact the severity of injury even with minor trauma.[37]

- **Fractures of the pelvis:**

They carry tremendous morbidity and mortality in elderly patients. In polytrauma elderly patients, pelvic fractures are more likely to cause hemorrhage. Pubic rami fractures are the most common type, followed by acetabular and ischium fractures. [38]

2) According to the possible causes of trauma in elderly

Falls remains the leading cause of trauma in the elderly. They are responsible for the majority of accidental deaths in persons 75 years of age and older; however, traffic accidents are increasing. Other forms of injuries, such as burns and scalds are also important. [39, 40]

I. Falls

Falling is one of the most common geriatric syndromes threatening the independence of older persons. Falls result from a complex and interactive mix of biological, medical, behavioral and environmental factors, many of which are preventable. [41]

Falls in the elderly are considered one of the "Geriatric Giants". Recurrent falls are an important cause of morbidity and mortality in the elderly and are a marker of poor physical and cognitive status. [42]

In the past, there has been no widely accepted definition of falls. More recently, ProFaNE (Prevention of Falls Network Europe), a multinational work group dedicated to reduce falls and injuries through research and implementation of evidence-based interventions, has proposed the following as the most reliable and valid definition:

"A fall is an unexpected event in which the participant comes to rest on the ground, floor or a lower level." [43]

Epidemiology:

Men are more likely to experience fatal falls than women. Fatality rates for men exceed that for women for all age groups. This may be due to the fact that men are more physically active or more likely to engage in risky behaviors. [44]

Most falls occur during the day; a smaller percent of falls occur at night, perhaps when older people wake up to use the bathroom. [32]

Older people who are living in nursing homes fall more often than those who are living outside. In a nursing home setting, older people are more likely to fall on the first day after moving into a new room or a new ward. [16, 45]

Risk factors for falls in old people:

1) Personal risk factors:

They include characteristics of the individual such as age, functional abilities, chronic diseases and gait disturbances. Altered mobility and cognition are major personal risk factors for falls. However, other important risk factors include history of previous falls, visual problems, postural hypotension and medications. [43, 46]

A number of medications have been strongly associated with trauma in the elderly, including psychotropic medications (i.e. antidepressants, neuroleptics, and sedatives) and antihypertensive medications (i.e. β-blockers, calcium blockers, and diuretics). Less commonly implicated medications are antiepileptic and glaucoma agents. Over 80% of

patients evaluated after accidental falls are found to be on medications that can be easily implicated in contributing to the fall. [47]

2) Environmental risk factors:

Environmental or extrinsic factors are also important in contributing to falls risk. They refer to fall hazards in and around the home such as poor fitting footwear, slippery floor or loose rugs, tripping hazards, lack of stair railings or grab bars, unstable furniture, and poor lighting. [48, 49]

Complications of falls in elderly:

Complications resulting from falls are the leading causes of death from injury in men and women older than 65 years of age. [50]

Injuries sustained by geriatric patients from falls tend to be more severe than the injuries sustained by younger patients from similar falls. [51]

Falls can cause many different types of severe non-fatal injuries to various parts of the body with particular emphasis on traumatic brain injuries (TBI) and hip fractures. Falls are the second leading cause of spinal cord and brain injury among older adults. Injuries to the pelvis and lower extremities are also extremely common following falls. [52 - 54]

- **Psychological complications of falling**

Falls can also result in a "post fall syndrome" that is often considered a contributing reason for admission to a nursing home. [55]

Most physicians however give their primary attention to the immediate injuries and traumatic consequences of falls, often under-estimating their psychological consequences.[56]

Nevertheless, a fall can cause significant psychological trauma to the elderly and this psychological factor makes rehabilitation more difficult because of the need to take both motor and psychological components into account. [57]

The immediate psychological consequences are most often described as fear, activity avoidance, loss of confidence, impairment of body image, dependence, insecurity, and in its most severe form, anxiety. All these psychological outcomes of falling are often grouped under the poorly defined 'post-fall syndrome'. This syndrome is probably similar to the definition of post-traumatic stress disorder (PTSD) according to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). [58, 59]

Indeed, in order for PTSD to occur patients must have been the victim of a traumatic event and their response must include intense fear, helplessness or feeling of horror. There is, in this definition, a subjective estimation of trauma intensity, and the focus is on the patient's response, which allows the possibility of defining a fall as a trauma. PTSD reactions among the elderly have also been shown, in general, to be quite similar to those displayed by younger people. [60]

Medicolegal aspect of elderly falls:

The majority of elderly falls is considered accidental or unintentional. However, claims of malpractice may be aroused on the basis of the hypothesis of a lack of fall prevention in hospitals and long-term care institutions and on an incorrect use of physical restraint. (61)

A fall of a patient during hospitalization may have not only clinical consequences for the patient but also judicial consequences for the clinician. (61)

Falls in older adults are common but are not necessarily an inevitable by-product of aging. Falls have been associated with a number of different risk factors. Some of these, like age or gender, cannot be altered. However, many other fall risk factors are amenable to interventions (e.g., muscle strength, balance, number of medications, cognitive function). Appropriate assessments can help to identify those elderly who have an increased risk of falls, the underlying causes, and, ultimately, reduce the negative impact of falls in older adults. (48, 62)

Non-accidental falls should be considered because of the rising incidence of physical elder abuse. Suicidal falls from a height are common in geriatric patients suffering from depression. Mortality rates in these cases are considerably high. (63)

II. Motor vehicle accident

Motor vehicle accident is the second most common cause of elderly injuries and it is considered also the leading cause of trauma deaths in the geriatric population between 65 and 75 years of age. It accounts for the majority of polytrauma victims. (17)

Risk factors for motor vehicle accidents in old people:

The pathophysiology of aging and the presence of chronic medical conditions that affect vision, reflexes, balance and cognition place elderly persons at high risk for involvement in motor vehicle crashes. (64)

- **Elderly pedestrians struck by motor vehicle :**

Accidents involving pedestrians account for the majority of road traffic accidents in elderly, followed by car seat occupants. (65)

The elderly pedestrian victims are commonly injured as a consequence of the physiological changes of ageing. These changes include impairments in balance, vision, hearing, proprioception, reaction time, muscle mass and bone mass. (66)

Elderly pedestrians are usually injured while traversing the road with many of them reporting that they usually do not notice or miscalculate the proximity of the approaching vehicle. It is reported that the walking speed of the elderly is reduced up to 75% of that of their younger counterparts. (67)

Another important risk factor for injuries in elderly pedestrians is polypharmacy, particularly the use of anti-hypertensives, diuretics, vasodilators and sedatives. (68)

The reaction time of the elderly also becomes longer; it is estimated that it is approximately 30% longer compared to young individuals. (68)

- **Elderly drivers:**

The use of cellular phones by elderly drivers is associated with a quadrupling risk of collision. The elderly have a reduced ability to divide attention. [69]

- **Elderly cyclist victims:**

Accidents involving elderly cyclist victims are caused mainly while turning to the right or when hit from the rear. It is reported that older cyclists have larger sways and their speed is approximately 20% lower compared to young cyclists. Also, older cyclists tend to neglect checking the traffic situation behind them when changing directions and tend to sway towards the centre of the road. [69]

Morbidity and mortality:

Elderly patients have an increased severity of injuries from motor vehicle collisions when compared with younger counterparts with subsequent poorer prognoses. Meanwhile, the most common injuries sustained by elderly pedestrian victims involve the lower extremity (hip fractures and femoral shaft fractures, respectively). Also, geriatric victims usually have an increased incidence of sternal fractures and chest injuries from seatbelts in case of being car seat occupants. [70, 71]

Medicolegal implications:

Drunk or drug-impaired drivers represent a major public health and social problem worldwide. Impaired driving plays a significant role in most of drivers' fatalities no matter is the age group. Elderly can be specifically more prone to problems with driving either because of alcohol, psychotropic or sedating drugs. [69, 72]

III. Burns and scalds

Epidemiology:

Elderly patients constitute nearly 13% of all patients admitted to burn unit. Women tend to be more highly represented among older burn victims than in younger populations. The vast majority of burn injuries among older adults occur in a domestic setting, specifically in the kitchen (cooking) and in the bathroom. [73]

Etiology:

Away from intentional thermal injuries, fatalities caused by fire and flames constitute the second most common cause of accidental death in older people. Burn etiology has also been linked to outcome, whereby flame injuries appear to have the highest risk of mortality in the older adult population. Flame burns almost always result in full-thickness loss of the skin and deeper tissues, and likely account for the higher mortality. Scalds are responsible for the majority of thermal injuries, which are also associated with a high death rate. [74]

Risk factors:

Elderly burn patients suffer from greater morbidity and mortality than younger patients with similar burn extents. [75]

Thermal injuries in older adults are multifactorial. Physiologic changes associated with acute and chronic medical conditions, age, and social isolation by the lack of supervision and

domestic support are factors that increase the morbidity and mortality from burns in the geriatric population. [17, 76]

Morbidity and mortality:

Total body surface area (TBSA) burned, percent of full-thickness burn, and smoke inhalation injury are the most important and independent predictors of burn mortality. [77]

Early mortality in burn injury results from intractable shock, whereas late mortality is attributable to multi-organ system failure. [78]

Medicolegal aspects of burns in elderly:

Epidemiologic studies have revealed that the majority of accidental burn injuries among older adults are in fact preventable. [79]

Burn injury can be inflicted intentionally either by another person, or it can be self-inflicted. Medical personnel must necessarily be trained in both the therapeutic and forensic aspects of the evaluation and care of patients that have sustained intentional burn injuries. A missed diagnosis can result in inappropriate medical care, on-going abuse and future fatality. [80]

3) According to whether elderly injuries are accidental or non accidental

Although accidental injuries have been known to take the upper hand among all traumatic injuries experienced by elderly populations, yet non accidental injuries have become quite common in the last few years. [81]

Non accidental injuries among elderly can be either suicidal or as result of an assault. Suicide among older adults is a major public health issue worldwide and especially prominent in the western countries and this is probably due to chronic illnesses and depression. [82]

Elder abuse is a growing problem and one of the most hidden forms of violence against the elderly. Elder abuse even probably increases as the population grows older. [83]

Definition of elder abuse:

According to the National Center on Elder Abuse (2005), "Elder abuse is any knowing, intended, or careless act that causes harm or serious risk of harm to an older person—physically, mentally, emotionally, or financially". Elder abuse includes acts of physical, psychological, verbal, sexual and financial abuses as well as abandonment and withholding care. [84]

World Health Organization (WHO) defines elder abuse as any type of action, series of actions, or lack of actions, which produce physical or psychological harm, and is set within a relationship of trust or dependence. [85]

WHO indicates that older people perceive abuse under three broad areas: [86]

1. Neglect (isolation, abandonment and social exclusion),
2. Violation (of human, legal and medical rights),
3. Deprivation (of choices. decisions, status, finances and respect).

Risk factors for elder abuse:

There is no doubt that elder abuse has a multifactorial etiology involving risk factors within the elder person, perpetrator, relationship and environment. [87]

- **Risk factors within the elder person;**

They include female gender, age over 80 years, being single or widow, physical and mental frailty, low income or wealth, those arguing frequently with relatives (behavioral problems) or dependent on someone to carry out a daily activity. [88]

- **Risk factors among the perpetrators;**

The perpetrators may be members of the family (as part of a cycle of family violence) or strange caregivers who are probably of young age, financially dependent on the victim, substance or alcohol abusers, and having psychological problems, emotional burden or stress or even prior history of violence. Social isolation of caregivers and older persons, and the ensuing lack of social support, is also a significant risk factor for elder abuse by caregivers. [89]

- **Sociocultural risk factors**;

These include erosion of the bonds between generations of a family, migration of young couples, leaving elderly parents alone, lack of funds to pay for care, family disharmony and poor relationships. [85, 90]

- **Risk factors within institutions;**

Abuse is more likely to occur where standards for health care, welfare services and care facilities for elder persons are low. Elder abuse may be the result of the poorly trained, remunerated, and overworked caregivers within social and health institutions, who cannot meet the needs of older persons. [91]

Types of elder abuse:

Both clinical reports and most legal international statutes recognize the following types of abuse: [92]

1) **Physical abuse;** which includes acts done with the intention of causing physical pain or injury.

Evaluation of all geriatric injury victims in the Emergency Department (ED) should include an assessment for signs and symptoms of abuse. [93]

These are the clues that abuse has occurred and should trigger further inquiry as to whether elder patients are victims of violence or other forms of abuse. Many of the indicators listed below can be explained by other causes (e.g. a bruise may be the result of an accidental fall) and no single indicator can be taken as a conclusive proof. Rather, one should look for patterns or clusters of indicators that suggest a problem. [94]

❖ **Signs and symptoms of physical abuse:**

➢ **Physical**

- Sprains, dislocations, or fractures.
- Burns from cigarettes, appliances, or hot water.
- Abrasions on arms, legs, or torso that resemble rope marks.
- Injuries healing through "secondary intention" (indicating that they did not receive appropriate care).
- Signs of traumatic hair and tooth loss. (95)
- **Bruising, which emerges as the most prevalent medical marker of physical abuse;** (96, 97)

Bruises that occur as a result of physical elder mistreatment are often

1. Large (>5 cm.) and on the face, the lateral right arm or the posterior trunk.
2. Bilateral bruising to the arms (may indicate that the person has been shaken, grabbed, or restrained).
3. Bilateral bruising of the inner thighs (may indicate sexual abuse).
4. "Wrap around" bruises that encircle an older person's arms, legs, or torso (may indicate that the person has been physically restrained).
5. Multicolored bruises (indicating that they were sustained over time).

➢ **Behavioral**

- Injuries are unexplained or explanations are doubtful (they do not "fit" with the injuries observed).
- Family members provide different explanations of how injuries were sustained.
- A history of similar injuries, and/or numerous or suspicious hospitalizations.
- Delay between onset of injury and seeking medical care. (98)

2) Psychological abuse

Psychological abuse is the willful infliction of mental or emotional threat, humiliation, or other verbal or nonverbal conduct with the intention of causing emotional pain or injury. Cultural values and expectations play a significant role in how psychological abuse is manifested and how it affects its victims. (99)

Signs and symptoms of psychological abuse: (100)

The perpetrator isolates the elder emotionally by not speaking to or comforting him or her. **The elder** has progressive worsening of general wellbeing, exhibits insomnia, depression and confusion, cowers in the presence of abuser, exhibits unusual behavior usually attributed to dementia (e.g., sucking, biting, rocking).

3) Sexual abuse:

Sexual abuse is any form of non-consensual physical contact. It includes rape, molestation, or any sexual conduct with a person who lacks the mental capacity to give consent. (101)

Signs and symptoms of sexual abuse: (101, 102)

- Genital or anal pain, irritation, or bleeding.
- Bruises on external genitalia or inner thighs.
- Torn, stained, or bloody underclothing.

- Sexually transmitted diseases.

4) Financial abuse "Financial exploitation":

It is the misappropriation of the old person's money or property. [103, 104]

Signs and symptoms of financial elder abuse: [105, 106]

- Unpaid bills, withdrawals from bank accounts.
- Belongings or property are missing.
- Suspicious signatures on checks or other documents.
- Getting an older person to sign a will or power of attorney through deception or undue influence.
- Absence of documentation about financial arrangements.
- Telemarketing scams "Perpetrators call victims and use deception, scare tactics, or exaggerated claims to get them to send money".

5) Neglect and Self-Neglect

Neglect is the failure of caregivers to fulfill their responsibilities to provide the needed care. [107]

"Active" neglect refers to situations in which the caregiver intentionally withholds care or necessities. The neglect may be motivated by financial gain (e.g. the caregiver stands to inherit) or reflect interpersonal conflicts. [108]

"Passive" neglect refers to situations in which the caregiver is unable to fulfill his or her care giving responsibilities as a result of illness, stress, ignorance, lack of maturity, or lack of resources. [108]

Self neglect refers to situations in which there is no perpetrator and neglect is the result of the older person refusing care. Elder self-neglect is the most frequently reported form of elder abuse. Self-neglect has implications for excess mortality and institutionalization among the frailest elderly individuals living in the community. [109]

Elder self-neglect is a multifactorial syndrome. The impaired frontal lobe functioning impedes elders' ability to cope with physical disabilities, resulting in or exacerbating functional impairments. Individuals with both clinically significant depressive symptoms and cognitive impairment have an enhanced risk of self-neglect. [110]

Signs and symptoms of elderly neglect: [111-113]

- Inadequate living environment evidenced by unsafe housing, lack of utilities, standard cleanliness, and ventilation.
- Signs of medication mismanagement, including empty or unmarked bottles or outdated prescriptions.
- Poor personal hygiene including soiled clothing, dirty nails and skin.
- Unclothed, or improperly clothed for weather.
- Decubitus ulcers (bedsores), skin rashes and dehydration.
- Absence of needed dentures, eyeglasses, hearing aids, walkers or wheelchairs.
- The elder person is unreasonably critical and/or dissatisfied with social and health care providers and changes them frequently.

Diagnosis and prevention of elder abuse and neglect:

Elder maltreatment continues to be increasing and yet it is still an underreported problem since the perpetrators usually belong to the same family of the victim, favoring denial and hindering prevention and intervention. (114)

Identifying risk factors is at the heart of problem prevention. In order to capture the alerting signs and symptoms of elder abuse, it is now recommended that physicians systematically question old people concerning the possible maltreatment by asking them directly. Healthcare professionals may be the only people in victims' life who have the opportunity to recognize the abuse and offer help. However, they should be always keeping in mind that suspicion is not the same as confirmation of abuse. (115 - 117)

The keyword continues to be prevention, in order to avoid the occurrence of serious cases of maltreatment. But it should not be forgotten that the best way of prevention is to provide old people, families, institutions and the professionals concerned with sufficient resources to work on generating positive attitudes in society towards old age. (118)

Trauma scoring systems:

Development of trauma scoring:

The ability to predict outcome from trauma is perhaps the most fundamental use of trauma scoring systems, a use that arises from the patient's and the family's desires to know the prognosis. It is also used to facilitate rational pre-hospital triage decisions, thereby minimizing the time from injury occurrence to definitive management. (119)

Groups of injured persons also differ as to the nature and severity of their injuries, so that it is essential to take the differences in injury severity into account when comparing the morbidity and mortality of various groups for purposes of evaluating their emergency and subsequent care. (120)

Trauma scoring systems can be categorized into anatomical scores, physiological scores and combined anatomical physiological scoring systems. (121)

A. Anatomical scoring systems:

The first attempt to classify injuries on the basis of severity was perhaps, made by DeHaven in early 1950s. The scoring systems primarily based on anatomic regions include; the Injury Severity Score (ISS), the New Injury Severity Score (NISS), the international classification of Disease and the Ninth Revision-based Injury Severity Score. The abbreviated injury scale **(**AIS) is considered the basis of such composite injury severity measurements. (122)

- **The abbreviated injury scale (AIS)**

It was the first scale developed by the U.S. Association for the Advancement of Automotive Medicine (AAAM) and published in 1971. It is frequently used to classify overall injury severity in the polytrauma patients. (123)

The AIS has been revised at least six times since the original version to introduce the severity value of different injuries. The latest revision was in 2005 and that was updated in 2008. It scores injuries from 1 (minor) to 6 (fatal), the higher the score the worse the injury. [124]

- **The injury severity score (ISS)**

It is an anatomical scoring system that provides an overall score for patients with multiple injuries. It depends on anatomical distribution of injuries over six specified body regions (head /neck, face, thorax, abdominal /pelvic contents, extremities /pelvic girdle, external). It is calculated by the sum of squares of the highest Abbreviated Injury Scale (AIS) severity scores from each of the three most severely injured body regions. The range of the ISS is 1–75. Any injury classified as an AIS severity 6 instantly results in an ISS of 75. [125]

More recently, the New Injury Severity Score (NISS) has been proposed. Although similar to the ISS, the NISS is the sum of the squares of the three most severe injuries regardless of body region. Preliminary studies suggest that the NISS is a more accurate predictor of trauma mortality than the ISS, particularly in penetrating trauma. [122]

ISS is one of the independent variables included in outcome prediction models such as the Trauma and Injury Severity Score (TRISS). [126]

B. Physiological scoring systems:

Scoring systems that incorporate physiologic data, such as the Glasgow Coma Scale (GCS) and the Revised Trauma Score (RTS), are easier to use and widely applied to trauma triage. However, they predicted mortality less accurately than did the anatomic-based scoring systems. [127]

- **The Glasgow coma scale (GCS)**

The Glasgow Coma Scale (GCS) was described by Teasdale and Jennett in 1974. Now it is the accepted international standard widely used for the assessment of a patient's level of consciousness and has been incorporated into the Revised Trauma Scale (RTS), which provides a more accurate estimation of severity for patients with serious head injuries and enables reliable predictions of outcome. [119]

The Glasgow Coma Scale is scored between 3 and 15, 3 being the worst and 15 the best. A Coma Score of 13 or higher correlates with a mild brain injury; 9 to 12 is a moderate injury and 8 or less a severe brain injury. [128 - 130]

It is composed of the patient's best response and takes into consideration three parameters which are eye opening, verbal response, and motor response. [131]

- **The Revised trauma score (RTS)**

The trauma score was published in 1981 as a tool for triage of trauma patients. The theory behind the trauma score was that most early trauma-related deaths were the result of injury to one or more of the central nervous, cardiovascular or respiratory systems. [132]

Five items were identified as independent predictors of trauma outcome: [133]

1. Glasgow coma scale (GCS),
2. Respiratory rate,
3. Systolic blood pressure,
4. Respiratory expansion, and
5. Capillary refill.

The trauma score was re-examined and the revised trauma score (RTS) developed. In the RTS, both the capillary refill and respiratory expansion were removed as these two variables were the most difficult to measure in the emergency room. [133]

A weighted form of the RTS was also developed to expand the use of the RTS to prediction of outcome following trauma. In this form, each individual component of the RTS is assigned a weight or a coded value. The weights for each component were developed from logistic regression analyses of a sample data set from the Major Trauma Outcome Study (MTOS). The highest weight is given to the GCS component to account for the greater impact of a head injury on outcome. [134]

The formula for the weighted RTS is: $RTS_w = 0.7326$ (systolic blood pressure) + 0.2908 (respiratory rate) + 0.9368 (GCS). [135]

C. Trauma score-Injury Severity Score (TRISS):

Several trauma-scoring systems have been developed over the past 30 years, TRISS was first described in 1981 and it has been proved popular over time. [136]

This score combines both anatomical and physiological grading of injury severity (Injury Severity Score-ISS and Revised Trauma Score-RTS, respectively) with patient age in order to predict survival from trauma. [137, 138]

The TRISS is used for a number of purposes including; quantifying the severity of injury of a patient population, calculating the probability of survival of patients, and comparing the death or survival rates of different populations/hospitals. [139]