CLINICAL DECISION RULES IN EVALUATING HEAD TRAUMA IN ADULT POPULATION AT THE EMERGENCY DEPARTMENT, DUBRAVA UNIVERSITY HOSPITAL

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Head trauma is a common presentation in the Emergency Department (ED), ranging from skull fractures, minor traumatic brain injuries (TBIs) to severe TBIs in polytraumas. In moderate traumatic brain injuries, patient assessment and diagnostic work-ups can be ameliorated with the application of Clinical Decision Rules (CDRs) such as the Canadian CT Head Rule (CCHR) and the National Institute for Care and Excellence (NICE) guidelines. Optimal adherence to these CDRs greatly benefits patients, reduces waiting times, ED overcrowding, mortality and ED clinician pitfalls. The aim of this report is to provide the reader with a brief review of the CCHR and NICE guidelines, which are implemented in Dubrava University Hospital, with an overview as to how our ED collaborates with its neurosurgical team and other surgical specialists in situations of polytrauma and TBI patients, mainly focusing on TBI. In addition, we will introduce the Dubrava Model, one of the neurotrauma models implemented in fast treatment of TBIs in rural hospitals devoid of resident neurosurgeon.

KEY WORDS: traumatic brain injury, Canadian CT Head Rule, National Institute for Health and Care Excellence, anticoagulants, Dubrava Model

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INTRODUCTION

Head trauma is a common occurrence in the Emergency Department (ED) and is a broad term encompassing various types of craniofacial injuries (1). Traumatic brain injury (TBI) is brain injury and impairment of brain function due to mechanical forces, which causes great mortality and morbidity worldwide (1-3). In traumas, the most frequent cause of early death was exsanguination (3). Survival and neurological deficits depend on the extent of brain injury, both primary (initial trauma) and secondary (hypotension, hypoxia, brain edema) injuries, which warrant prompt anesthetist and neurosurgical intervention with computed tomography (CT) scanning (4,5).

The estimated incidence of TBI is highest in North America and Europe; approximately 69 million individuals worldwide are reported to suffer TBI each year (6). The majority of TBIs are attributed to falls (older population and alcoholics) and motor vehicle collisions (MVC) (younger adults) (1,6). The Centers for Disease Control and Prevention (CDC) report that TBI accounts for a considerable portion of the global in-

jury burden due to health loss, disability, health care systems and high health care costs (7). The incidence of TBI will continue to increase due to population aging, increase in population density and increase in the number of motor vehicles and bicyclists (8). In 2014, the CDC reported that an average of 155 people in the United States died each day from injuries that included TBI (7), and it is pertinent to suspect TBI in all polytraumatized patients in the ED. Priority in the ED is to stabilize patient airway, breathing, maintaining adequate ventilation and intubation, where required (severe TBI) and circulation (Airway, Breathing, Circulation, Disability, Exposure, ABCDE). The clinician must perform fast primary assessment (examination), work with a multidisciplinary team and use appropriate radiological interventions. Polytrauma (multiple trauma), according to the new Berlin definition, is an Abbreviated Index Score (AIS) ≥3 involving two or more areas of the body and including one of the following: hypotension (systolic blood pressure ≤90 mm Hg), unconsciousness (Glasgow Coma Scale (GCS) score ≤8), acidosis (base excess ≤-6.0), coagulopathy (International Normalized Ratio (INR) ≥1.4 or partial prothrombin time (PTT) ≥40 s) or 70 years of age (9).

The aim of this article is to review some of the pitfalls in the ED in adult and geriatric examination and to demonstrate that by utilizing Clinical Decision Rules (CDR), such as the Canadian CT Head Rule (CCHR) and the National Institute for Health and Care Excellence (NICE) guidelines, both adapted and integrated in Dubrava University Hospital, assist clinicians in determining when to use CT imaging. We will review the pitfalls in the underusage of CDRs, overuse of head CT imaging, neurological examination, anticoagulant therapies, and the effects of alcohol consumption. We will also introduce the reader into the Dubrava Model implemented in fast treatment of TBIs in rural areas where a neurosurgical team is not available in EDs.

Canadian CT Head Rule

The CCHR was published in 2001 by Stiell *et al*. at the University of Ottawa, and was developed as a clinical tool to predict which patients having suffered 'minor' head injury warranted CT head scan (10,16); details are listed in Table 1. This CDR was designed to assist in the ED physician decision making, reduce the number of unwarranted CT scans, avoid unnecessary patient radiation exposure, reduce waiting times in the ED, and spare resources (16). This prospective study was designed for 'minor' head injuries only and the CCHR should only be used in patients having one of the following: 1) witnessed loss of consciousness (LOC); 2) amnesia for the injury; or 3) confusion after the injury. In addition, if the patient has GCS 13-15 on ED arrival, and the injury occurred within the last 24 hours, these patients will require head CT scan (16). Thus, the CCHR is not used in those with 'minimal' head injuries or those with minor head injury not exhibiting neurological symptoms (16). The misinterpretation of inclusion and exclusion criteria is a major pitfall. Inclusion criteria refer to patients who were involved in the study to devise the CCHR and exclusion criteria were patients not used in the study. In addition, not all individuals aged ≥65 with minor head trauma will require CT scan unless they are on anticoagulant or antiplatelet therapy or unless they exhibit neurological symptoms. The mechanism of injury should always be considered in head trauma. The patient may have GCS 15, no loss of consciousness, amnesia or confusion, and still require detailed diagnostic workup (Figure 1).

Table 1. *The Canadian Head CT Rule. Indications for CT head scan required in minor head trauma (by the courtesy of Stiell IG, Lesiak H, Wells GA et al. The Canadian Head CT Rule for Minor Head Injury. Lancet 2001;367:1391-6).*

FIVE HIGH RISK CRITERIA	MEDIUM RISK CRITERIA
1. Glasgow Coma Scale <15 two hours post-injury	1. Amnesia before impact ≥30 minutes
2. Suspected open or depressed skull fracture	2. Dangerous mechanism (pedestrian struck by vehicle, occupant ejected from vehicle, fall from elevation ≥3 feet or 5 stairs)
3. Any sign of basal skull fracture	
4. Vomiting ≥2 episodes	
5. Age ≥65 years	

Exclusion criteria: non-trauma cases, Glasgow Coma Scale ≥13, age ≥16, Coumadin or bleeding disorder, obvious open skull fractures

Fig. 1. *Head injury in a 59-year-old female after falling down a metal spiral staircase (>5 stairs, medium risk criteria as per the CCHR). GCS 15 and unremarkable pupillary reactivity. No loss of consciousness with full reconstruction of events, no episodes of vomiting. No findings on CT head scan. The patient was discharged after wound suturing and a 6-hour observation period.*

The National Institute for Health and Care Excellence (NICE) Guidelines for Head Injury

In 2002, the National Institute for Health and Care Excellence (NICE) released its guidelines on head injuries and CT recommendations based on the CCHR but with some modifications (10). These modifications include that CT is now the primary modality in assessing head injuries, CT head scan is required within 1 hour of the risk factor being identified, patients on anticoagulation treatment should have CT head scan within 8 hours of the injury and more than 1 episode of vomiting requires and urgent CT head scan (12). Anticoagulants such as warfarin, direct oral anticoagulants/non vitamin-K oral anticoagulants or novel oral anticoagulants (DOACs/NOACs) and antiplatelets such as Aspirin and clopidogrel require CT head scans, documented observation and follow-up procedures, verbal and written advise for patient and family upon patient discharge, follow-up dates and instructions for an appropriate care provider to stay with the patient for the next 24-hour post-discharge (12). NICE also recommends effective pain management for ED patients, which is another pitfall in some EDs, as the lack of analgesia leads to exacerbation of intracranial pressure increase in addition to patient discomfort (12). NICE recommends both head and cervical spine imaging and CT head scan for patients returning 24-hour post-discharge (12). Dubrava University Hospital practices detailed documentation upon discharge, verbal and written instructions are given to the patient and family, along with immediate instruction to return to the ED in case of symptom worsening.

CT head imaging and Clinical Decision Rules

Although CT head imaging is the modality of choice for acute head injury, not all patients require it. The pitfall is that we are overexposing our patients to unnecessary radiation levels, inundating EDs and compelling patients to wait countless hours and straining resources when not adhering to the CCHR or NICE guidelines. In 2000, before he pioneered the CCHR, Stiell reported that out of the 7 teaching hospitals in Canada, only 6.2% of all minor head traumas in the ED had brain injury results on CT scans and only 0.5% had epidural hematoma (13). It has been reported that the largest source of ionizing radiation exposure is due to medical exposure, whereby 1 of 4 Americans are CT scanned each year (14). Sharp *et al.* also report that 1 of 3 CT scans performed for head injury is avoidable and by implementing the CCHR there was a reported reduction in head CT use across 13 community EDs in addition to reduction in radiation exposure and costs (15). Harris *et al.* proved that by the application of the NICE guidelines, due to inadequate adherence, there was a 23% decrease in the number of CT head requests, decrease in CT scan times and decrease in time to report subsequent scans (16). A study from 2018 showed the number of head CT scans to have increased over two decades with less findings (17). Approximately 7%-12% of patients with minor TBI (mTBI) have abnormal CT scans and neurosurgical intervention is required in less than 1% of them due to deterioration/complications related to intracranial hematomas (17).

Neurological assessment using the GCS Motor Score and Pupillary Reaction

The GCS is the most widely used scale in assessing neurological status in TBI patients. Scores are based on best eye opening, best verbal response and best motor reaction, and total scores range from 3 to 15 (18). The most prognostic information is obtained in the motor component of the CGS in severe TBI patients (18). A pitfall is in reporting GCS Motor Score as a total sum without pupillary reaction. In ED practice, the GCS should be reported as "E4-V5-M6" and not just 15 along with pupillary reactivity assessment to a light source, and if the pupil is dilated, it is an indication for CT scan and neurosurgical intervention (18) (Figure 2). On assessing mTBI, a set of specific questions are asked at the Dubrava University Hospital to see if the patient is able to fully reconstruct the events: "Can you tell me where you are right now, what is today's date?", "Can you tell me what happened, when and where?", "How did it happen?", "Are you nauseous?", "Have you vomited?", and "Are you on any blood thinners?". We get patient history (SAMPLE) and perform GCS Motor Score, pupillary reactivity, eye movements (bulbomotor) examination and note any nystagmus, coordination testing (finger-to-nose testing, heel-to-shin), noting any involuntary movements, graded strength and resistance testing of upper and lower limbs, and sensation testing of all extremities.

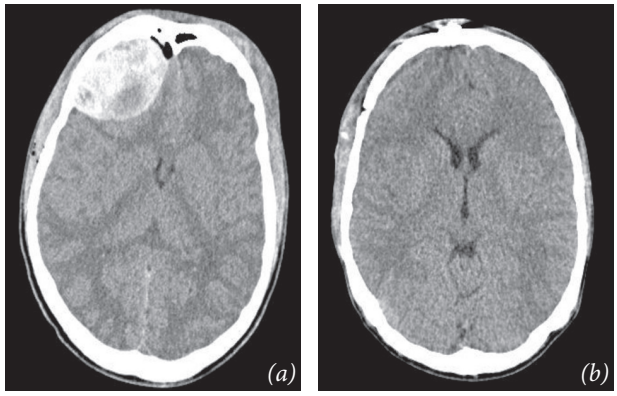

Fig. 2. *(a) Right frontotemporal epidural hematoma in a non-enhanced CT scan in a 32-year-old female after a fall during an epileptic seizure. GCS 8, anisocoria with absent pupillary reactivity; (b) the same patient, post-operative trepanation and hematoma evacuation.*

Alcohol

Alcohol intoxication is reported in 35%-50% of TBI patients in the ED, making the GCS assessment a challenge (11). Alcohol has both depressive effects and neuroprotective effects (11). There are a few pitfalls in this category as there are no concise rules, so the clinician's judgment is paramount. Absolute indications for CT head scan are if the patient has suffered TBI in the past, had prior intracranial hemorrhage, or if there is evidence for neurological deterioration (19). Ethanol intoxication is frequently associated with subarachnoid hemorrhage and subdural hematomas due to ground level falls (GLFs), particularly in chronic intoxication or with larger blood alcohol concentrations, which leads to impairment of the blood brain barrier, brain edema and platelet impairment resulting in post-traumatic coagulopathy (19,11) (Figures 3 and 4). These patients are also at a higher risk of cervical spine fractures due to osteopenia, even from GLFs, as most traumas that occur in GLF are in intoxicated patients (19). It has been reported that GCS improves significantly over time in intoxicated patients with TBI after 24 hours (11). In practice, at Dubrava University Hospital, we evaluate injury severity, observe intoxicated patients for at least 6 hours, frequently reassess the GCS, obtain regular blood pressure, pulse, SpO2 readings, monitor temperature, provide intravenous crystalloids, gauge pupillary reactivity and other neurological examinations, and order CT head scan within a 3-hour window. Where warranted, we consult our neurosurgeons to observe patients for 24 hours.

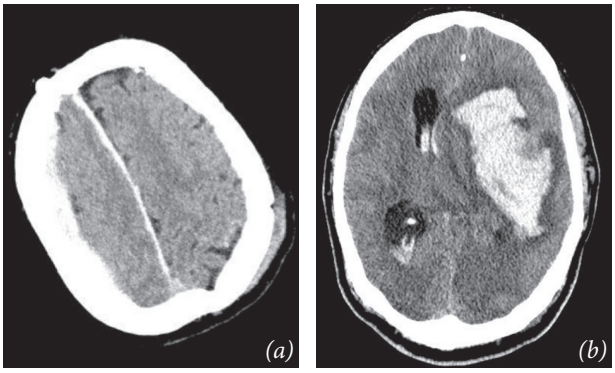

Fig. 3. *(a) Non-enhanced CT scan of a severe TBI showing a right sided subdural hematoma in a 51-year-old alcoholic after falling from a bicycle. GCS 3 and absent pupillary reactivity; (b) the same patient exhibiting massive subarachnoid hemorrhage.*

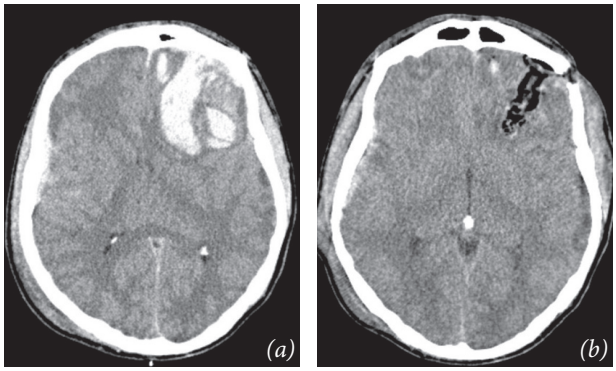

Fig. 4. *Non-enhanced CT scan in a 24-year-old male after physical assault and alcohol consumption; (a) GCS 3 with absent pupillary reactivity. Visible subarachnoid hemorrhage; (b) follow-up CT (24-hour): left-sided postoperative trepanation and hematoma evacuation.*

Older Adults

According to the CDC, in the United States, 81% of TBI related ED visits where in older adults (≥65 years of age) caused by falls and the rates of TBI and hospitalizations were higher for persons aged ≥75, more in women (7,19,20). However, many respond well to therapy and rehabilitation after TBI (19). Older adults are classified as ≥75 years of age by some authors, and ≥55 years of age by others (12,19,20). Patients aged ≥55 have the highest sports related rate of TBIs due to skiing related injuries (19). Older adults have more comorbidities and predisposing factors to falling, such as a history of TBI, medication side effects, visual, cognitive or gait impairment and dementia (19). Thus, they are 3 times more likely to undergo CT head scan in the ED and 4 times more likely to be admitted (19). They are at an increased risk of midline shifts and subdural hematomas due to brain atrophy, and up to 45% have subdural hematoma reported on CT imaging (19). Anticoagulation, antiplatelet, and DOAC/NOAC therapy are greater in patients aged ≥55 (21). The pitfall is that not all seniors require CT head image. If the patient has sustained 'minimal' head injury without neurological symptoms, no amnesia or LOC, there is no need for CT. An Emergency Medical Services (EMS) study in California has reported that many older adults (55 and older) who did not meet their criteria guidelines to be transported to a trauma center and who were on anticoagulant therapy had a higher incidence of TBI related hospitalization and worse related TBI outcomes compared to younger adults (21). Cervical neck fractures are also necessary to consider due to degenerative changes in this age population (20).

Our recommendation for mTBI in the older adult is to utilize CDRs. Intoxicated patient requires frequent recording of vital signs, monitoring, CT head scan performed within a 3-hour window (post-incident) and keeping the patient in observation for at least 6-24 hours.

Anticoagulants and TBI

There is an increase in the number of patients that are on some form of anticoagulant or antiplatelet therapy due to comorbidities such as cardiovascular problems and thromboembolic events. Nishijima *et al.* found traumatic intracranial hemorrhage (ICH) to have become an epidemic in patients on anticoagulant therapies aged ≥55 (21). This is yet another pitfall as anticoagulated patients still present a dilemma to clinicians, which leads to more diagnostic and therapeutic procedures, resulting in increased healthcare costs and compromising patient safety (22). Clopidogrel and aspirin are antiplatelet agents, whereas vitamin K inhibitors (warfarin) and NOACs or DOACs (direct oral anticoagulants) are used as anticoagulants (22). Patients on warfarin who sustain TBI have poorer outcome, especially in the event of ICH but at greatest risk are patients on clopidogrel or aspirin therapy (22,23). DOACs/NOACs appeared to have a lower risk, although some studies report that the use of DOAC/NOAC was associated with the incidences of delayed ICH, especially in geriatric patients in the event of GLF, whereas others report no risk of ICH or ICH progression (22-25). Minor head trauma in anticoagulated patients leads to less than 9% of ICH, but to avoid any pitfalls, by following CCHR and NICE guidelines, all patients that are on anticoagulant or antiplatelet therapy and present with mTBI, regardless of the history or neurological examination, moderate or severe TBI, or any alteration in mental status, should undergo head CT scan and in the event of any ICH, neurosurgical intervention is required (22,26). All patients with TBI on anticoagulant therapy should be held for 24-hour observation even with normal findings on head CT scan with follow-up CT in cases of neurological deterioration (22). Patients on aspirin monotherapy with normal CT, GCS 15, with no further complaints or without any other risk factors, can be discharged but with family/friend monitoring (22).

The Dubrava Model

The Dubrava Model was designed to treat neurotraumatized patients in rural hospitals lacking a resident neurosurgeon (27). For the past 5 years, neurosurgeons from Dubrava University Hospital have performed over 300 urgent neurosurgical interventions in 4 rural general hospitals in Croatia (Sisak, Koprivnica, Bjelovar and Čakovec) (27). Through prompt assistance of telemedicine and 24-hour on-call neurosurgeon at Dubrava University Hospital, pertinent patient information, laboratories and CT scans are sent to our neurosurgeon in emergency situations (27). If urgent neurosurgical intervention is warranted, two additional on-call mobile neurosurgeons are on standby and can be mobilized to any of these hospitals (27). This has proven effective in reducing patient transport times, transportation costs and transport complications. It has also reduced patient waiting times from ED presentation to arrival to the operating theater (OT) (27). It has enabled Dubrava University Hospital and the rural hospitals involved in the Dubrava Model adhere to the 'golden hour', where the first 60 minutes following TBI is a critical period, and the patient can be transported into the OT within this time frame, thus reducing patient mortality (27). Additionally, it has reduced the extra burden on our Hospital (OT and ICU), thus providing appropriate availability for our patients (27). Patients are able to recover in their respective hospital ICU with 24-hour follow-up availability *via* telemedicine with our neurosurgical department.

CONCLUSION

In adhering to the CCHR and NICE Guideline, ED clinicians are empowered with rapid decision-making tools to reduce unwarranted patient radiation exposure, waiting times, health care costs and mortality in evaluating mTBIs. CDRs are designed to prevent numerous pitfalls and we recommend the need for on-going education and stricter CDR implementation. CT imaging remains the modality of choice for moderate to severe TBIs, and in detecting secondary injuries. Close collaboration with Dubrava University Hospital ED clinicians, neurosurgeons and other surgical specialists allows for rapid transportation to the OT, within 20 minutes, when surgical intervention is required, thus reducing mortality. The Dubrava Model, one of the neurotrauma models in Croatia, implemented in fast treatment of TBIs in rural hospitals devoid of a resident neurosurgeon, further enhances optimal patient care with additional reduction in mortality.

REFERENCES

1. Walls RM, Hockberger RS, Gausche-Hill M, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. Ninth edition. Philadelphia, PA: Elsevier; 2018, p. 2.
2. Tintinalli JE, Stapczynski JS, Ma OJ, Cline D, Meckler GD, Yealy DM, eds. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. Eighth edition. New York: McGraw-Hill Education; 2016, p. 2128.
3. Picetti E, Rossi S, Abu-Zidan FM *et al.* WSES Consensus Conference guidelines: monitoring and management of severe adult traumatic brain injury patients with polytrauma in the first 24 hours. World J Emerg Surg. 2019; 14: 53.
4. Lolli V, Pezzullo M, Delpierre I, Sadeghi N. MDCT imaging of traumatic brain injury. Br J Radiol. 2016; 89(1061): 20150849.
5. Dash HH, Chavali S. Management of traumatic brain injury patients. Korean J Anesthesiol. 2018; 71: 12-21.

6. Dewan MC, Rattani A, Gupta S *et al*. Estimating the global incidence of traumatic brain injury. J Neurosurg. 2018; 1: 1-18.
7. TBI: Get the Facts | Concussion | Traumatic Brain Injury | CDC Injury Center [Internet]. [cited 2020 Feb 6]. Available from: https://www.cdc.gov/traumaticbraininjury/get_the_facts.html
8. James SL, Theadom A, Ellenbogen RG *et al*. Global, regional, and national burden of traumatic brain injury and spinal cord injury, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2019; 18: 56-87.
9. Rau CS, Wu SC, Kuo PJ *et al*. Polytrauma defined by the new Berlin definition: a validation test based on propensity-score matching approach. Int J Environ Res Public Health. 2017; 11: 14.
10. Sultan HY, Boyle A, Pereira M, Antoun N, Maimaris C. Application of the Canadian CT Head Rules in managing minor head injuries in a UK emergency department: implications for the implementation of the NICE guidelines. Emerg Med J. 2004; 21: 420-5.
11. Shahin H, Gopinath SP, Robertson CS. Influence of alcohol on early Glasgow Coma Scale in head-injured patients. J Trauma. 2010; 69: 1176-81.
12. Overview head injury: assessment and early management guidance NICE [Internet]. [cited 2020 Feb 6]. Available from: https://www.nice.org.uk/guidance/cg176
13. Stiell IG. Clinical decision rules in the emergency department. CMAJ. 2020; 163: 1465-6.
14. Gao Y, Quinn B, Mahmood U *et al*. A comparison of pediatric and adult CT organ dose estimation methods. BMC Med Imaging. 2017; 17: 28.
15. Sharp AL, Huang BZ, Tang T *et al*. Implementation of the Canadian CT Head Rule and its association with use of computed tomography among patients with head injury. Ann Emerg Med. 2018; 71: 54-63.
16. Harris L, Axinte L, Campbell P, Amin N. Computer tomography (CT) for head injury: adherence to the National Institute for Health and Care Excellence (NICE) criteria. Brain Inj. 2019; 33: 1539-44.
17. Pons E, Foks KA, Dippel DWJ, Hunink MGM. Impact of guidelines for the management of minor head injury on the utilization and diagnostic yield of CT over two decades, using natural language processing in a large dataset. Eur Radiol. 2019; 29: 2632-40.
18. Majdan M, Steyerberg EW, Nieboer D *et al*. Glasgow Coma Scale motor score and pupillary reaction to predict six-month mortality in patients with traumatic brain injury: comparison of field and admission assessment. J Neurotrauma. 2015; 32: 101-8.
19. Gardner RC, Dams O'Connor K, Morrissey MR, Manley GT. Geriatric traumatic brain injury: epidemiology, outcomes, knowledge gaps, and future directions. J Neurotrauma. 2018; 35: 889-906.
20. Wang H, Coppola M, Robinson RD *et al*. Geriatric trauma patients with cervical spine fractures due to ground level fall: five years experience in a level one trauma center. J Clin Med Res. 2013; 5: 75-83.
21. Nishijima DK, Gaona S, Waechter T *et al*. Prehospital triage of older adults with head injury: a retrospective study of the impact of adding "anticoagulation or antiplatelet medication use" as a criterion. Ann Emerg Med. 2017; 70: 127-38.
22. Wiegele M, Schöchl H, Haushofer A *et al*. Diagnostic and therapeutic approach in adult patients with traumatic brain injury receiving oral anticoagulant therapy: an Austrian interdisciplinary consensus statement. Crit Care. 2019; 22: 23-62.
23. Kobayashi L, Barmparas G, Bosarge P *et al*. Novel oral anticoagulants and trauma: the results of a prospective American Association for the Surgery of Trauma Multi-Institutional Trial. J Trauma Acute Care Surg. 2017; 82: 827-35.
24. Valiudin H, Calice M, Alam A *et al*. 291 Incidence of delayed intracranial hemorrhage among patients using direct oral anticoagulants. Ann Emerg Med. 2018; 72: S115.
25. Gottlieb M, Thottathil SM, Holton JP. What is the incidence of intracranial hemorrhage among anticoagulated patients with minor head trauma? Ann Emerg Med. 2019; 74: 98-100.
26. Orešković D, Raguz M, Almahariq F *et al*. The Dubrava Model – a novel approach in treating acutely neurotraumatized patients in rural areas: a proposal for management. J Neurosci Rural Pract. 2019; 710: 446-51.
27. Newgard CD, Meier EN, Bulger EM *et al*. Revisiting the 'Golden Hour': an evaluation of out-of-hospital time in shock and traumatic brain injury. Ann Emerg Med. 2015; 66: 30-41.
28. Stiell IG *et al.* The Canadian Head CT Rule for Minor Head Injury. Lancet 2001; 367: 1391-6.

SAŽETAK

SMJERNICE ZA OBRADU TRAUMATSKIH OZLJEDA GLAVE U ODRASLOJ POPULACIJI U HITNOJ SLUŽBI U KLINIČKOJ BOLNICI DUBRAVA

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Trauma glave, sežući od prijeloma lubanje i manje traumatske ozljede mozga do teške traumatske ozljede mozga u politraumama, česta je prezentacija u hitnoj službi. Kod umjerenih/srednje teških traumatskih ozljeda mozga pristup bolesniku i dijagnostička obrada mogu se poboljšati primjenom kliničkih smjernica kao što su *Canadian CT Head Rule* (CCHR) i smjernice *National Institute for Care and Excellence* (NICE). Optimalno pridržavanje navedenih smjernica uvelike koristi bolesnicima, smanjuje vrijeme čekanja, prenapučenost hitne službe, smrtnost i pogreške liječnika u hitnoj službi. Cilj ovoga rada je pružiti čitatelju kratak pregled smjernica CCHR i NICE koje se primjenjuju u Kliničkoj bolnici Dubrava, s osvrtom na suradnju naše hitne službe i neurokirurškog tima te liječnika drugih kirurških grana u obradi politraumatiziranih bolesnika i bolesnika s traumatskim ozljedama mozga. Uz to, prikazujemo Model "Dubrava", jedinstveni model pristupu neurotraumi koji se primjenjuje u brzom liječenju traumatskih ozljeda mozga u ruralnim bolnicama lišenim službujućeg neurokirurga.

KLJUČNE RIJEČI: traumatska ozljeda mozga, Kanadski protokol za CT glave kod ozljede mozga, smjernice NICE, trauma glave, antikoagulantna terapija, Model "Dubrava"