Scientific Research Publishing

Open Journal of Modern Neurosurgery, 2026, 16(1), 8-21
https://www.scirp.org/journal/ojmn
ISSN Online: 2163-0585
ISSN Print: 2163-0569

Bed Occupancy Rate and Quality of Care for Cranio-Encephalic Trauma Patients in the Surgery Department of the Borgou Departmental University Hospital (CHUD-B) in 2020 in the Republic of Benin

Kouassi Jean Marie Maurin Kisito Quenum[1*], Agbeko Komlan Doleagbenou[2], Oumar Coulibaly[3], Ayaovi Armel Hadonou[4], Manasse Kakpo[1], Hamidath Bio Sika[1], Christian Padonou[1], Olatoundji Holden Fatigba[1]

[1]Neurosurgery Department CHUD-B, University of Parakou, Parakou, Benin
[2]Department of Neurosurgery, Lome-Togo University, Lomé, Togo
[3]Neurosurgery Department UTTB, Bamako, Mali
[4]General Surgery Department of CHUD-B, University of Parakou, Parakou, Benin
Email: *kisitoq@gmail.com

How to cite this paper: Quenum, K.J.M.M.K., Doleagbenou, A.K., Coulibaly, O., Hadonou, A.A., Kakpo, M., Bio Sika, H., Padonou, C. and Fatigba, O.H. (2026) Bed Occupancy Rate and Quality of Care for Cranio-Encephalic Trauma Patients in the Surgery Department of the Borgou Departmental University Hospital (CHUD-B) in 2020 in the Republic of Benin. *Open Journal of Modern Neurosurgery*, **16**, 8-21.
https://doi.org/10.4236/ojmn.2026.161002

Received: October 14, 2025
Accepted: November 23, 2025
Published: November 26, 2025

Copyright © 2026 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

Introduction: Hospital care services are subject to many random events such as the number of patients admitted and discharged, the availability of beds in the inpatient department, the delay for a bed in the emergency room and length of hospital stay, which influence the quality of care received by patients. **Objective:** To assess the bed occupancy rates and the quality of care for Traumatic Brain Injuries (TBI) in the surgical department of CHUD-B. **Method:** This was a descriptive cross-sectional study carried out from March 19 to June 17, 2020. All patients admitted to the surgical department of CHUD-B were included in our study. The bed occupancy rates, the time to be taken in charge for TBI, and the satisfaction were assessed. **Results:** Three hundred and twenty-six patients were recorded, of which 41.7% were neurosurgery patients. There were 107 TBIs with a mean age of 27.1 ± 17.2 years and a sex ratio of 7.9. The average occupancy rate of the surgical beds was 87.3%. The average occupancy rate of neurosurgical beds was 163.3%, of which that of TBI was 109.4%. The mean hospital stay for TBI was 6.5 ± 7.0 days. The mean wait time for emergency beds was 0.5 ± 1.1 days. The mean time to perform the brain scan was 10.8 ± 17.0 hours. Mortality was 20.7%. 72.9% of TBI patients were satisfied with the care. **Conclusion:** The bed occupancy rate in the surgical department is above recommended standards. Increasing the reception capacity of the

neurosurgery unit would optimize the results of patient care. Patients and their caregivers are satisfied with the care they receive in the neurosurgery unit.

Keywords

Occupancy Rate, Quality, Care, Traumatic Brain Injury

1. Introduction

Traumatic Brain Injury (TBI) is a major public health concern. It is estimated that there are 10 million cases of traumatic brain injuries worldwide each year [1] [2]. The epidemiology of cranial trauma varies depending on the country considered. In North America, according to studies conducted, the annual incidence is estimated at 200 to 300 per 100,000 inhabitants and 500 per 100,000 inhabitants, respectively [3]-[5]. In Antananarivo, the prevalence was 19.6 per 100,000 inhabitants and the incidence was 131 cases per year, or 11 cases per month [6]. In Benin, Fatigba *et al.* [7] found that TBIs accounted for 13.5% of consultations and 61.4% were hospitalized in 2010; these cases represented 31.9% of hospitalizations in Parakou at the Borgou Departmental University Hospital Center (CHUD/B). This demonstrates the magnitude of TBI management and also reflects the neurosurgical activity. However, in 2020, the neurosurgery unit had a capacity of 7 beds out of 35, which is 20% of the total capacity of the surgery department, while more than one-third of hospitalizations are neurosurgical conditions. This is likely the cause of the long waiting periods observed, with an average transfer time for TBI hospitalizations of 11 ± 5.7 hours, ranging from 2 to 24 hours in 2018 [7]-[9]. This situation will be described in our study through the calculation of bed occupancy rates. It has consequences on the quality of care, which the WHO [1] defines as follows: "Quality is providing each patient with the appropriate diagnostic and therapeutic actions to ensure the best health outcome, in accordance with the current state of science, at the best cost for the same outcome, with the least iatrogenic risk, and with the highest satisfaction in terms of procedures and human interactions within the healthcare system." Therefore, our study will also focus on evaluating the quality of TBI care specifically, with a satisfaction survey and identifying the factors influencing the quality of care received by TBI patients in the neurosurgery department of CHUD/B.

2. Framework and Method

The present study was conducted in the General Surgery Department of the Borgou Departmental University Hospital Center in Parakou, specifically within the Neurosurgery units and the Anesthesia-Resuscitation and Emergency Service (SARU). It was a descriptive cross-sectional study with prospective data collection. Data collection took place from March 19 to June 17, 2020, over a period of

90 days.

The study population consisted of patients hospitalized in the surgery department of CHUD/B during the study period who occupied a bed. All patients whose hospital stay was less than one day were excluded from this study. These were patients who did not spend at least one night in a hospital bed, according to non-probability sampling.

Satisfaction (the general opinion of the patient or their companions upon discharge from the hospital) was assessed using two forms. The Bed Occupancy Rate (BOR) was calculated by relating the total number of hospitalization days to the total theoretical number of available beds over the period, using the following formula:

$$\mathrm{TO} = \frac{\text{Hospitalization days} * 100}{\text{Number of beds} \times \text{Number of days}}$$

The quality criteria are:

- Accessibility, assessed by waiting times in emergency services and the time to access specialist doctors;
- Safety, evaluated through nosocomial infections, decubitus complications, perioperative and postoperative complications, and sentinel events;
- Sustainability, examined through complaints and physical signs during follow-ups;
- Reliability, determined by diagnostic accuracy;
- Satisfaction, gathered through the general opinion of the patient or their companions regarding the care received.

Delay is defined as the time taken to perform an action when it should have been done immediately.

3. Results

3.1. Sociodemographic Data

The results of this study involved 326 patients hospitalized for a surgical condition, of which 41.7% (n = 136) were neurosurgery patients. TBIs accounted for 32.8% (n = 107), representing 78.7% of the neurosurgery patients. The average age of the patients was 32.4 ± 19.98 years, with a range from 3 months to 88 years. The average age of TBI patients was 27.1 ± 17.2 years, with a range from 1 year to 80 years. The most represented age group was [20 - 39] years (41.1%). Male patients represented 82.35%, and the sex ratio was 3.2 M/F. The TBI patients comprised 95 (88.8%) men and 12 (11.2%) women, with a sex ratio of 7.9.

3.2. Admission Rate

Regarding bed occupancy, the average number of admissions per week is 25.1 ± 8.37 patients, with a range from 16 to 46 patients. Peaks in admission frequency were observed in the first, second, eighth, and eleventh weeks, as reported in **Figure 1**.

The average number of admissions per week for patients with neurosurgical conditions is 10.5 ± 3.2 patients, with a range from 5 to 16 patients. During the study period, a total of 2750 hospitalization days were recorded, of which 1029 hospitalization days were in the neurosurgery unit.

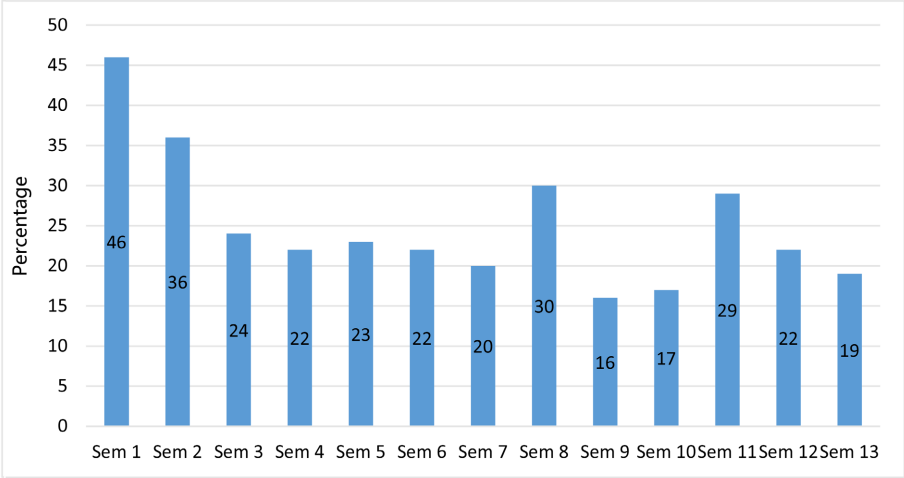
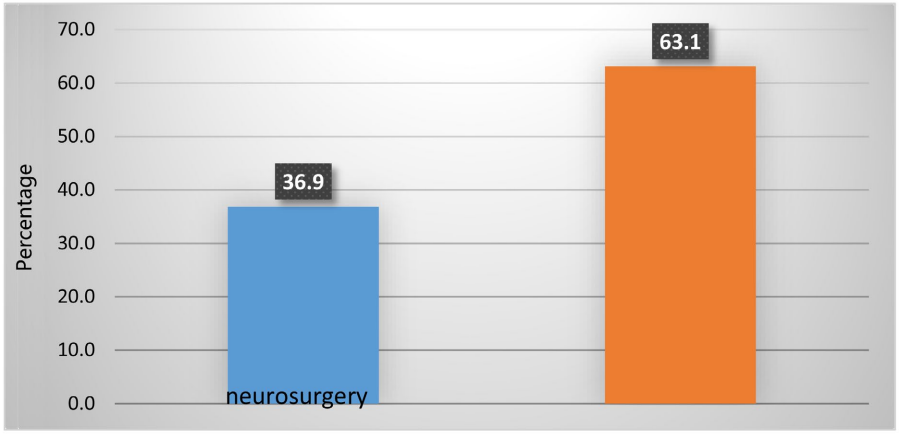


Figure 1. Frequency of patient admission per week from March to June 2020 in the CHUD/B Surgery Department (N = 326).

3.3. Occupancy Rate

The surgery department had 35 beds, and the occupancy rate was 87.3%, which translates to 31 functional beds. Of these 31 beds, the occupancy rate for neurosurgery patients was 36.9%, meaning a total of 12 out of 31 beds were occupied by neurosurgery patients, even though initially only 7 beds were dedicated to this neurosurgery unit. Figure 2 illustrates this bed occupancy.

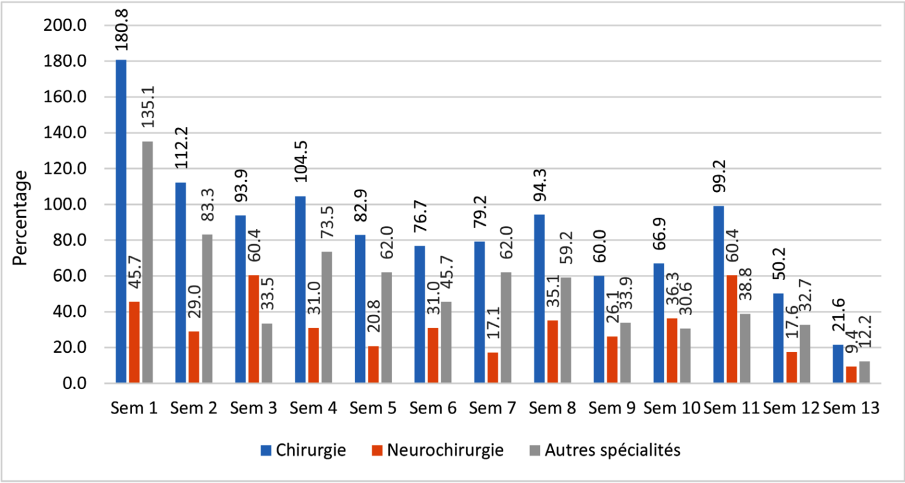


*Other specialties: visceral, trauma orthopedics, urology.

Figure 2. Average bed occupancy rate from March to June 2020 by specialty in the Surgery Department of CHUD/B.

The weekly evolution of bed occupancy rates by specialty is shown in Figure 3.

The peaks in bed occupancy rates were observed during the first week (180.8%), the second (112.2%) and the fourth week (104.5%).

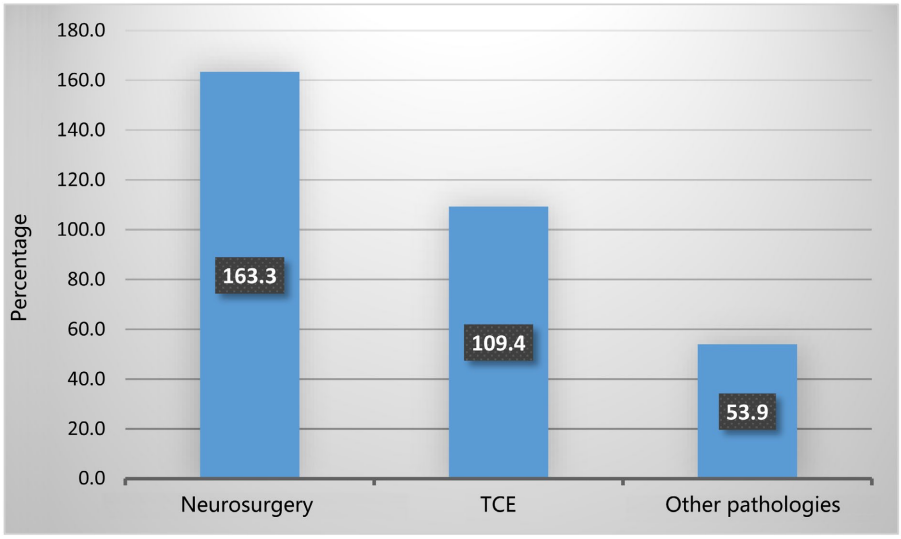


***Other specialties:** visceral, trauma-orthopedics, urology.

Figure 3. Weekly evolution of the bed occupancy rate from March to June 2020 according to specialty in the Surgery Department of CHUD/B.

Average Occupancy Rate of Beds in the Neurosurgery Unit

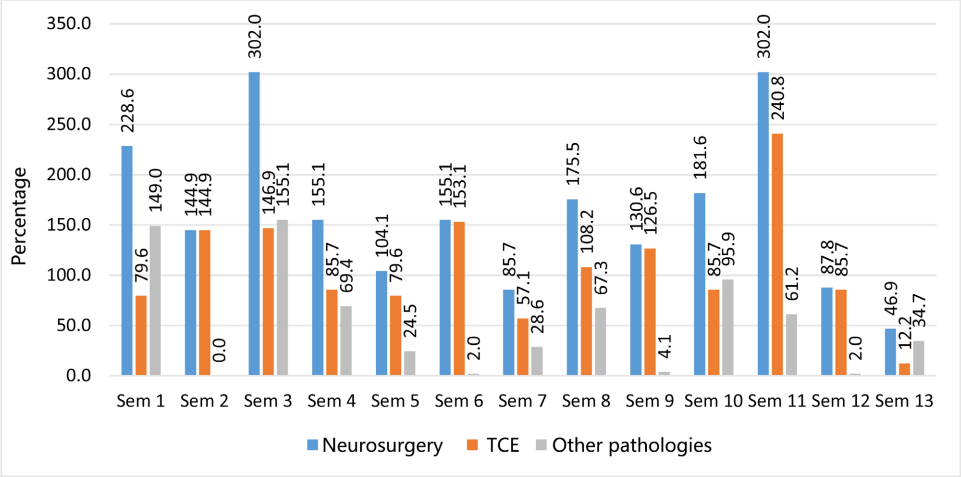
The hospitalization days recorded for TCE were 689 days. The neurosurgery unit had 7 beds. The average occupancy rate of the neurosurgery unit beds was 163.3%, *i.e.*, 5 beds from other specialties occupied by neurosurgery patients. The average occupancy rate of the neurosurgery unit beds by TCE patients was 109.4%. This distribution is shown in **Figure 4**.



***Other pathologies:** these are neurosurgical pathologies except TCE (Vertebro-Spinal Cord Trauma, tumor, malformation, degenerative, vascular and infectious pathologies).

Figure 4. Average occupancy rate of beds in the neurosurgery unit from March to June 2020 according to neurosurgical pathologies in the Surgery Department of CHUD/B.

Peak bed occupancy rates per week in the neurosurgery unit were observed in the first week (228.6%), the third week (302.0%) and the eleventh week (302.0%) as reported in Figure 5.



***Other pathologies:** these are all neurosurgical pathologies except TCE (Vertebro-Spinal Cord Injury, tumor, malformation, degenerative, vascular and infectious pathologies).

Figure 5. Weekly evolution of the occupancy rate of beds in the neurosurgery unit from March to June 2020 according to pathologies in the Surgery Department of CHUD/B.

The mean hospital stay was 8.4 ± 8.9 days with extremes of 1 and 68 days. Patients with neurosurgical pathology had a mean hospital stay of 7.6 ± 7.7 days with extremes of 1 and 61 days.

3.4. Quality of Care for TBI Patients

Patients were referred in 56.1% of cases. Intern trainees received patients in 100% of cases under the supervision of a graduate in neurosurgery specialty (DES). Admission time ranged from 15 minutes to 60 days, with 55.1% of patients admitted within the first 6 hours following the injury. The average time to provide emergency care was 0.25 ± 1.4 hours, with extremes of 15 minutes and 10 hours.

3.4.1. Emergency Room Stay

The average emergency room stay was 0.5 ± 1.1 days, with a range of 1 to 7 days.

3.4.2. Specialist's Opinion

The specialist's opinion was obtained directly in 15% of cases and by phone in 85% of cases. The average time for obtaining this opinion was 0.7 ± 4.7 hours, with extremes ranging from 20 minutes to 48 hours. In 86% of cases, the specialist's opinion was obtained within the first hour following the patient's admission. The time taken to obtain the specialist's opinion was not significantly associated with the TBI classification according to Masters (p-value = 0.872). The time to obtain the specialist's opinion was not significantly associated with the time taken to perform the CT scan (p-value = 0.854). The time taken to perform the CT scan was

significantly associated with the TBI classification according to Masters (p-value = 0.016). Among the patients who had a CT scan performed within the first 24 hours, 65 (85.5%) were classified as Masters III.

3.4.3. Surgical Treatment

Care was administered within less than one hour after hospitalization in 88.8% of cases. Surgery was indicated for 25 patients (23.4%), but 23 patients (21.5%) were actually operated on. No perioperative complications were noted. Table 1 shows the distribution of surgical procedures performed.

Table 1. Distribution of surgical procedures performed in the Surgery Department of CHUD/B (N = 23).

	Staff numbers	Percentages (%)
Wound Debridement	1	4.4
Evacuation of EDH (Epidural Hematoma)	3	13.0
Evacuation of ASDH (Acute Subdural Hematoma)	2	8.7
Evacuation of chronic SDH (Subdural Hematoma)	2	8.7
Elevation of depressed skull fracture	5	21.7
Repair of compound skull fracture (CSF leak repair)	6	26.1
Repair of the anterior cranial fossa	4	17.4

Table 2 reports the distribution of patients according to complications.

Table 2. Distribution of TBI patients from March to June 2020 according to complications occurring in the CHUD/B Surgery Department.

	Staff numbers	Percentages (%)
Infectious complication or nosocomial infection	1	0.6
Hemodynamic complication	3	1.9
Neurological complication	**16**	**15.0**
Convulsion	1	0.9
Brain herniation	5	4.7
Neurological deterioration	**15**	**14.0**

Twenty-two patients died (20.6%), of whom 51.7% had a severe TBI.

3.5. Follow-Up Review and Complaints at Follow-Up

Twenty-six patients underwent a clinical follow-up, accounting for 24.3%. Complaints at follow-up included headaches (2.8%), rhinorrhea (0.9%), and aphasia (0.9%).

Satisfaction Expressed at Discharge

Seventy patients, or 65.4%, expressed their satisfaction at discharge, as reported in Table 3.

Table 3. Distribution of TBI patients from March to June 2020 according to the level of satisfaction with care in the Surgery Department of CHUD/B.

Level of Satisfaction	Count	Percentage
Not satisfied	2	2.8
Slightly satisfied	1	1.5
Satisfied	17	24.3
Very satisfied	50	71.4

4. Discussion

4.1. Admission Rates and Sociodemographic Data

TBI cases accounted for 32.8% of patients hospitalized in the surgery department. This result is identical to that of Fatigba *et al.* [7] in 2010 in a study conducted at CHUD/B in Parakou, which reported a rate of 31.9%. TBI patients represented 78.7% of those hospitalized for a neurosurgical condition.

The average age of TBI patients was 27.1 ± 17.2 years, with a range from 1 year to 80 years. Some authors have reported average ages similar to our series [10] [11], while others reported average ages of 39 years and 31.4 ± 2 years, which are higher than those in our series [12]. The most represented age group in our series was [20 - 39] years. Young people are therefore the most affected due to their high mobility.

Male predominance has been reported in the literature as in our series, at a proportion of 88.8%. The sex ratio in our series was 7.9 M/F, which differs from those found by other authors [7] [8] [11]. These findings are related to the socio-professional activities of men, which expose them to traumatic brain injuries more than women.

4.2. Bed Occupancy Rate

The risks of bed shortages become apparent when the average bed occupancy rates exceed 85%, and a hospital can expect regular bed shortages and periodic bed crises if the average bed occupancy rises to 90% or more [13]. This statement is supported by the Australian Medical Association [14], the Irish Medical Organization, and the Australasian College for Emergency Medicine in 2010 [15]. In the United Kingdom, the National Institute for Health and Care Excellence (NICE) in 2018 recommended that healthcare providers plan their capacity to limit the risks associated with an occupancy rate exceeding 90% [16] [17]. In our study, the average bed occupancy rate in the surgery department is 87.3%. This average occupancy rate is above 85% and explains the bed shortages the department often faces. These results are similar to those reported by other authors, even though some found lower average bed occupancy rates than those in our series, ranging from 66.5% to 51.7% [18]-[20].

In our series, the weekly evolution of the bed occupancy rate showed that for 6 out of 13 weeks, this occupancy rate was above 85%. This aspect has not been

addressed in the literature, but it reveals the extent of the bed shortage crisis in our study. In the neurosurgery unit, the average bed occupancy rate is 163.3%, while some authors reported an average occupancy rate of 87% in France [13].

This difference is because these authors conducted their study in a neurosurgery department with a higher capacity than ours. The weekly evolution of the neurosurgery bed occupancy rate showed that for 12 out of 13 weeks, this occupancy rate was above 85%, ranging from 46.9% to 302.0%. This proves that the neurosurgery bed shortage is a constant problem and explains the long waiting times observed in the emergency department for TBI patients in our series, which was 0.5 ± 1.1 days, with extremes ranging from 3 hours to 7 days.

Regarding the bed occupancy rate by traumatic brain injury patients in the departments, the literature remains silent, but in our series, it averaged 109.4% in the neurosurgery unit.

4.3. Admission

In our series, the average weekly admissions in neurosurgery were 10.5 ± 3.2, with a range of 5 to 16 patients, which was different from these results. Admissions were direct in 43.9% of cases, compared to 56.1% that were referrals, contrary to direct admissions in 70% of cases [10]. This difference in our study could be explained by the fact that CHUD-B is the reference hospital in the northern region and the only one offering specialized neurosurgery services.

Recommendations call for the management of TBIs by a specialized and trained team upon admission. In our series, interns handled patient admissions in 100% of cases. The difference in our study is the supervision by a DES neurosurgery trainee. The admission delay ranged from 15 minutes to 60 days, with 55.1% of patients admitted within the first 6 hours following the trauma. These results are identical to those reported in other studies [21] [22], whereas the very long average delay was 66 ± 108.02 hours at CNHU/HKM in Cotonou due to patients being routed through a healthcare center before being referred to CNHU/HKM [10].

4.4. Emergency Department Stay

The average stay in the emergency department, which reflects the waiting time for hospital beds, was 0.5 ± 1.1 days, with extremes ranging from 3 hours to 7 days. This delay is very long compared to what has been reported by other authors [6] [23] [24], which was 11 ± 5.7 hours, with extremes of 2 and 24 hours. This is primarily due to the lack of available hospital beds.

4.5. Specialist Consultation

The specialist's opinion was obtained within an average time of 0.7 ± 4.7 hours, with extremes ranging from 20 minutes to 48 hours. In 86% of cases, the specialist's opinion was obtained within the first hour following patient admission, contrary to some authors who reported an average delay of 12 ± 11.5 hours, with extremes of 5 minutes to 6 days [7] [10]. The reason given in their study was the

reluctance of interns to call the supervisors. In our study, the presence of the DES neurosurgery trainee facilitated quick consultation with the specialist.

4.6. Paraclinical Examination

A non-contrast brain CT scan was performed in 81.3% of cases. This rate of brain CT scan performance is higher than that reported by other authors [6] [9] [19]. The average time to perform the brain CT scan was 10.8 ± 17 hours, with extremes ranging from 1 to 72 hours. This delay is significantly shorter than that reported in the literature [7] [10] [12]. The shorter delay in our series can be attributed to the 24/7 availability of the brain CT scanner at two peripheral centers (Hôpital d'Instruction des Armées de Parakou and Centre de Diagnostic Médical Sancta Maria), but the cost remains a burden for the patient and family due to a lack of financial resources.

The simple skull X-ray is unnecessary in brain trauma patients as it does not predict the presence or absence of brain lesions. In some series from developing countries, emergency CT scans are performed in proportions ranging from 33.7% to 61% [7] [10] [12]. These results are significantly higher than in our series, which was 0.9% (only 1 case). This difference was due to the inaccessibility of the CT scanner and the lack of financial means.

4.7. Neurosurgical Treatment

Neurosurgical treatment (evacuation of EDH, evacuation of ASDH, evacuation of chronic SDH, elevation of depressed skull fracture, repair of CSF leak, or repair of the anterior cranial fossa) was performed on 23 patients (21.5%) in our series. This rate of surgical treatment could be explained by the lack of financial resources of some patients, as they do not have health insurance for systematic coverage when care is needed. This difficulty is reported by other authors working in conditions similar to ours [7]-[10] [12] [22]. The average delay for surgical intervention was 125.2 ± 156.3 hours, with extremes ranging from 4 to 528 hours (9 days).

4.8. Hospital Stay

The average hospital stay was 6.5 ± 7.0 days, with extremes ranging from 1 to 45 days, similar to what some authors have reported [7] [9] [12].

4.9. Nursing, Progress, Monitoring, and Satisfaction

In terms of nursing care, in a previous study conducted in the same department in 2020, the current results are very encouraging and explain the low rates of complications, especially infections, and the absence of pressure sores [8]. Nursing care generally includes body hygiene, bed care, early and periodic mobilization, propped-up positioning, early feeding via nasogastric tube for severe TBI patients, and physiotherapy started in the hospital ward in cases of motor deficits. Caregivers are trained and supervised in these practices due to staff shortages.

The overall mortality in our series was 20.6% of patients. This is higher than

what is reported in some publications [7] [8] [11] [12], which had mortality rates ranging from 8.5% to 20%. Patients with severe traumatic brain injury accounted for 51.7% of our mortality. The main reason for this high death rate is the inadequacy of technical facilities.

Out of the 70 patients who expressed their overall satisfaction with the care received, 72.9% were satisfied. This satisfaction level is higher than that reported in a study conducted at the Comè Zone Hospital in Benin, which was 41.1% [23] [24].

4.10. Assessment of the Quality of Care Received by Patients

Based on these different results, the quality of care for traumatic brain injury patients has been assessed according to the following criteria:

- **Effectiveness:** The high mortality rate (20.6%) observed in our series undermines the effectiveness of the care. Severe TBI patients accounted for 51.7% of this mortality.
- **Accessibility:** The waiting time for hospital beds is long, highlighting a lack of continuity in care within an appropriate healthcare facility. The specialist's opinion is obtained quickly.
- **Safety and Reliability:** The low rate of nosocomial infections, pressure sore complications, and absence of perioperative complications justify the safety of the care received by TBI patients [25].
- **Durability:** Apart from the patients not seen for follow-up, the absence of complaints at follow-up (88.3%) assures durable care.
- **Satisfaction:** Patients were generally satisfied (72.9%) with the care received.

These results align with the literature, where healthcare often yields satisfaction when standards are met, despite limited technical facilities [26]-[32].

5. Conclusions

At the conclusion of this study, it is clear that the bed occupancy rate in the surgery department exceeds the standards recommended by the Australian Medical Association (AMA) and the National Institute for Health and Care Excellence (NICE), explaining why this department is regularly exposed to bed shortage crises. The neurosurgical activity, particularly the management of TBIs in this department, is significant and exceeds the theoretical bed capacity occupied by the neurosurgery unit.

Regarding patient management in this unit, remarkable progress has been made, improving the quality of care received by TBI patients despite the inadequacy of technical facilities and patients' financial constraints. Increasing the capacity of the neurosurgery unit would optimize the outcomes of patient care.

Ethical Considerations

This study was carried out as part of a PhD thesis in medicine, and the research protocol was submitted to the local ethics committee of the University of Parakou

for a favourable opinion (REF:208/2020/CLERB-UP/P/SP/R/SA). This work was carried out in compliance with current ethical standards. The agreement of the authorities at various levels was obtained and the anonymity of the patients was respected.

Conflicts of Interest

The authors have no conflicts of interest to declare.

References

[1] Organisation Mondiale de la Santé (2010) Normes essentielles en matière de santé environnementale dans les structures de soins. OMS, 92.

[2] Langlois, J.A., Rutland-Brown, W. and Wald, M.M. (2006) The Epidemiology and Impact of Traumatic Brain Injury: A Brief Overview. *Journal of Head Trauma Rehabilitation*, **21**, 375-378. https://doi.org/10.1097/00001199-200609000-00001

[3] Ritter, M. (2023) Evidence-Based Pearls: Traumatic Brain Injury. *Critical Care Nursing Clinics of North America*, **35**, 171-178. https://doi.org/10.1016/j.cnc.2023.02.009

[4] MacKay, R.J. (2004) Brain Injury after Head Trauma: Pathophysiology, Diagnosis, and Treatment. *Veterinary Clinics of North America*: *Equine Practice*, **20**, 199-216. https://doi.org/10.1016/j.cveq.2003.11.006

[5] Sussman, E.S., Pendharkar, A.V., Ho, A.L. and Ghajar, J. (2018) Mild Traumatic Brain Injury and Concussion: Terminology and Classification. *Handbook of Clinical Neurology*, **158**, 21-24.

[6] Ratovondrainy, W., Raobela, L., Rasolonjatovo, E.C. and Rabarijaona, M. (2015) Traumatisme crânien: Réalité de sa prise en charge au Centre Hospitalier de Soavinandriana, Antananarivo. *Revue d'anesthésie-réanimation et de médecine d'urgence*, **7**, 1-5.

[7] Fatigba, O.H. and Padonou, J. (2010) Epidemiologie des traumatismes cranioncephaliques a parakou (BENIN). *African Journal of Neurological Sciences*, **29**, 25-33.

[8] Quenum, K., Fatigba, O., Houndje, Y.P., Tchegnonsi, C., Alihonou, T., *et al.* (2020) Favourable Outcome in Pediatric Neurosurgery for Extra Dural Hematoma in Sub Sahara Africa: Report of Parakou University Hospital in the Benin Republic. *Journal of Neurological Research and Therapy*, **3**, 17-26. https://doi.org/10.14302/issn.2470-5020.jnrt-20-3629

[9] Rasolonjatovo, C., Tsiaremby, G., Rakotovao, K.T., Ratovondrainy, W., Rabarijaona, M. and Andriamamonjy, C. (2015) L'hematome extradural operé au Chu Joseph Ravoahangy, Andrianavalona Antananarivo, Madagascar. *African Journal of Neurological Sciences*, **33**, 26-31.

[10] Hode, L., Madougou, S., Fatigba, H.O., Hounnou, P., Ebassa, K., Hans Moevi, A.A., *et al.* (2017) The Direct Cost of Treatment of Traumatic Brain Injury in a Sub-Saharan African Country (Benin). *World Neurosurgery*, **99**, 210-213. https://doi.org/10.1016/j.wneu.2016.11.083

[11] Aguèmon, A.R., Padonou, J.L., Yévègnon, S.R., Hounkpè, P.C., Madougou, S., Djagnikpo, A.K., *et al.* (2005) Traumatismes crâniens graves en réanimation au Bénin de 1998 à 2002. *Annales Françaises d'Anesthésie et de Réanimation*, **24**, 36-39. https://doi.org/10.1016/j.annfar.2004.11.011

[12] Doléagbenou, A.K., Ahanogbé, H.K., Kpelao, E.S., Beketi, A.K. and Egu, K. (2019)

Bilan de 24 mois d'activités neurochirurgicales au centre hospitalier régional Lomé commune (Togo). *African Journal of Neurological Sciences*, **38**, 3-10.

[13] Lemaire, J.J., Delom, C., Coste, A., Khalil, T., Jourdy, J.C., Pontier, B., *et al.* (2015) Analyse médico-économique d'un service de neurochirurgie en centre hospitalier et universitaire. *Neurochirurgie*, **61**, 2-15. https://doi.org/10.1016/j.neuchi.2014.11.011

[14] Australian Medical Association (AMA) (2006) Position Statement on Quality and Safety in Public Hospitals. ACT.

[15] Keegan, A.D. (2010) Hospital Bed Occupancy: More than Queuing for a Bed. *Medical Journal of Australia*, **193**, 291-293. https://doi.org/10.5694/j.1326-5377.2010.tb03910.x

[16] Friebel, R., Fisher, R., Deeny, S.R., Gardner, T., Molloy, A. and Steventon, A. (2019) The Implications of High Bed Occupancy Rates on Readmission Rates in England: A Longitudinal Study. *Health Policy*, **123**, 765-772. https://doi.org/10.1016/j.healthpol.2019.06.006

[17] Krall, S., O'Connor, R.E. and Maercks, L. (2009) Higher Inpatient Medical Surgical Bed Occupancy Extends Admitted Patients' Stay. *The Western Journal of Emergency Medicine*, **10**, 93-96.

[18] Lawin, H.A., Ayelo, A.P., Hinson, A.V. and Fayomi, B. (2015) Evaluation de la charge de travail des infirmiers dans un hopital au Bénin. *Mali Medical*, **2**, 19-24.

[19] af Ugglas, B., Djärv, T., Ljungman, P.L.S. and Holzmann, M.J. (2020) Association between Hospital Bed Occupancy and Outcomes in Emergency Care: A Cohort Study in Stockholm Region, Sweden, 2012 to 2016. *Annals of Emergency Medicine*, **76**, 179-190. https://doi.org/10.1016/j.annemergmed.2019.11.009

[20] Rahman, H., Haque, S. and Hafiz, M. (1970) Percent Bed Occupancy Rate in a Selected Specialized Tertiary Care Hospital in Dhaka City. *Bangladesh Journal of Medical Science*, **11**, 18-24. https://doi.org/10.3329/bjms.v11i1.9817

[21] Bagust, A., Place, M. and Posnett, J.W. (1999) Dynamics of Bed Use in Accommodating Emergency Admissions: Stochastic Simulation Model. *BMJ*, **319**, 155-158. https://doi.org/10.1136/bmj.319.7203.155

[22] Nkuna, M.H. (2008) Le taux d'occupation de l'hôpital Sendwe Lubumbashi (R.D. Congo). Mémoire Oneline.

[23] Ahanhanzo, Y.G., Landaogo Soutongonoma, L. and Saizonou, J. (2014) Performance d'un hôpital de zone sanitaire au Benin: Un exemple de modèle d'évaluation. *Pan African Medical Journal*, **18**, Article 63. https://doi.org/10.11604/pamj.2014.18.63.3465

[24] Poon, C.M., Wong, E.L.Y., Chau, P.Y.K., Yau, S.Y. and Yeoh, E.K. (2018) Management Decision of Hospital Surge: Assessing Seasonal Upsurge in Inpatient Medical Bed Occupancy Rate among Public Acute Hospitals in Hong Kong. *QJM: An International Journal of Medicine*, **112**, 11-16. https://doi.org/10.1093/qjmed/hcy217

[25] Cunningham, J.B., Kernohan, W.G. and Rush, T. (2006) Bed Occupancy, Turnover Intervals and MRSA Rates in English Hospitals. *British Journal of Nursing*, **15**, 656-660. https://doi.org/10.12968/bjon.2006.15.12.21398

[26] Pawlson, L.G. (2004) An Introduction to Quality Assurance in Health Care. *American Journal of Preventive Medicine*, **26**, 96-98. https://doi.org/10.1016/j.amepre.2003.09.013

[27] Or, Z. and Com-Ruelle, L. (2008) La qualité de soins en France: Comment la mesurer pour l'améliorer? *Journal de gestion et d'économie médicales*, **26**, 371-385. https://doi.org/10.3917/jgem.086.0371

[28] Mission National d'Expertise et d'Audit Hospitalier (MeaH) (2008) La gestion des lits dans les hôpitaux et cliniques Bonnes pratiques organisationnelles.

[29] Alves Júnior, M.A., Passos, T.S. and Almeida-Santos, M.A. (2020) Evaluation of Bed Vacancy and Occupancy Times as Governance Parameters in Patients Admitted to a Public Intensive Care Unit. *Revista Brasileira de Terapia Intensiva*, **32**, 412-417. https://doi.org/10.5935/0103-507x.20200070

[30] Roush, K. (2025) Hospital Occupancy Is High, Potentially Nearing Capacity. *AJN, American Journal of Nursing*, **125**, 13-14. https://doi.org/10.1097/ajn.0000000000000094a

[31] Jones, R.P. (2024) A New Approach for Understanding International Hospital Bed Numbers and Application to Local Area Bed Demand and Capacity Planning. *International Journal of Environmental Research and Public Health*, **21**, Article 1035. https://doi.org/10.3390/ijerph21081035

[32] Keown, P., Alder, R., Wild, G., Ouma, L., McKinnon, I. and Weich, S. (2025) Long Term Trends in NHS Inpatient Bed Provision in England, 1960-2020. *PLOS One*, **20**, e0330931. https://doi.org/10.1371/journal.pone.0330931