



## Impact of Compliance of Pre-hospital Care on the Evolution of Cervical Spine Trauma in Tlemcen

**Sidi Mohammed Medjadi\***

Department of Anesthesia and Intensive Care, Aboubekr Belkaïd University,  
Tlemcen, Algeria

\*Corresponding Author: Sidi Mohammed Medjadi, Department of Anesthesia and Intensive Care, Aboubekr Belkaïd University, Tlemcen, Algeria.

DOI: 10.31080/ASMS.2022.06.1368

Received: June 29, 2022

Published: August 29, 2022

© All rights are reserved by **Sidi Mohammed Medjadi**.

### Abstract

**Objectives:** The main objective of our work is to observe the compliance of actions and care provided during the pre-hospital phase in traumatized patients of the cervical spine in the wilaya of Tlemcen (Algeria), and its impact on the evolution of these.

**Patients and Methods:** Exhaustive descriptive-type study with prospective collection, carried out over a period of three and a half years at the level of several structures of the Tlemcen University Hospital, namely medico-surgical emergencies, multipurpose resuscitation and neurosurgery departments. It focuses on cervical spine trauma patients treated from the scene of the accident to the neurosurgery and/or medico-surgical intensive care unit at Tlemcen University Hospital. All were admitted for cervical spine trauma, whatever the level reached, whatever the mechanism of the accident, whatever the treatment decision, with or without neurological lesions, with or without signs of seriousness on admission and over 16 years of age.

**Results:** The frequency of patients having benefited from non-medicalized transport called "sanitary" was 57.04%, compared to 14.06% in medicalized ambulances and 28.90% had arrived at the medical and surgical emergencies via a private vehicle. A large majority of the injured (66.40%) passed through one or more hospital structures before arriving at the medical and surgical emergencies department of the Tlemcen University Hospital (n = 85). 57% (n = 73) were evacuated to a single hospital structure (PHE or LPHE) before being transferred to our level. The rest of the patients had passed through two, three, or even up to four (04) hospitals before their evacuation. The length of stay in a hospital structure before admission to Tlemcen University Hospital was variable in the 66.40% of patients concerned (n = 85), with extremes ranging from 15 min to 28,800 min.

**Conclusion:** Data from the literature show that it is difficult to determine who is responsible for the neurological deterioration, whether it is because of more serious initial lesions or because of the more frequent appearance of secondary lesions of the ACSO type. Knowing that we fight the same fight when it comes to aggression of the brain and the marrow (ACSO = AMSO). The quality of pre-hospital care is one of the fundamental factors in improving the vital and functional prognosis of these patients.

**Keywords:** Cervical Spine; Trauma; Pre-hospital Care; Medical Transport; Duration

### Introduction

What is true for brain tissue is also largely true for medullary tissue, which is why it is essential to standardize the conditions of pre-hospital care in order to avoid neurological deterioration during this phase.

The risk of aggravating an already unstable lesion requires some caution and therefore requires systematic immobilization of the cervical spine with a rigid cervical collar from the initial treatment [1].

In addition, the initial neurological examination, at the scene of the accident, is often the only one available and therefore

constitutes the reference examination, engaging decision-making, in particular subsequent surgery [2]. It cannot be reproduced after intubation of the patient or in a subject whose GCS deteriorates.

The accuracy and reliability of this initial examination are therefore fundamental [2,3].

Picking up and carefully immobilizing the cervical trauma patient are key steps in pre-hospital management, especially when we know that the high incidence of neurological deterioration occurring in the first hours of trauma is a concern [4,5].

In addition to immobilizing the spine, early management of these patients must ensure the maintenance of vital functions. The Mean blood pressure (MBP) must be maintained > 80 - 85 mm Hg according to the authors [1,6]. This control of MBP is based on close control of blood pressure and the rapid introduction of vasopressors (Noradrenaline®) in a context of sympathetic inhibition.

The main objective of our work is to observe the compliance of actions and care provided during the pre-hospital phase in traumatized patients of the cervical spine in the wilaya of Tlemcen (Algeria), and its impact on the evolution of these.

**Patients and Methods**

Our research work consisted in carrying out an exhaustive study of the descriptive type with prospective collection, carried out over a period of three and a half years stretching from July 2013 to December 2016 at the level of several structures of the University Hospital of Tlemcen, in namely the medical and surgical emergencies, multipurpose resuscitation and neurosurgery services.

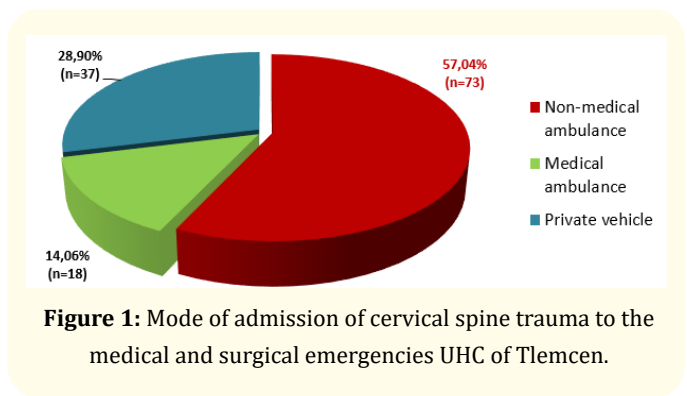
It focused on cervical spine trauma treated from the scene of the accident to the neurosurgery and/or medico-surgical resuscitation departments of the Tlemcen University Hospital. Were all admitted for trauma of the cervical spine, whether superior (C0-C2), inferior (C3-C7) or mixed, whatever the mechanism of the accident, whatever the therapeutic decision (surgical or orthopedic), with or without neurological lesions, with or without signs of severity on admission and aged over 16 years.

We excluded from our study all subjects with other associated traumatic spinal lesions, namely dorsal, lumbar and/or sacral.

**Results**

In our study, mainly civil protection ambulances, and those of the PHE (public hospital establishments) and LPHE (local public health establishments) did the transport of the wounded.

The frequency of patients having benefited from non-medical transport known as “sanitary” was 57.04%, compared to 14.06% in medicalized ambulances and 28.90% had arrived at the medical and surgical emergencies via a private vehicle (Figure 1).

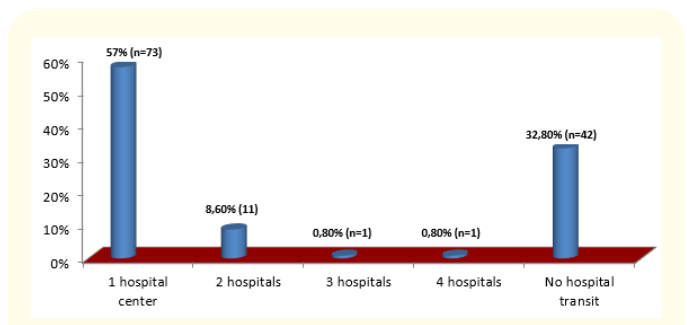


**Figure 1:** Mode of admission of cervical spine trauma to the medical and surgical emergencies UHC of Tlemcen.

A large majority of the injured (66.40%) passed through one or more hospital structures before arriving at the medical and surgical emergencies department of the Tlemcen University Hospital (n = 85).

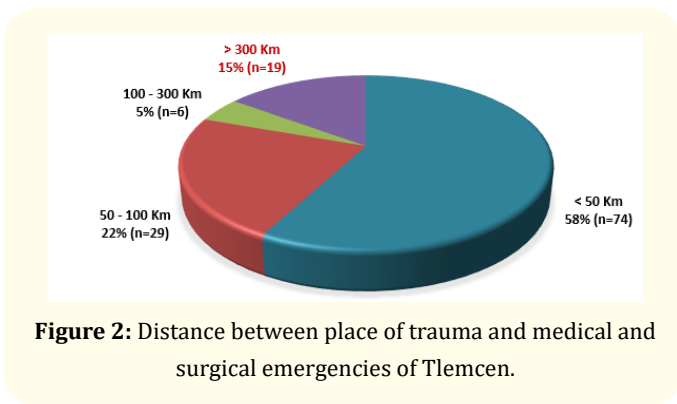
57% (n = 73) were evacuated to a single hospital structure (PHE or LPHE) before being transferred to our level.

The rest of the patients had passed through two, three, or even up to four (04) hospitals before their evacuation, as shown in histogram 1.



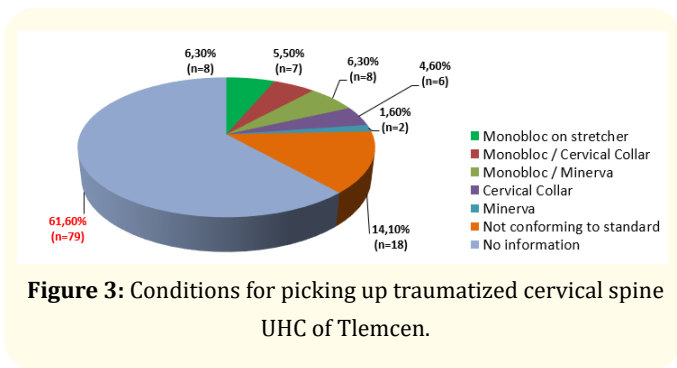
**Histogram 1:** Transit of cervical spine trauma patients before hospitalization at the medical and surgical emergencies.

A number of 74 patients (58%) had their cervical spinal trauma within a kilometer radius that did not exceed 50 km around the city of Tlemcen, and 19 patients (15%) within a radius greater than 300 km (Figure 2).



**Figure 2:** Distance between place of trauma and medical and surgical emergencies of Tlemcen.

Only 38.28% of the patients could be informed about their pick-up conditions at the site of the trauma. No information was found for 61.6% of them and 14.10% were not properly conditioned before being transported to the Tlemcen University Hospital (Figure 3).

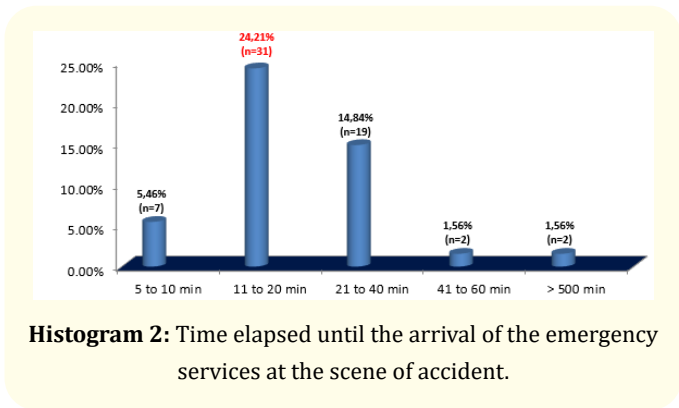


**Figure 3:** Conditions for picking up traumatized cervical spine UHC of Tlemcen.

Variations ranging from 5 minutes to 10 hours were used when assessing the time that the first aid teams took to arrive at the scene of the trauma following a telephone call.

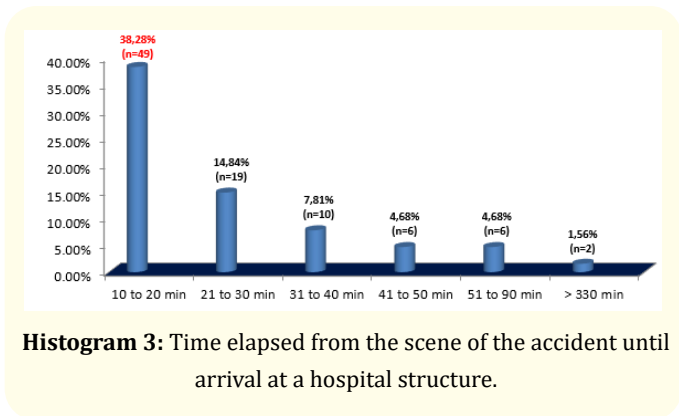
Five patients had to be evacuated by a third party following a delay in treatment.

We failed to obtain accurate information in 62 patients. It should be noted that two patients arrived intubated and that 36 were intubated within 48 hours of their admission.



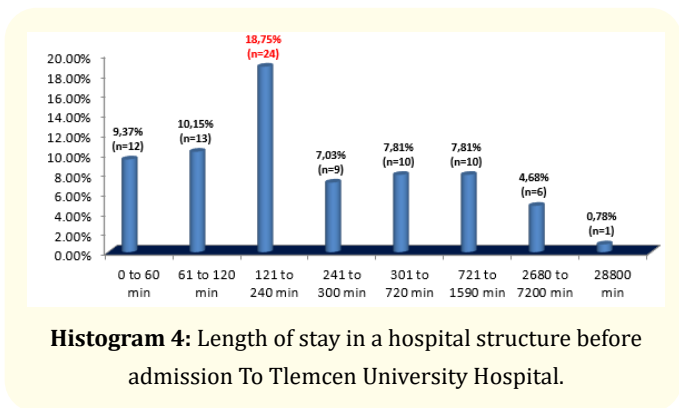
**Histogram 2:** Time elapsed until the arrival of the emergency services at the scene of accident.

Most patients took between 10 to 20 minutes to reach the nearest hospital. We were unable to obtain information in 36 patients (28.12%).



**Histogram 3:** Time elapsed from the scene of the accident until arrival at a hospital structure.

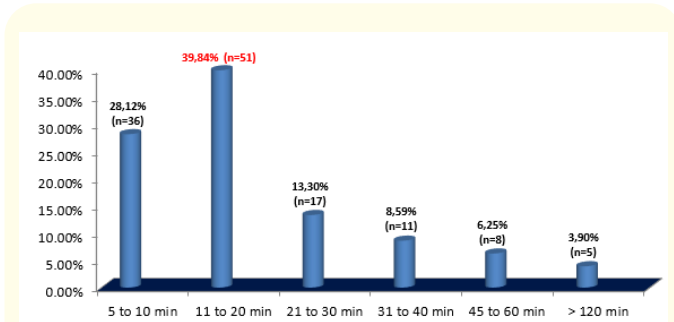
The length of stay in a hospital structure before admission to Tlemcen University Hospital was variable in the 66.40% of patients concerned (n = 85), with extremes ranging from 15 min to 28,800 min.



**Histogram 4:** Length of stay in a hospital structure before admission to Tlemcen University Hospital.

Support estimated between 5 and 20 minutes was noted in 67.96% of TRCs admitted to the medical and surgical emergencies of Tlemcen (n = 87).

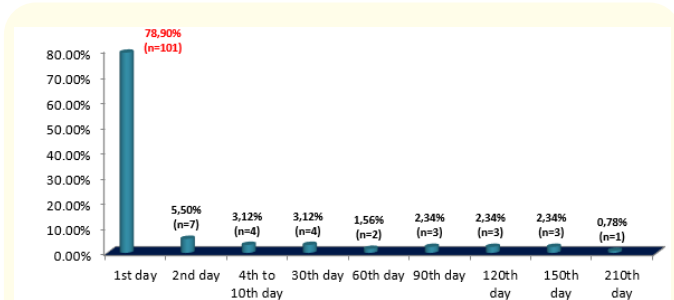
Six patients were examined within 5 min after their arrival and only 1 patient, 3 hours later.



**Histogram 5:** Time elapsed from arrival at medical and surgical emergencies service in Tlemcen to specialized treatment.

The study of our series reveals that 78.90% (n = 101) of our injured were admitted within 24 hours of their trauma and that seven patients were admitted within 48 hours (5.46%).

Beyond 48 hours, we recorded late consultations (one case for the 4<sup>th</sup> day, one for the 5<sup>th</sup> day, one for the 8<sup>th</sup> day and one for the 10<sup>th</sup> day following the spinal trauma and 12.5% of CRTs were neglected and had been consulted for more than 10 days.



**Histogram 6:** Time elapsed between the date of the trauma and that of admission to the medical and surgical emergencies of Tlemcen.

## Discussion

It is always important to remember that the management of potentially spinal cord injured patients begins at the scene of the accident itself [7,8].

In our study, only 38.28% (n = 49) of the patients could be informed about their pick-up conditions at the site of the trauma.

No information was found for 79 patients (61.6%) and 18 others (14.10%) were not properly conditioned before being transported to the Tlemcen University Hospital.

All the publications agree that cervical spine injuries are more and more frequent and that their management requires a multidisciplinary approach based on the management of first aid care and secure medical transport, which will condition the treatment. Subsequent care of the wounded.

In our study, this chain was failing, especially at the level of primary care where we observed practically a desert of information and care that was most often inappropriate, not to say sometimes dangerous, particularly in terms of picking up the wounded on the scene of the accident, but also in their conditioning during their evacuation to the nearest hospital.

We have also noted in this study, the difficulties of taking care of the traumatized at the level of the wilaya of Tlemcen, mainly due to lack of information and organization of the actors concerned.

In Canada, paramedics must be professional. The 2016 Canadian Consensus [9] first Aid and Cardiopulmonary Resuscitation (CPR) Guidelines contains recommendations that will assist first aid and CPR providers in their workplaces, communities, or institutions. Advanced functions to improve the prognosis of these people and save their lives.

For the American system [10,11], pre-hospital care is provided by non-medical ambulances whose paramedical team is responsible for initiating emergency care. Qualified regulatory centers assume coordination, control and regulation. The intervention of the ambulance network is done according to a very precise territorial division, which allows very short intervention times.

For the European systems and especially the French system [12,13], there is a well-codified medicalized pre-hospital care. The

doctor has the task of maintaining vital functions, diagnosing and stabilizing lesions as well as preparing for reception in the most suitable department. Before departure, a telephone agreement with the regulation is necessary in order to release the pick-up and exploration sites [14].

In the series BEMORA., *et al.* [15], the victims were transported by a personal car in 36.69%; 24.46% by taxi; 5.75% by ambulance, 2.15% by plane and the remaining 30.95% by other means.

In addition, in the study by BENYIHA., *et al.* [16], no initial clinical examination was carried out at the scene of the accident. All the patients were extricated and picked up in an anarchic and inadequate manner. The city taxi was the most used mode of transport for the victims (58.1%), and the majority of the patients (67.7%) were transported initially to the nearest hospital, then secondarily to the Hospital General of Douala or to the LAQUINTINIE Hospital of Douala.

On the other hand, in the Senegalese series of KPELAOA., *et al.* [17], the transport of the wounded was better because it was medicalized in 65.7% with the establishment of immobilization of the cervical spine in 68.7% of cases. The average patient admission time was 64.86 hours.

The danger of inadequate initial management comes from the fact that a certain number of spinal lesions can move secondarily, due to incorrect management. This possibility must be taken into account during the intervention of the first aid teams. This implies, according to researchers from the University of San Diego in California – USA [18], precise rules for any suspected injured person: Cervical brace in principle, adapted to the patient, coordinated one-piece release of the injured person, with maintenance of the axis head neck trunk, without excessive traction. Installation in a vacuum mattress, comprising an anti-retraction device.

If you use a mattress not equipped with this system, it is essential to avoid molding at the level of the vertex and the arch of the foot.

The study of De LORENZO., *et al.* [19] in healthy patients shows that raising the occiput by 2 cm leads to an increase in the diameter of the medullary canal at C5-C6, which is a frequent lesional level. Its purpose is to limit or prevent spinal cord compression in the event of an unstable spinal lesion.

Immobilization of the cervical spine must therefore be carried out from the pre-hospital phase [20]. In 2003, the SFAR recommended the use of a rigid cervical collar and a vacuum mattress [1]. Other authors recommend the use of a global immobilization device [21].

The latter, well-described elsewhere [20] comprises a hard surface, a cervical collar, a head fixator and straps distributed from the forehead to the pelvis.

No treatment to date leading to major functional or neurological recovery is available [19]. This is why experts in anesthesia and resuscitation recommend great vigilance when picking up and transporting injured people, despite numerous preclinical trials of neuroprotection and neuroregeneration [20]. Only mastery and good knowledge of the rules of pre-hospital and hospital medical management of these traumas can limit neurological sequelae [21].

In a frequent context of polytrauma, orotracheal intubation is often necessary during this initial phase, consequently, the rule is to prevent any aggravation secondary to this one, because with the often-urgent need to oxygenate the patient and to secure its pharyngolaryngeal junction [22] opposes the risk of aggravation of traumatic lesions, with serious consequences in these usually young subjects.

The collection and transport conditions were not really specified in the series of KHOUDIR and ZENATI from Bejaïa (Algeria) [23], in the majority of the observations. Evacuations of the wounded were carried out either by civil protection ambulances or by ambulances from hospitals in the region. Only one patient had benefited from medical transport with preventive immobilization by neck brace. This was also the case for the mode of transport of the injured in the series of HABBAB [24], where only six injured had benefited from medical transport.

In Algeria, as in Morocco, the transport of the wounded is not much better. Non-medical civil protection ambulances or even those of peripheral health structures mainly do it where the attendant could be a nurse or a social worker from the sending establishment.

In Oran - Algeria, a "SMUR 31" unit was created five years ago and pre-hospital relief is beginning to be provided by a medical team including a resuscitator among the intervention group. On the other hand, it has been reported that this unit moves first in patients with signs of stroke.

The orientation of the injured person must be made to a reference center with human and material resources (resuscitation unit, multidisciplinary surgical team, imaging platform, physical rehabilitation center).

Often, the importance of the associated haemorrhagic lesions makes it mandatory to transfer the unstable cervical spine trauma to a local establishment before its secondary transfer to a referral center [1].

Proper referral is essential, as spinal cord injury is reported in 10–50% of cases with cervical spine trauma [28-30].

In our study, we had difficulty reconstructing the events of the accident and transport because they were little told at the start during the interrogation, due to a state of post-traumatic shock, but above all because it is This routinely involved an unmedicalized and undocumented transport. It must also be said that in our population, the poor initial management conditions were significant and corresponded to the rate of neurological non-recovery or death of our patients ( $P = 0.007$ ).

We strongly deplore the non-existence to date of coordination or links with reception centers located in the main cities of the country, explaining the insufficiency of capital pre-hospital information, because it conditions the therapeutic management of cervical spinal cord injuries.

## Conclusion

Data from the literature show that it is difficult to determine who is responsible for the neurological deterioration, whether it is because of more serious initial lesions or because of the more frequent appearance of secondary lesions of the ACSO type (cerebral aggressions side effects of systemic origin).

Knowing that we are fighting the same fight in terms of aggression of the brain and spinal cord (ACSO = AMSO), the quality of pre-hospital care remains one of the fundamental factors in improving the vital and functional prognosis in this type of patients.

## Conflict of Interest

The authors have stated that there is no conflict of interest.

## Acknowledgments

We are thankful for all the practicing physicians of the Neurosurgery and Anesthesia-Intensive care department of Tlemcen University Hospital, who participated in the care of cervical spine trauma patients and in the collection of data:

- **Internal Doctors:** In particular Rajaa Hebri who had done a remarkable job.
- **Medical Staff:** Mohammed Nedjraoui and Amina Bendahmane.
- **Paramedical Staff:** Mrs. Khalida Hadeb, Mr. Madani El Hadj and all the nurses in the department and physiotherapists. All dedicated and very well organized in the rotation of the guards.
- **University Hospital Departments:** Professor. Mohamed Si Saber (Neurosurgery), Professor. Rachida Djerfaoui (Anesthesia - Intensive care), Professor. Meriem Bouteflika (Radiology), Professor. Katia Taouli (Hemobiology) Algeria.
- **International teams:** A special thanks to Professor. Frederic Aubrun (Croix-Rousse Hospital) and Professor. Anne-Marie Schott Pethelaz (Hesper Laboratory) from France, who helped me to finalize this work.

## Bibliography

1. "Prise en charge d'un blessé adulte présentant un traumatisme vertébro-médullaire". Conférence d'experts SFAR (2003).
2. Faure A., *et al.* "Prise en charge immédiate et démarche clinique: Les traumatismes récents du rachis cervical inférieur". *Revue de Chirurgie Orthopédique et Réparatrice De L'appareil Moteur* 88.5 (2002): 1S114-1S118.
3. Coleman WP and Geisler FH. "Injury severity as primary predictor of outcome in acute spinal cord injury: retrospective results from a large multicenter clinical trial". *The Spine Journal* 4.4 (2004): 373-378.
4. Podolsky S., *et al.* "Efficacy of cervical spine immobilization methods". *The Journal of Trauma* 23.6 (1983): 461-465.
5. SWAIN A., *et al.* "Trauma of the spine and spinal cord". *BMJ: British Medical Journal* 301 (1990): 34-38.
6. Casha S and Christie S. "A systematic review of intensive cardiopulmonary management after spinal cord injury". *Journal of Neurotrauma* 28.8 (2011): 1479-1495.

7. Allen JB., *et al.* "A mechanistic classification of closed, indirect fractures and dislocations of the lower cervical spine". *Spine* 7.1 (1982): 1-27.
8. Seltzer S., *et al.* "Prise en charge pré hospitalière des traumatismes du rachiscervical". Urgences. Cours supérieurs et mises au point SFUM Arnette, Paris. (2001): 49-59.
9. Consensus canadien sur les lignes directrices en matière de premiers soins et de RCR. (2016).
10. Ankelf and Roenigsberg M. "Pre hospital care in Chicago". *Journal Européen des Urgences et de Réanimation* 5 (1992): 235-242.
11. Harvey S., *et al.* "Severe head injury in children: experience of the Traumatic Coma Data Bank". *Neurosurgery* 31.3 (1992): 435-444.
12. Bleichnerg Maneph Desboudard. "Enquête sur le fonctionnement des services d'accueil et d'urgence de 260hôpitaux Réanimation". Soins intensifs Med Urg 6.1 (1990): 31-37.
13. Calonb Launoy A. OCQUIDANT ph, AHOPUDEAUG, GENGEN – WIN N, GEARTNERE". Poly traumatismes et personnes ages Cah. Anesthesia 42.4 (1997): 535-553.
14. "Le polytraumatisé Manuel d'anesthésie de réanimation et d'urgence". Elsevier Masson II Edition. (2002).
15. Joseph Synèse Bemora., *et al.* "139 cas de traumatisme du rachis hospitalisés et pris en charge dans le service de neurochirurgie du CHUJRA Madagascar". *The Pan African Medical Journal* 26 (2017): 16.
16. Beyiha G., *et al.* "Aspects épidémiologiques des traumatismes du rachis au Cameroun: à propos de 30 cas". *Journal maghrébin d'anesthésie-réanimation et de médecine d'urgence* 15.65 (2008): 258-261.
17. E.Kpelaoa A., *et al.* "Challenge of the management of severe trauma of cervical spine in sub-developed country". *Dakar, Sénégal Neurosurgery* 59 (2013): 11-114.
18. Gerling MC., *et al.* "Effects of cervical spine immobilization technique and laryngoscope blade selection on an unstable cervical spine in a cadaver model of intubation". *Annals of Emergency Medicine* 36.4 (2000): 293-300.
19. De Lorenzo RA., *et al.* "Optimal positioning for cervical immobilization". *Annals of Emergency Medicine* 28.3 (1996): 301-308.
20. Toscano Joseph. "Prevention of neurological deterioration before admission to a spinal cord injury unit". *Paraplegia* 26.3 (1988): 143-150.
21. Theodore N., *et al.* "Prehospital cervical spinal immobilization after trauma". *Neurosurgery* 72 (2013): 22-34.
22. Tator CH. "Review of treatment trials in humanspinal cord injury: Issues, difficulties, and recommendations". *Neurosurgery* 59.5 (2006): 957-987.
23. PM LOEMBE., *et al.* "Fractures et luxations du rachis cervical inférieur (c3-c7) attitudes thérapeutiques au gabon". *Médecine d'Afrique Noire* 45.11 (1998).
24. Pierre Bouzat Jean-François Payen-Pôle. "SFAR Anesthésie Réanimation". CHU de Grenoble 38000. (2014).
25. Hassid VJ., *et al.* "Definitive establishment of airway control is critical for optimal outcome in lower cervical spinal cord injury". *Journal of Trauma and Acute Care Surgery* 65.6 (2008): 1328-1332.
26. KHOUDIR Ouahiba and ZENATI Lydia. "Rachis cervical inférieur post traumatique". Etude rétrospective à propos de 41 cas. 27/05/2017 (Tasdawit n Bgayet, Université de Bejaïa ).
27. Habbab Adil. "Prise en charge du rachis cervical traumatique en milieu de réanimation chirurgicale à l'hôpital militaire Avicenne- Marrakech (à propos de 20 cas)". (2016).
28. Hu R., *et al.* "Epidemiology of incident spinal fracture in a complete population". *Spine* 21.4 (1996): 492-499.
29. DesPlaines I. "Committee on Injury Scaling, Association for the advancement of automotive medicine". The abbreviated injury scale (1990).
30. Thompson WL., *et al.* "Association of injury mechanism with the risk of cervical spine fractures". *Canadian Journal of Emergency Medicine* 11.1 (2009): 14-22.