ORIGINAL ARTICLE

The impacts and outcomes of implementing head injury guidelines: clinical experience in Thailand

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Objective: To describe the impact of implementing clinical practice guidelines (CPG) for head injury in a trauma referral system in Songkla province, Thailand.

Methods: The CPG was developed by a local multidisciplinary team and implemented using multi-faceted methods. The outcome of patients with head injury from three community hospitals and a university hospital (Songklanagarind Hospital) was reported in terms of "talk and deteriorate" patients and a "poor" outcome for patients with severe head injury. Changes to clinical practice were observed where the guidelines were implemented.

Results: 1000 patients with head injury were enrolled from 1st August 2005 to 15th January 2006. The incidence of "talk and deteriorate" patients was 10.5% and a poor outcome was noted in 35.5% of patients with severe head injury, similar to the results of a previous study in Songklanagarind Hospital ($p > 0.05$). Following implementation of the guidelines, 19.8% of patients underwent CT scanning with similar outcomes for alert patients with and without basal skull fracture ($p > 0.05$). The clinician–nurse relationship also improved and there was closer collaboration between hospitals. Short observation in community hospitals for repeat neurological examination may be an appropriate strategy for management of some patients with minor head injury.

Conclusions: Local ownership, an appropriate implementation strategy and working as a multidisciplinary team are key factors for success in implementing the CPG. Basal skull fracture may not be an absolute criterion for CT imaging of the head. Further initiatives will be developed in response to the incidence of "talk and deteriorate" patients.

Head injuries are a common worldwide problem. Statistics show that Thailand was ranked sixth in the world for road fatalities with more than 10 000 deaths per year occurring as a result of head injuries.^{1,2} In addition, hundreds of thousands of patients with minor head injuries are treated in emergency rooms by clinicians and released after evaluation. As public awareness of the quality of care under the Thai universal health care coverage system has grown, clinicians' anxiety over missing rare but potentially serious intracranial complications has also increased. Guidelines developed mostly in North America and Europe have recommended various sets of clinical findings to help identify which patients with head injury should undergo a CT scan and which can be safely discharged from the emergency room.^{3–6}

The different causes of injury, trauma care systems and facilities available in hospitals must be considered before translating recommendations from developed to developing countries. Furthermore, management of head injuries in Songkla province, the business centre of southern Thailand, has become more difficult recently due a reduction in the number of neurosurgeons compared with the increase in the number of injured patients. Local initiatives have been set up to reorganise the referral system and establish general management guidelines for appropriate care at community, general, regional and university hospital level. Community hospitals provide primary health care but their emergency rooms are sometimes crowded with patients injured in road traffic accidents. General guidelines for trauma care may not be relevant or help actual day-to-day practice. More disease-specific guidelines are required to assist clinical decision making, especially in caring for patients with head injury.

We present our experiences with the development and implementation of clinical practice guidelines (CPG) for head

injury in the trauma referral system of Songkla province, Thailand. The implementation process is also evaluated as regards the effect on practice in community hospitals and the clinical outcome of patients with head injury.

METHODS

Project development

Government health care is provided for 1.3 million people in Songkla province. There are 15 community hospitals, one general hospital, one regional hospital and one university hospital (Songklanagarind Hospital). Songklanagarind Hospital is also a tertiary health care centre for southern Thailand. Due to lack of neurosurgeons in the general and regional hospitals, Songklanagarind Hospital now receives more head injury patients than previously from community hospitals 1 year after reorganisation of the referral system.

Differences in management practice cause problems in the referral system. The authors therefore proposed guidelines for managing patients with head injury both within hospital and throughout the referral system. The guidelines were developed by a multi-disciplinary committee of neurosurgeons from Songklanagarind Hospital, clinicians or general practitioners from community hospitals, and emergency room nurses. To accelerate the development process, the content and format of the document was adapted from various existing guidelines including the Songklanagarind head injury guidelines.^{3–11} The proposed new guidelines were subsequently launched at Songklanagarind Hospital and three selected community hospitals in Ranod, Sathingphra and Rattaphum in July 2005. After discussion with each hospital team, the guidelines were

Abbreviations: CPG, clinical practice guidelines; GCS, Glasgow Coma Scale; LOC, loss of consciousness.

adjusted by consensus to suit local resources and were implemented in the above mentioned hospitals in August 2005. Neurosurgeons in general and regional hospitals receiving patients referred from community hospitals have accepted these guidelines. The ethics committee of the Faculty of Medicine, Prince of Songkla University approved the project.

There is evidence that written instructions are superior to verbal explanation at the time of patient discharge.¹² The present guidelines strongly recommend that all patients receive written instructions on head injury at discharge from either emergency room or ward staff. The head injury instruction for Songklanagarind Hospital was introduced as a template for community hospitals to develop their own guidelines. The instruction contains information on the signs and symptoms of acute intracranial complications and on the causes and natural course of post-concussion symptoms.

Upon discharge from the emergency room or ward, patients are encouraged to return within 1 week for a follow-up visit. Patients with persistent symptoms are advised to return to the emergency room whenever they feel uncomfortable.

Guideline implementation

Our aim was to study the impact and clinical outcomes following guideline implementation. Impact was only studied at those community hospitals which did not have head injury guidelines already in place. Information on changing practices in hospitals and on the patient's perspective was obtained through observation as well as research group and hospital team meetings. The clinical outcomes were the Glasgow Outcome Scale and the incidence of "talk and deteriorate" patients (defined as those who speak lucidly but then deteriorate to a severe head-injured condition within 48 h after injury) at 7 days and 1 month after injury.¹³ A good outcome was considered to be a good recovery or moderate disability.

Data on patients with acute head injury were prospectively collected from 1st August 2005 until the target of 1000 patients was reached. Nurses recruited as research assistants communicated with the team in each hospital or through direct contact with the principal investigator regarding any problems with either the guidelines or data collection. Participation by the clinicians in the emergency room was voluntary and not linked to any sanction. Clinicians had full autonomy in clinical decision-making in each individual case. There was verbal communication between the clinicians and investigators or at case conferences concerning risk, for example, in "talk and deteriorate" cases. Upon discharge from the emergency room a patient was scheduled, as appropriate, for a follow-up visit between 6 and 8 days later. Follow-up investigations, by telephone or home visit, were carried out if the patient was lost to follow-up. A 1-month follow-up visit was scheduled for patients admitted to the hospital or referred to other hospitals.

Statistical methods

Data were presented using description statistics including number and percentage. The χ^2 test was used to investigate the significance of differences in clinical outcome compared with previously published data of case series studies in Songklanagarind Hospital.

RESULTS

The guidelines

Patients with head injury were categorised for management according to age, GCS score, history and physical examination as shown in fig 1. The definition of head injury is that of Jennett and Teasdale.¹⁴ Skull radiography is recommended only for suspected fractures in a child less than 2 years of age. Head injury instructions were given to all patients with head injury or

their relatives except for those patients referred to other hospitals.

Impact of guideline implementation

Use of the guidelines had an enormous impact on hospitals and the referral system, particularly as regards communication between clinicians and nurses. The flow of patients along the established referral line was also improved. Clinicians in community hospitals felt more confident in treating patients with head injury, and patients and relatives appreciated the instruction sheet and the extra advice from nurses if they had any questions before leaving the hospital. A summary of the impact of implementing the guidelines is shown in table 1.

Clinical outcome

Between 1st August 2005 and 15 January 2006, 1000 patients with head injury were enrolled in the study. General data are shown in table 2 and fig 2. Road traffic accidents accounted for 59.9% of cases and most were motorcycle accidents (crash helmets are rarely used by motorcyclists, especially in rural areas). Injury was related to alcohol in 43.1% of road traffic accidents. Only 3.8% of patients were taken to hospital by ambulance, which reflects on the pre-hospital care in Thailand (table 2). No patient with pre-injury coagulopathy was found. There were four "talk and deteriorate" patients; details are shown in table 3. Unfortunately, no autopsies were carried out on these four patients because of cultural barriers, but the authors are confident that two of the four had no major intracranial injuries because they were fully conscious in the early phase of hypotension. Massive intraperitoneum bleeding was the cause of death in both these patients. Poor outcome was observed in 35.5% of patients with severe head injury (initial GCS score 3–8). The "talk and deteriorate" and poor outcome rates were similar to those found in a previous study in Songklanagarind Hospital ($p>0.05$).^{15 16} The rate of CT scan was 19.8% among the 560 patients treated at Songklanagarind Hospital; only half of the patients with basal skull fracture who had a GCS score of 15 were sent for a CT scan (table 4). Although the incidence of intracranial abnormality was high, the surgical lesions and clinical outcome were not significantly different from those of the group without fractures ($p>0.05$).

DISCUSSION

Guidelines have been introduced into clinical practice to reduce the variation in clinical management that may result in suboptimal outcomes. Ingebrigtsen *et al* have pointed out that the value of guidelines lies in their widespread use, not only in neurotrauma centres but also in smaller general hospitals.⁴ In Thailand, guideline use should not be limited to clinicians, especially in community hospitals where clinicians are not always available out of hours in the emergency rooms (some patients, mostly with minor head injury, are managed by nurses).

Concerning the differences in resources available in hospitals, the present guidelines were designed locally by a multi-disciplinary committee of representatives from Songklanagarind Hospital and the community hospitals where the guidelines will be implemented. The key concept was to provide opportunities for clinicians and health care personnel to challenge the evidence and contribute clinical experience to guideline development. For instance, basal skull fracture in fully conscious adult patients was moved from a high risk to medium risk category in the proposed guidelines. This means that clinicians in community hospitals responsible for taking care of these patients in their wards continue to do so after this study.

Initial care	ABCs (Airway, Breathing, Circulation)								Resuscitation (shock?)			
Age	<15 years				15–60 years				>60 years			
GCS	15	15	3–14	15	15	15	14–13	14–13	12–3	15	15	14–3
History + physical examination	<div> <div>Low risk*</div> <div>Age <2 years Vomiting <3 times Seizure Concern of parent</div> </div> <div>Multiple injuries Seizure at >1 h after injury GCS drop >1 Coagulopathy Vomiting ≥3 times Focal neurological deficit Skull fracture Basal skull fracture</div>				<div>Low risk*</div> <div>Medium risk RTA <30 min LOC <30 min PTA <1 h Severe headache Intoxication Seizure Vomiting Uncertain history Hypertension Bradycardia Basal skull fracture High energy accident†</div> <div>High risk RTA >30 min LOC >30 min PTA >1 h Seizure at >1 h after injury Vomiting ≥3 times Multiple major organ injuries Coagulopathy Focal neurological deficit GCS drop >1 Skull fracture</div>				<div>No focal neurological deficit</div> <div>Clinical high risk Skull fracture of any type</div> <div>Low risk*</div> <div>Clinical sign in both risks Coagulopathy</div>			
Management in community hospitals	D/C	Observe >2 h ←Improve	Refer	D/C	Observe 2 h Stable → refer Improve → continue observation (>6 h)	Refer	Short observation 2 h not improve →	Refer	Refer	Observe >2 h	Refer	
Management in Songklanagarind hospital	D/C	Admit ←Improve Worse →	Consider CT scan	Emergent CT scan	D/C	Observe 2 h Not improve → Improve → continue observation (>6 h)	Consider CT scan	Short observation 2 h if not improve consider CT brain	Consider CT scan	Emergent CT scan	Observe >2 h	Emergent CT scan

Figure 1 Clinical practice guidelines for head injury in Songkla province. *Adult low risk: asymptomatic, mild or no headache, transient loss of consciousness, scalp injury (bruise or laceration). †Defined as initial speed >64 km/h, major vehicle damage, intrusion into passenger compartment >30 cm, extrication time from vehicle >20 min, falls >6 m, roll-over, vehicle–pedestrian accidents, or motor cycle crash >32 km/h or with separation of rider and bike.¹¹ GCS, Glasgow Coma Scale; LOC, loss of consciousness; PTA, post-traumatic amnesia; RTA, retrograde amnesia.

The next step was to make the guidelines more attractive and user friendly. A decision tree for management was inserted on one page as a quick reference if needed. The colour of the guideline sheets differed depending on the preference of team members in each hospital, and these sheets were presented to the emergency room, ward and clinician's office. Different methods were used for translating the guidelines into practice, for example, multidisciplinary team meetings, academic conferences, case conferences, telephone consultation and feed back. Near the end of the study, other community hospitals in Songkla province adopted elements of the guidelines into their

practice as shown by the fact that “reason transferred” was clearly marked on the referral form.

Before discharge, patients and relatives were asked to complete a questionnaire regarding the ability of the patient to care for themselves at home; 97.6% of respondents indicated they would be able to do so. Emergency room nurses should also repeat advice either when patients have lost concentration following acute injury or if asked further about the instructions given. This study did not measure patient satisfaction but nurses considered that the patients or relatives were appreciative before leaving hospital.

Table 1 Impact of guideline implementation on practice in community hospitals

	Before	After
Treatment of head injury patients	Varied depending on judgment of individual clinician (or nurse in minor head injury cases) No short observation No follow-up visit except for wound care	Used recommendation as guidance Short observation in ward or emergency room Scheduled follow-up visits Patients were first seen by senior emergency room nurse on follow-up visit. If there were questions regarding clinical signs, patient proceeded to see the clinician
Intra-hospital communication	Conventional doctor–nurse relationship	Worked as multidisciplinary team with improved communication
Medical records	Incomplete	New form developed which nurses can help clinician complete, eg, vital signs, history, wound, etc
Referral system	Confusion	Clinicians have clear direction about which patients require transfer to an upper level of care Referral line set up in Songkla province. Telephone consultation and feedback system with four hospitals in study
Academic activities	No formal activity	Academic activities scheduled for improved care of patients with head injury

Figure 2 Summary of management outcome in patients with head injuries between 1st August 2005 and 15th January 2006. *Patient was under the care of the Thai Social Security Fund and had no emergent medical condition. †GOS, Glasgow Outcome Scale (G, good recovery; M, moderate disability; S, severe disability; V, vegetative state; D, death).

*GOS=Glasgow outcome scale (G=Good recovery, M=Moderate disability, S=Severe disability, V=Vegetation state, D=Death) **Patient was under manage care of Thai Social Security Fund and had no emergent surgical condition

Table 2 General data of 1000 patients with head injury

	Number (%)
Age <15 years	190 (19.0)
Age 15–60 years	722 (72.2)
Age >60 years	88 (8.8)
Road traffic accident	599 (59.9)
Alcohol related	258 (43.1)
Motorcycle related	521 (52.1)
Helmet used in motorcycle related injury	69 (13.2)
Transfer to hospital by ambulance	38 (3.8)
No loss of consciousness	600 (60.0)
Vomiting $\geq$ 3 times	29 (2.9)
Fracture of base of skull	78 (7.8)
Severity by initial GCS score	
Minor head injury (GCS 15–13)	936 (93.6)
Moderate head injury (GCS 12–9)	30 (3.0)
Severe head injury (GCS 8–3)	34 (3.4)
Positive CT scan (from 560 patients)*	68 (61.3)
Ability to self care at home	97.6%

*Positive CT scan: skull fracture (linear, depressed, basal skull), cerebral contusion, subarachnoid haemorrhage, epidural haematoma, subdural haematoma, intracranial haemorrhage, brain swelling, pneumocephalus.^{4, 11}

The purpose of the CPG is to improve outcome for patients. The incidence and outcome of “talk and deteriorate” patients is a reliable marker of the quality of a regional trauma system.¹⁷ Patient’s who “talk and deteriorate” are defined as those who utter at least some comprehensible speech at some time after head injury and then deteriorate to a severe head-injured condition (GCS score of 8 or less) within 48 h after injury.¹⁸ In this study, there were four “talk and deteriorate” patients and all died. The incidence of 10.5% (four out of 38) in this study is similar to the 10.5% and 8.9% reported by the National Traumatic Coma Data Bank and Songklanagarind, respectively ($p>0.05$).^{15, 19} All four “talk and deteriorate” patients died (100% mortality) with a higher than 40% poor outcome rate of the report from Songklanagarind Hospital ($p<0.05$). A trauma care system to reduce the incidence of such deaths has been initiated through the close collaboration of all specialty clinicians and hospital directors.

Increased experience in guideline implementation will improve the outcome of patients with head injury. The rate of poor outcome in patients with severe head injury (initial GCS 3–8) in this study was 35.5%, similar to the rate of 38% in the 2003 study from Songklanagarind Hospital ($p>0.05$).¹⁹

Table 3 Details of “talk and deteriorate” patients

Patient no	Initial assessment	Initial GCS score	Cause of death	Note
1, 2	Community hospital	15	Massive haemoperitoneum, shocked before arrival at provincial hospital	No neurosurgical consultation
3	Community hospital	15	Posterior fossa haematoma Delay in CT scanning	No CT scan facility in general hospital
4	Songklanagarind Hospital	15	Acute subdural haematoma Coagulopathy found after coma	Healthy 30-year-old male, no history of bleeding disorder No LOC after falling, small contusion of head, thoraco-lumbar fracture dislocation caused paraplegia GCS score dropped 2 points at 3 h after admission and emergency CT was requested. Patient developed seizure and coma before CT imaging

LOC, loss of consciousness.

However, the sample size was small and the outcome referred to 1 month after injury rather than 6 months as in the previous study. This will be the basis for further study of the management of severe head injury and road traffic accident patients whose outcome is commonly determined at 1 month after injury.²⁰

CT scanning of the brain is key in the evaluation of traumatic brain injury but imaging practice varies widely around the world.^{3–11} Recent work in the United Kingdom has shown that the rate of CT scanning in minor head injury (GCS 13–15) increased from 14% to 20% after the Canadian CT head rules were applied.²¹ In Songklanagarind Hospital, CT scanning is available 24 h a day and was carried out in 19.8% of all severity cases, with abnormality detected in 61.3%. Four fully conscious patients with low risk criteria were scanned before emergency orthopaedic surgery and all scans were normal. This small subgroup of patients needs to be studied further regarding the appropriate use of CT imaging of the head.

Basal skull fracture is predictive of intracranial lesions and warrants immediate CT scan of the head.^{5, 6, 11} In Thailand, clinicians and neurosurgeons routinely admit fully alert patients with basal skull fracture to hospital without conducting CT imaging of the head. Therefore, the guideline development team determined that basal skull fracture was of medium risk in patients with a GCS score of 15. Of the 24 adult patients treated at Songklanagarind Hospital who had a GCS score of 15 and basal skull fracture, a CT scan was carried out in 50%. Outcomes and the presence of surgical intracranial lesions were similar to the non-fracture group (table 4; $p>0.05$). Alert patients with only basal skull fracture may not need CT imaging of the head. Miller *et al* suggested that it is not necessary to identify all intracranial abnormalities especially in those who do not need neurosurgical intervention.²² It would be better for the patients to treat all neurological problems regardless of the results of CT scanning.

Table 4 Results of CT scan and outcomes of patients with a GCS score of 15 and basal skull fracture compared with patients without fracture

	Total	CT scan	Positive CT scan*	Cranio-tomy**	Outcome**	
					Good	Poor
Fracture	24	12	7	1	23	1
No fracture	451	42	14	2	450	1

* $p<0.05$; ** $p>0.05$.

Data are derived from the 560 patients treated in Songklanagarind Hospital. A 90-year-old woman with a basal skull fracture had good consciousness until sudden cardiac arrest occurred 23 days later. The patient without fracture who died was a “talk and deteriorate” patient.

Loss of consciousness (LOC) has been used to differentiate significant head trauma from trivial injury.^{10, 23} LOC increases the risk of intracranial complications and absence of LOC is believed to be associated with a good outcome.^{11, 23} In clinical practice, an accurate history is often difficult to obtain, as shown in this study where both “talk and deteriorate” patients with intracranial haematoma presented without a history of LOC. However, health care teams in community hospitals found it useful for clinicians to pay more attention to history taking and patient care in patients with a history of LOC. Thus, this aspect will be incorporated into the guidelines so as to raise the awareness of the clinician in the emergency room.

Head injury is an acute condition that can cause physical and psychological trauma to both patients and relatives. The decision-making of the clinician should take account of patient values and preferences. The concern of parents of paediatric patients concerning the consequences of head injury was noted in the guidelines (fig 1). Observation in emergency rooms or the wards would be an appropriate strategy for this group of patients as there is a very low incidence of intracranial complications.^{7, 10} Skull radiography in community hospitals may be performed if necessary to relieve the worry of patients or relatives. If a fracture is noted, the patient should be referred to a specialist.

The CPG should remain dynamic and evolve following scientific advance and experience gained after implementation. For instance, seven paediatric patients who had a GCS score of 15 with high risk signs were first seen at community hospitals. Four patients including one with signs of basal skull fracture were admitted to community hospitals and three patients with basal skull fracture were referred to provincial hospitals. All had a good outcome. Because of this, the authors will change the recommendation in this group of patients from “refer” to “admit or refer as appropriate”.

This study concerned management outcome related to the decision making of clinicians assisted by guidelines. Conventional practice may result in incomplete data as happened in the early phase of this study. These data were excluded from the study. (The 138 patients lost to follow up had completely recovered and had received both written instruction and advice before discharge.)

No guidelines are perfect and the present guidelines for the management of patients with head injury are the first step in changing practice based on an individual’s clinical judgment to more evidence-based medicine. Local ownership, an appropriate implementation strategy and working as multidisciplinary teams are the key factors to overcoming barriers in establishing the CPG and incorporating the recommendations into day-to-day practice.

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