

Racial disparities in health care—emergency department management of minor head injury

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Abstract

Background/aim International research has demonstrated disparities in the Emergency Department care of patients of certain racial or ethnic backgrounds. The management of minor head injuries requires a careful clinical assessment to determine the requirement of a CT scan of the head. The aim of this study was to determine if there was any disparity, based on race, in the management of minor head injury.

Methods This was a retrospective, structured, medical record review of patients presenting to The Townsville Hospital Emergency Department, between September 2004 and April 2007, with minor head injury. The main outcome measure was whether or not patients received a CT head scan when clinically indicated. The Canadian CT Head Rule was considered the standard for clinical indication for a CT head scan. Secondary outcome measures included triage category, waiting time, level of care provider, disposition and serum ethanol.

Results A total of 270 patients (73 indigenous and 196 non-indigenous) were enrolled. There was no statistically significant difference in ordering CT head scans when clinically indicated between indigenous and non-indigenous patients. However, a trend indicating that indigenous patients were less likely to receive a CT head scan when

clinically indicated (OR 0.35; 95% CI=0.07 to 1.77) was noted. Indigenous patients had a mean waiting time of 44.6 min (SD 49.6) compared to non-indigenous with 31.1 min (SD 36.4; $p=0.02$).

Conclusion This study concluded that there was no statistically significant disparity based upon race in the management of minor head injuries with regard to decision to perform a CT head scan. There is some evidence that indigenous patients waited longer to be seen. A multi-centre prospective study is necessary to confirm these findings.

Keywords Racial disparity · Head injury · Emergency department

Introduction

Patients of indigenous descent are a unique population with a unique risk factor profile. Although the Australian health system aims to provide universal access to all aspects of health care to all Australians, non-indigenous Australians now have a life expectancy of 78 to 83 years [1], whereas the life expectancy of Australia's indigenous population may be up to 18 years less [2, 3]. This gap in life expectancy is predominantly due to rising rates of non-communicable diseases such as diabetes, cardiovascular disease, cancers, digestive diseases and their subsequent complications [4].

International research has demonstrated many fields in which a disparity in the level of care of patients based on race has existed [5–15], including differences in Emergency Department management [16, 17], and has also examined areas such as the management of chest pain [18], the management of head injury [19] and the provision of analgesia [20, 21]. There has been very little research in this field in Australia.

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Racial disparity in medical management is an evolving field of research in many countries. Evidence from the US suggests that racial and ethnic disparities exist in the provision of health care [5–15]. In 2002, a report titled “Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care” outlined that minority groups such as African Americans, Hispanics and American Indians experienced higher rates of heart disease, diabetes, carcinomas and liver disease disproportionate to the size of the population [33]. Additionally, these patients were less likely to have health insurance and more likely to use the hospital Emergency Department as their primary medical provider. These patients were also more likely to experience direct and indirect discrimination in medical management. While the demonstrated health status of Australia’s indigenous population appears to be similar to that demonstrated above [3, 34–37], it is unknown if Aboriginals and Torres Strait Islanders are more likely to experience discrimination in medical management.

Even though there have been demonstrated disparities in the US, it must also be remembered that many of these disparities may be due to the level of insurance coverage of the patient as the United States’ health system is different from that of Australia [38]. New Zealand, however, has a similar health-care system to Australia, and Māori patients were found in one study by Davis et al. to receive a slightly poorer level of hospital care than non-Māori patients [39]. Additionally, Māori patients were found to be ten times more likely to have experienced racial discrimination in health management than those New Zealanders of European origin [40].

Racial disparity in emergency medicine is still a limited field of research in Australia. A study performed in the Northern Territory in 2000 investigated potential disparity in the management of acute myocardial infarction between indigenous and non-indigenous people [41]. While there was a significant difference in the provision of thrombolysis between the two groups, it was found that the only statistically significant reason for this disparity was the delay in presentation of the individual.

In 2001, a study at the Royal Darwin Hospital investigated potential disparity based upon race in the triage process at the Emergency Department [42]. After collection of data over a 3-month period, no difference was shown.

Trauma remains a significant source of morbidity and mortality overseas and in Australia. It accounts for approximately 16% of indigenous deaths, 20% of which are due to head injury [3]. Emergency departments in the US treat approximately 2 million patients with head injury annually [22]. In Australia, the incidence of mild traumatic brain injury is approximately 61–131/100,000 trauma presentations [23].

The aim of this study was to determine if a disparity exists between Australians of indigenous descent and other Australians in the assessment and management of minor head injury in the Emergency Department, and in the decision to perform CT head scans.

Methods

This was a retrospective, structured, medical record review of adult patients presenting with minor head injury to The Townsville Hospital, a tertiary public hospital in North Queensland, Australia. The emergency department attends to over 54,000 presentations per year [24]. It is the only Emergency Department in the Townsville-Thuringowa area caring for a population of 190,000, approximately 6.5% of whom identify themselves as indigenous [25].

The Townsville Hospital also serves a greater population of 615,000 people as a tertiary referral centre for Cardiothoracic Surgery and Neurosurgery. Additionally, the Townsville Hospital serves as a teaching hospital for the James Cook University Medical School. CT scans are available at the Townsville hospital 24 hours a day if clinically indicated. Approval to perform this study as a quality improvement audit was granted by the Townsville Health Service District Human Research Ethics Committee.

The ED database (EDIS version 9.34.1022PAI) was used to identify all patients with a minor head injury aged 18 to 65 presenting from 1 September 2004 to 30 April 2007 with the following diagnoses: concussion, minor head injury, post concussional syndrome, post traumatic amnesia, scalp contusion and loss of consciousness.

Minor head injury was defined as a witnessed loss of consciousness, definite amnesia or witnessed disorientation in a patient with GCS 14–15 following blunt head trauma [27]. Patients were excluded from the study if the mechanism of injury recorded was not consistent with blunt trauma, if other significant injuries co-existed and if their GCS on arrival was less than 14. Additionally, patients with significant radiological findings on CT scan, thus implicating an alternative diagnosis (e.g., subdural haematoma, cerebral contusion and skull fracture), were excluded.

Data were collected using a specifically designed, piloted data collection sheet. Sources included EDIS, medical notes and nursing notes.

Data extracted from EDIS included demographic data such as:

- age,
- gender,
- indigenous status,
 - Aboriginal and not Torres Strait Islander,
 - Torres Strait Islander and not Aboriginal,

- Aboriginal and Torres Strait Islander and
- neither Aboriginal nor Torres Strait Islander (this was subsequently recorded as indigenous yes/no).

This information is routinely collected by clerical staff. Other data extracted included:

- ED triage category,
- waiting time (time from presentation until seen by a medical practitioner),
- medical provider level (consultant, registrar or RMO) and
- patient disposition.

Variables extracted from the charts included:

- mechanism of injury consistent with blunt trauma (yes/no);
- GCS recorded by triage nurse on arrival.
- Clinical variables were as outlined in the Canadian CT Head Rule by Stiell et al. [27], specifically, high-risk features:
 - failure to achieve GCS 15 within 2 h of presentation to the emergency department,
 - suspected open skull fracture,
 - clinical signs of basal skull fracture,
 - CSF otorrhoea or rhinorrhoea,
 - mastoid ecchymosis or Battle's sign,
 - periorbital ecchymosis or raccoon eyes,
 - hemotympanum,
 - vertigo,
 - reduced hearing or deafness and
 - seventh nerve palsy [29].
- Vomiting on at least two occasions post head injury;
- age 65 or older.
- Moderate risk factors were:
 - amnesia before the time of impact greater than 30 min;
 - dangerous mechanism of injury.
 - Pedestrian struck by motor vehicle;
 - assault with a blunt object;
 - fall from a height of greater than 1 m/five stairs;
 - heavy object falling onto the head;
 - high-speed motor vehicle collision [27].

If an item was not specifically documented in the medical record, it was assumed to be absent. The final variable extracted was whether or not serum ethanol was tested.

The primary outcome measure was the evidence of any disparity, based on race, in the performance of CT head scans in cases of minor head injury when clinically indicated. For the purposes of this study, performance of a CT head scan was deemed clinically indicated if any high or moderate risk factors outlined in the Canadian CT Head Rule were present. Of note, the Canadian CT Head Rule

states that CT head scans should be considered in the presence of moderate risk factors.

Secondary outcomes included examination of potential disparity in waiting times in addition to determining what percentages of patient waiting times were within established recommended triage parameters according to the Australasian College of Emergency Medicine (ACEM) Policy [28], the decision to test for serum ethanol, level of the medical practitioner providing care and patient disposition.

Statistical analysis

Collected data were entered into an Excel spreadsheet (Microsoft corporation version 2002) and subsequently into a format suitable for statistical analysis, utilising the Public Domain Statistics program [30]. Mean ages and waiting times were not normally distributed and hence were compared using the Mann-Whitney test. Comparisons of performance of CT, in the presence or absence of being clinically indicated, were performed using two-by-two tables and Fisher's exact test. The 95% confidence intervals are presented, and statistical significance was defined as $p < 0.05$.

Finally, agreement and inter-rater reliability were assessed using a randomly selected sample of 10% of the included subjects. This was determined by calculating a kappa statistic for the overall outcome of whether or not a CT head scan was clinically indicated, thus demonstrating the strength of agreement and reproducibility of data.

Results

Review of EDIS identified a total of 647 patients with the specified ICD-10 diagnoses. Of these, 76 were indigenous and 571 were non-indigenous. From this group, all 76 indigenous patients were selected, and 200 non-indigenous patients were randomly selected by utilising Microsoft Excel spreadsheet programming to rearrange the identified patient UR numbers randomly for inclusion in this study.

A total of seven patients were excluded from the study either due to insufficient clinical information or failure to meet selection criteria. Further demographic data are demonstrated in Table 2. While there was a statistically significant difference in mean age, this was unlikely to be of clinical significance.

Primary outcome measures have been outlined in Table 1. Overall, there was no statistically significant disparity in the performance of CT head scans between indigenous and non-indigenous patients.

Secondary outcomes are outlined in Table 2. While a statistically significant difference in waiting time was demonstrated, that difference was only 13.5 min. Indigenous patients were found to be 2.6 times more likely to

Table 1 Comparison of performance of CT scan with respect to clinical indication

	Indigenous (percentage)	Non-indigenous (percentage)	p OR 95% CI
CT scan performed when clinically indicated	12 (80%)	46 (92%)	0.34 (Fisher's exact test) 0.35 0.07 to 1.77
CT scan not performed when clinically indicated	3 (20%)	4 (8%)	
CT scan performed when not clinically indicated	2 (3%)	12 (8%)	0.36 (Fisher's exact test) 0.4 0.09 to 1.84
CT scan not performed when not clinically indicated	56 (97%)	134 (92%)	

p=0.34 (Fisher's exact test), OR 0.35 (95% CI=0.07 to 1.77)

p=0.36 (Fisher's exact test), OR 0.4 (95% CI=0.09 to 1.84)

have serum ethanol levels tested, which was a statistically significant result.

There was no statistically significant disparity demonstrated between indigenous and non-indigenous patients regarding treatment either in allocated triage times or in the level of the medical practitioner attending the patient. There was no statistically significant difference in patient disposition.

Finally, inter-rater reliability calculations for the outcome of a CT head scan being clinically indicated resulted in κ of 0.8, thus demonstrating good data reproducibility [31, 32].

Discussion

Regarding head injuries, two studies have been performed investigating racial disparities in the Emergency Department

care of patients with traumatic brain injuries [19, 43]. Both studies compared Hispanics with non-Hispanics and African Americans with non-African Americans. Like our study, these both focussed on blunt head trauma. Wall et al. [19] investigated all traumatic brain injuries, whereas Bazarian et al. [43] studied only minor traumatic brain injury. Both studies, like ours, discovered no statistically significant disparity in the decision to perform a CT head scan when clinically indicated.

However, Bazarian found that Hispanic patients were more likely to have significantly longer waiting times to see a doctor and were more likely to leave the Emergency Department before being seen. Hispanic patients were also more likely to have serum ethanol levels performed than non-Hispanic patients, which correlates with our findings regarding indigenous patients.

Table 2 Summary of results. Demographic data: mean ages, waiting times, serum ethanol testing and disposition

	Indigenous	Non-indigenous	p value	OR 95% CI
Mean age (years) (SD)	32.7 (9.45)	29.4 (10.58)	0.005 *	
Sex M/F	38/35	111/85	0.58 #	
Mean waiting time (minutes) (SD)	44.6 (49.6)	31.1 (36.4)	0.02 *	
Seen within recommended triage time n(%)	54 (74%)	160 (82%)	0.18 #	0.63 0.34–1.21
Consultant n(%)	10 (13.5%)	21 (11%)		
Registrar n(%)	22 (30%)	80 (41%)	0.27 \$	
Resident n(%)	41 (56%)	95 (48%)		
Serum ethanol tested n(%)	16 (22%)	19 (9.7%)	0.013 #	2.6 1.26–5.42
Admitted n(%)	13 (17.8%)	36 (18.4%)	0.25 \$	
Left against medical advice n(%)	3 (4%)	2 (1.5%)		

*Mann-Whitney test, #Fisher's exact test, \$Chi-square comparative test

While the disparity in waiting time of 13.5 min discovered in our study was found to be statistically significant, it is unlikely that this time frame would be of clinical significance.

Although our study and the study by Bazarian et al. demonstrated that indigenous patients were more likely to have serum ethanol levels tested than non-indigenous patients, another US study demonstrated no such difference. In a study by Marcin et al., the frequency of alcohol and drug screening between Caucasian and African-American patients was the same [44]. Our finding that indigenous patients were 2.6 times more likely to have serum ethanol tested was interesting as evidence suggests that serum ethanol has no impact upon GCS in traumatic brain injury and therefore should not impact decision making [45].

The difference in the mean age of the two groups was rated as statistically significant, but unlikely to be of clinical significance. With the development of the CT Head Rule by Stiell et al. [28], it was determined that the need for the performance of CT head scans in cases of minor head injury was only affected by age in those 65 and older. Intuitively, one would suppose that any bias because of age would favour the ordering of CT head scans in older patients where our study found indigenous patients less likely to receive a CT head scan despite a higher mean age.

Our study did have a number of limitations. The major limitation of this study is in its design, namely, a retrospective medical record review, with all the well-known weaknesses of this methodology. The most significant weakness is that the absence of documentation of clinical findings in the chart does not necessarily mean that they were looked for, or indeed, absent. Also, the limited size and specifically the small number of CT head scans performed mean our study was only powered to find very large differences between the two groups for this outcome. The selected time period was chosen as this was the commencement time for EDIS at this centre, enabling more accurate data collection than the previous system. Additionally, this particular centre was not working to a set Minor Head Injury protocol during the time period studied. Clinical decision making was performed by individual medical practitioners. For the purpose of uniformity, the Canadian CT Head Rule was applied externally to charted clinical findings.

It should be noted that this study did not test or allow for all potential confounders; for example, daily patient loads, timing of presentations, access block or staffing levels at times of presentation may have contributed to the increased waiting times for patients. Finally, with regard to external validity, ours was a single-centre study and therefore not necessarily representative of the state or national population. Therefore, our results are not necessarily transferable to different populations and different settings.

Conclusions

This study demonstrated no statistically significant disparity in the decision to perform CT head scans for indigenous patients with minor head injuries. Statistically significant secondary outcome findings included longer mean waiting times and an increased likelihood to have serum ethanol testing. This single-centre, retrospective study requires confirmation with a multi-centre, prospective study.

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Conflicts of interest None.

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