Referral for CT brain in adult patients with head injury: are Emergency Centre doctors adhering to the Western Cape Head Injury guidelines?

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Declaration of conflict of interest

None

Ethics approval

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ABSTRACT

BACKGROUND: Head injuries constitute a large number of trauma cases due to high rates of interpersonal, motor vehicle accidents, falls and use of recreational substances\(^{(3,4,6)}\). The Western Cape head injury guidelines were developed to guide EC doctors with the management of acute head trauma.

OBJECTIVE: To investigate whether emergency centre doctors in the Western Cape are guideline-compliant when referring adult patients with head injury for CT head scans. Secondarily, we reviewed the difference in CT head referral rates during working hours and after-hours.

METHODOLOGY: A retrospective chart review was performed over six months (January to July 2011) at the five local public hospitals with CT scan facilities (Groote Schuur, Tygerberg, GF Jooste, New Somerset, Paarl). Trauma and emergency centre admission records, radiology and electronic records were used to locate suitable subjects.

RESULTS: 882 charts were reviewed, 77% males and 23% females. The average age was 24 years for both genders. Results showed that NSH, GFJ & Paarl were more likely to adhere to WCHI guidelines than central hospitals during working hours (81% and 59% respectively). Guideline compliance after-hours at TBH and GSH was 73%, almost similar to rates at NSH,GFJ & Paarl. The after-/working hours ratio of CT head scan at GSH and TBH was 1.05 and 1.18 respectively.

CONCLUSION: Doctors working at GFJ, NSH and Paarl hospitals are adhering to the WCHI guidelines more stringently than those working at GSH and TBH. Compliance rates are higher at central hospitals after-hours, during which time a lot more scans are performed.
INTRODUCTION

Traumatic brain injury (TBI) is an important public health problem in South Africa, with high incidence of motor vehicle collisions (MVCs), falls and assault rates. The cost to society of TBI is staggering, from both a socio-economic and a psychological standpoint. Prompt diagnosis and intervention in patients with head injuries improves morbidity and mortality. It is therefore imperative for emergency centre (EC) doctors to be competent in the initial management of these patients. Trauma is the second leading cause of death among young South Africans, after HIV/AIDS. It accounts for 145 deaths per 100,000 in Cape Town. According to the Western Cape burden of disease reduction project, violence is the major contributor to injury in the Western Cape. Domestic violence and community-related violence account for 12.9% of deaths related to trauma, followed by motor vehicle collisions (MVC), which account for 6.9%.

Studies have already demonstrated that clinicians cannot solely rely on experience, current patient condition and or history to determine whether a patient has sustained a traumatic brain injury requiring CT scan and neurosurgical intervention. Therefore guidelines, together with clinical acumen, are important in deciding which patients need a CT brain scan. The Western Cape Head injury guidelines were adopted from the NICE 2007 guidelines in order to assist emergency centre doctors with acute management of head injury patients. Research post-modification of the NICE guidelines in 2007 identified an increase in the number of requested CT scans, as well as a dramatic incline in the cost of head injury management in the US, Canada and most of Europe. This may be due to the NICE 2007 guidelines which suggests that CT head scan should be performed instead of skull x-rays and or observation/admission as the first investigation, when indicated. This led to a two- to five-fold increase in the rates of CT head scans in most hospitals in the UK and US.

The many causes of injury, differing trauma care systems and facilities available in hospitals must be considered before applying these guidelines in a developing world setting. It is therefore mentioned in the Western Cape head injury guidelines that this guideline may prompt request for more CT head scans, putting further strain on the radiology departments. It Studies have already demonstrated that clinicians cannot solely rely on experience, current patient condition and or history to determine whether a patient has sustained a traumatic brain injury requiring CT scan and neurosurgical intervention. Therefore guidelines, together with clinical acumen, are important in deciding which patients need a CT brain scan.

AIMS AND OBJECTIVES

i. To determine if EC doctors are using the local guidelines when referring patients for CT head scans following head injury.

ii. Secondarily compare the amount of CT head scans requested during working hours (8am-4pm) and after-hours (After 4pm, weekends, holidays).

METHODOLOGY

Five emergency centers were evaluated, viz. Groote Schuur, Tygerberg, GF Jooste, New Somerset and Paarl hospitals. The first two hospitals are central/academic hospitals with 24-hour CT facilities and well-organized trauma and neurosurgical facilities. New Somerset and Paarl hospitals are regional hospitals and GF Jooste is a district hospital. The last 3 hospitals only have CT scan facilities during working hours, i.e. 8 am to 4 pm. Patients from district...
and regional hospitals are regularly referred to either GSH or TBH after-hours if there is an indication for an urgent CT head scan or neurosurgery referral after hours. A retrospective chart review was performed at the afore-mentioned hospitals. A data capture sheet was used to capture essential information such as demographics, hospital presenting to, indication for CT brain scan (as per WCHI guidelines), time scan was requested, results and disposition). Records of head injury patients who presented to these centers between January and June 2011 were evaluated to identify reasons for CT head referral, and secondarily compare CT scans during working hours and after hours. Data was later captured using Microsoft excel and basic statistical analysis was carried out.

RESULTS

A total of 882 charts were analyzed, the majority being from the two tertiary hospitals. Notably, there is a big percentage of males presenting with TBI to all the hospitals. The study population comprised of 680 males (77%) and 202 females (23%). The average age was 24 years for both men and women, with an age distribution of 17-85 years. GFJ and NSH had the smallest number of subjects compared to Paarl hospital. A considerably higher amount of CT head scans were performed after hours at both GSH and TBH, i.e. at a ratio of afterhours to working hours was 1.05 and 1.2 respectively.

Graph 1. Study population at different hospitals
Graph 2 & 3. After-hours: Working-hours ratio of CT head scans requested at GSH and TBH, respectively.

Graph 3. Comparison of guideline-compliant and non-guideline compliant CT head scans performed at GFJ, NSH & Paarl hospitals vs. GSH & TBH during working hours and afterhours. Also shown in the graph are the rates doctors used ‘other reasons’ when CT was unindicated (i.e. other than indications as per WCHI guidelines).
Graph 4. The following graph shows a relationship between guideline-compliant and non-compliant CT scans requested at different hospitals, as well as usage of other reasons when CT is not indicated. a/h = after hours. w/h = working hours

ANALYSIS

According to these results, during working hours, GSH and TBH are less likely to use the CT test criteria than GFJ, NSH and Paarl. After hours they use them at almost similar rates as GFJ, NSH and Paarl do during work hours. To test this, tertiary and secondary level hospitals were compared via t-tests for independent samples. As represented in Graph 3, GFJ/NSH/Paarl utilized the following CT test criteria significantly more often than did GSH & TBH (at the 5% CI level): GCS < 13, GCS 13-14 2 hours after injury, post traumatic seizures, average number of criteria used. There were no significant differences on any of the other criteria.

Graphs 2 and 3 shows that there were slightly more scans performed at tertiary centers after hours. When comparing the working hours versus after hours utilization of CT test criteria at GSH and TBH, via t-tests for independent samples, the following CT test criteria were utilized significantly more often after hours than during working hours (at the 5% CI level): GCS <13, GCS 13-14 two hrs. after injury, deteriorating LOC, post traumatic seizures, average number of criteria used and use of any of the criteria.

Males were also referred for CT scans significantly more often – relative to females – after hours than during working hours. There were no significant differences on any of the other criteria. As shown in Graph 4 the frequency with which GSH and TBH used any of the criteria to refer patients for CT scans after hours did not differ significantly from the frequency with which GFJ, NSH and Paarl rely on them during working hours (73% and 81% respectively). Guideline-compliant scans were as low as 59% during working hours at
GSH/TBH. Results also indicate that GSH and TBH are more likely to give other reasons e.g. headaches, accident, assault, etc. for CT scan referrals than GFJ, NSH and Paarl, both in the absence and presence of the use of CT test criteria (Graph 4). This observation was tested using t-tests for independent samples too. When no CT test criteria have been used GSH and TBH supplied other reasons significantly more often than did GFJ, NSH and Paarl (at the 0.0003% level), viz. 93% versus 57% respectively.

Notably, when any CT test criteria were used GSH and TBH supplied other reasons significantly more often than did GFJ, NSH and Paarl (at the 0.0008% level) i.e. 35.2% versus 6.8% respectively. When referring patients for CT because at all hospitals these ‘other reasons’ are used decidedly more frequently when CT test referral criteria are not used than when they are, so they are probably substituted to some degree. The general picture then is that CT test referral criteria are being used more reliably in secondary level hospitals; as well as after hours at tertiary hospitals than they are during normal working hours.

**DISCUSSION**

The results of this research confirm that some emergency doctors are adhering to the Western Cape head injury guidelines. As suggested in the hypothesis, secondary level doctors are more likely to follow guidelines than doctors working in tertiary trauma centers. The reason for this is multifactorial – secondary hospitals tend to have a smaller team of experienced doctors, interns and community service doctors with only one or two EC consultants, which makes it easier to implement and follow guidelines. Secondary level doctors have to be mindful when referring these patients to tertiary trauma centers, as the gatekeepers, i.e. receiving doctors have to agree with the indication for CT radiography prior to referral.

Tertiary trauma centers are staffed by a wide array of doctors from different departments with different levels of experience, e.g. general surgery, neurosurgery, emergency medicine, medical officers. There are usually also a lot more consultants and a constant flow of nursing staff. It is a bit more challenging to keep up to date with doctors’ adherence to protocols or accountability to patients. It seems that 24-hour availability of CT resources seems to play a role in unnecessary CT referral. As indicated in the results, it is more likely to happen after-hours, when there are no consultants available in both emergency centers and radiology departments. Referral for CT head scan following TBI at TBH and GSH is as easy as filling a request form or picking up a phone to call radiology suites.

GSH and TBH also manage more complex patients, e.g. polytrauma, severe head injury, gunshot, etc. These patients are likely to be referred for head CT for many other reasons other than the ones indicated by guidelines. It may be because certain consultants or departments require CT head before admission to respective units or use the investigation to ‘rule out’ head injury as differential diagnosis to an acutely ill and confused trauma patient. It is noted that a very small number of CT scans for head injury patients were done at secondary level hospitals. The explanation for this might be because patients needing CT head are most likely to be referred to a trauma center, as per Western Cape trauma referral guidelines. It is also because they might need review by neurosurgeons, a service that is unavailable at secondary level hospitals. The majority of patients at GSH and TBH are referred by community health centers and secondary hospitals. Only a small percentage presented to these trauma centers.
LIMITATIONS AND BIAS

Although all the charts were tracked using trauma and radiology records, there were a considerable number of patients that were missed. During data collection, some folders were not found, either because the patients presented again to hospital and needed their file, folders were kept separate for outpatients follow-up, patients demised or files lost. This was not a big problem at TBH as the radiology department computerizes all their notes, CT scan and the trauma CT request form. This might add to bias. To overcome this, the number of CT scan and patient records is considerably high, and hospitals were visited in multiple days to look for ‘missing records’.

As mentioned in the protocol, only patients presenting within 24 hours of sustaining head trauma were reviewed. A considerable number of delayed presentations or referrals from secondary might have been missed. According to the direct tertiary trauma center guidelines, any polytrauma patient presenting to a secondary level hospital or community health center must be taken directly to a tertiary hospital. The majority of patients presenting directly to trauma centers actually bypass their local hospitals, hence a large number of severe head injuries at tertiary hospitals. Instead of analyzing one hospital, the different centers were grouped into secondary and tertiary hospitals and reviewed as such to look at a more general view.

CONCLUSION

It is clear that secondary level doctors are adhering to CT head protocols. GSH and TBH doctors are more compliant after-hours during working hours. There is higher amount of scans requested and performed after-hours at GSH and TBH. There is a considerable amount of non-guideline-compliant CT head scans at tertiary level hospitals - the majority of which yield negative results. This may be an indication that consultant cover is needed in tertiary centers, especially after-hours, in order to keep a uniform and standard level of medical care. Further local research is needed on initial management, presentation and cost-effectiveness in the management of head injuries in South Africa. More rigorous measures need to be put in place when referring patients for CT head scans, especially in tertiary hospitals.

REFERENCES

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