

# Information on the Internet about head injury pertaining to intensive care: less quantity and more quality is needed

Benjamin K Cheung, Conrad J Morze,  
Mark A Jones and Bala Venkatesh

The Internet is a potentially useful health care tool. Medical information is one of the most commonly searched topics on the Internet.<sup>1</sup> Medical professionals commonly search for peer reviewed articles using medical search engines, such as PubMed and Ovid, and simple text-based search or advanced search filters, such as "clinical queries". The general public uses common search engines for health information, which have the advantage of accessibility, low cost and extensive information.<sup>2</sup> The exponential growth of the Internet brings with it the difficulty of finding useful information. It is estimated that at least 38 web pages are added to the Internet every second. More importantly, this information is not always subjected to peer review, nor is there a need for disclosure of authorship or sponsorship. Consequently, the information may be irrelevant, outdated, incomplete, inaccurate and contain financial bias.<sup>3</sup>

Strategies such as credential certification, rating tools and web filtering have been used to monitor or improve the quality of health information websites. The American Accreditation HealthCare Commission (URAC) and Health on the Net (HON) are examples of certification organisations that issue credential labels on the Internet.<sup>4</sup> URAC reviews websites and, if they meet its standard, allows them to display a seal of approval for 2 years. Currently, more than 300 websites worldwide meet its criteria.<sup>5</sup> HON established a seal of approval for websites that follow its principles, but does not have a review process.<sup>6</sup>

Over the past decade, evaluations of website information using condition-specific criteria have been reported in relation to headache,<sup>1</sup> childhood fever,<sup>2</sup> urological conditions,<sup>3</sup> common emergency medicine conditions,<sup>4</sup> and lower back pain.<sup>7</sup> Results of these studies suggest the quality of health information on the Internet is poor. To our knowledge, no peer-reviewed study has evaluated websites specific to intensive care conditions. Head injury is a common ICU problem, and its serious nature may motivate families to search for information on the Internet. Consequently, they may confront intensivists with potentially useful or misguided information.<sup>8</sup> Furthermore, there is a paucity of published information on website characteristics that correlate with content quality.

## ABSTRACT

**Objective:** Published data suggest that the quality of information on diseases accessible on the Internet using non-medical search engines is poor. Such data do not exist for illnesses requiring intensive care. This study investigated the accuracy of health information about head injury pertaining to intensive care on the Internet, and correlated website characteristics with the quality of their content.

**Methods:** A cross-sectional survey was conducted of the first 20 websites retrieved by the seven most frequently used search engines, with the information evaluated by two independent observers. Inter-observer reliability was evaluated using the  $\kappa$  statistic. Website information on head injury was compared with "gold standard" guidelines from the Brain Trauma Foundation. Website characteristics were assessed, and their correlation with quality of website content was analysed.

**Results:** 58 websites were assessed. Weighted  $\kappa$  for inter-observer agreement on quality scores was 0.72. The median content score was 2 (interquartile range, 0–4) out of a possible maximum of 23. Logistic regression analysis suggested that medical authors, government sponsors, and being in the second 10 websites retrieved by a search engine were associated with higher website quality scores, while financial incentive and advertisement were associated with lower quality scores.

**Conclusion:** This study demonstrated that information retrieved by the public on head injury from non-medical websites may be incomplete and inaccurate. It also identified website characteristics associated with poor content quality.

Crit Care Resusc 2006; 8: 100–106

We therefore designed a study to compare the medical information on management and prognosis most likely to be obtained by members of the public using common search engines against the management and prognosis guidelines published by the Brain Trauma Foundation in 2000 and updated in 2003.<sup>9</sup> These are internationally

recognised evidence-based guidelines available on the Internet.<sup>10</sup> A second aim of this study was to examine the correlation between website characteristics and content quality.

## Methods

This project and its preliminary pilot study were approved by the West Moreton Health District Ethics Committee. We accessed seven search engines in October 2004, representing the seven of the eight most commonly used search engines on the Internet worldwide. The top eight engines, which together comprise 98.9% of the total usage, in order of use were Google (36.8%), Yahoo (26.8%), Microsoft Search (14.5%), America Online (12.8%), Excite (4.3%), AskJeeves (1.8%), InfoSpace (1.3%) and Lycos (0.8%).<sup>11</sup> America Online was excluded because it is not commonly used by Australians and because of its pay-on-use nature. A recent Internet survey reported that 90% of users use only the top 10 search websites, and 80% do not click past the first page of search results.<sup>12</sup>

The aim of our study was to emulate a search on the Internet by a member of the public looking for information about head injury in an ICU setting. A questionnaire pilot study involving 20 layperson volunteers with no medical background showed that the terms "head injury" (75%) and "intensive care" (40%) were those most often used to search for health information on head injury patients in an ICU. Therefore, we used the terms "head injury" and "intensive care", combined with the logical operator "AND", in our search strategy.

## Evaluation of inter-observer reliability

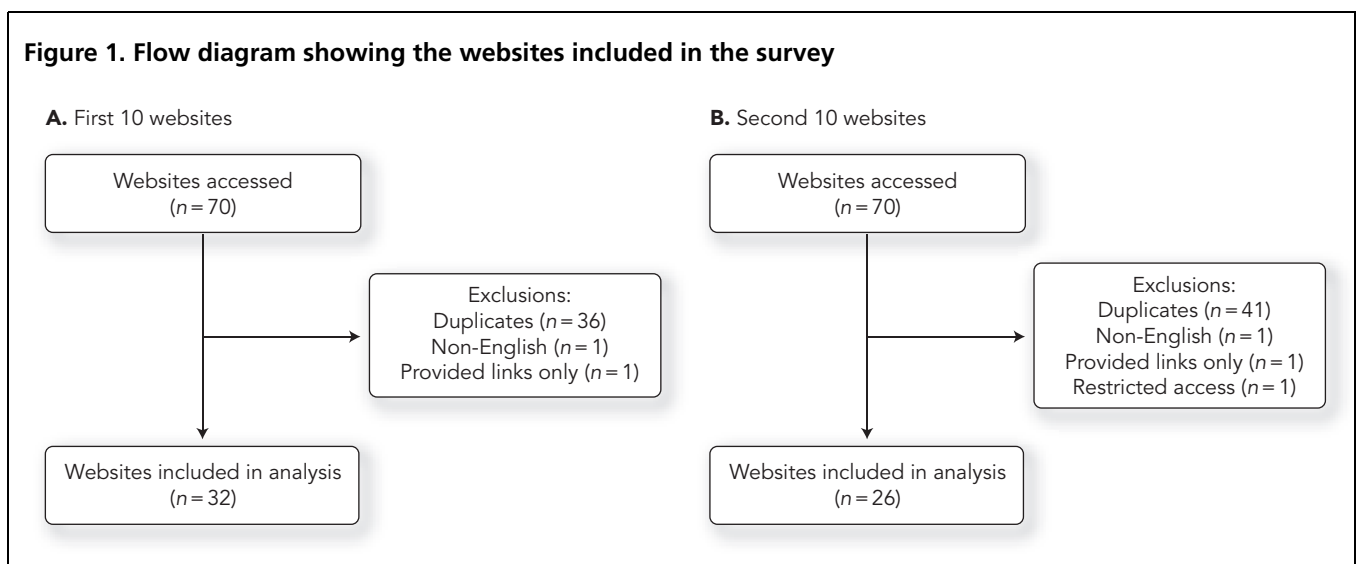
The first and second author independently evaluated the first 10 websites retrieved from each of the seven search engines. The scores they gave each website (see below) were compared. Inter-observer reliability was evaluated using weighted  $\kappa$  statistics. As agreement between the observers was satisfactory, all analyses were performed on the data evaluated by the first author.

## Retrieval of websites

The first 20 websites from each search engine were retrieved by the first author to form a website evaluation database. Only websites in English were evaluated. Websites were excluded if they were duplicates (ie, the website had already been returned from any preceding search engine), they had restricted access, or they provided only hyperlinks to other sites.

## Evaluation of website characteristics

The websites were evaluated for authorship (*medical*: including doctor, nurse, allied health professional; or *other*: including layperson and unidentified), sponsorship (*public*: including government department, academic institution, hospital; or *other*: including commercial organisation and unidentified), financial incentive (*present* or *not declared*), contact details (*present* or *absent*), product or service advertisement (*present* or *absent*), date of last update (< 1 year, > 1 year or *unknown*) and credential label, such as URAC or HON (*present* or *absent*) (Appendix 1).



### Evaluation of quality of website content

Websites were scored for both the completeness and accuracy of their information. Information from each website was compared against the “gold standards” obtained from the Brain Trauma Foundation. Checklists were created from these “gold standards” to evaluate website content quality (Appendix 2).

Only materials from the original web page were evaluated; hyperlinks to other websites were excluded. Each “gold standard” item mentioned in the website was awarded 1 point; 0 was awarded if it was not mentioned. Because there were 11 items relating to management but only 6 items relating to prognosis, the prognosis score was doubled to avoid giving excessive weight to the management score. The maximum score of 23 comprised 11 management points and 12 prognosis points. Any inaccurate information was awarded –1 points for management, or –2 points for prognosis. Number of hyperlinks was also recorded, and their relative weighting (medical, public, private or other) was used as a surrogate measure of quality.

### Data analysis

Scores for website content quality were reported as median and interquartile range. These scores were then dichotomised to 0 or less (no useful information) or greater than 0 (useful information). Logistic regression was used to investigate possible correlations with website characteristics. Correlations investigated included authorship, sponsorship, financial incentive, contact details, advertisement, update and the first 10 websites retrieved by search engines versus the second 10 websites (order).

All analyses were performed using SAS version 8.2 for Windows (SAS Institute, Cary, NC, USA).

## Results

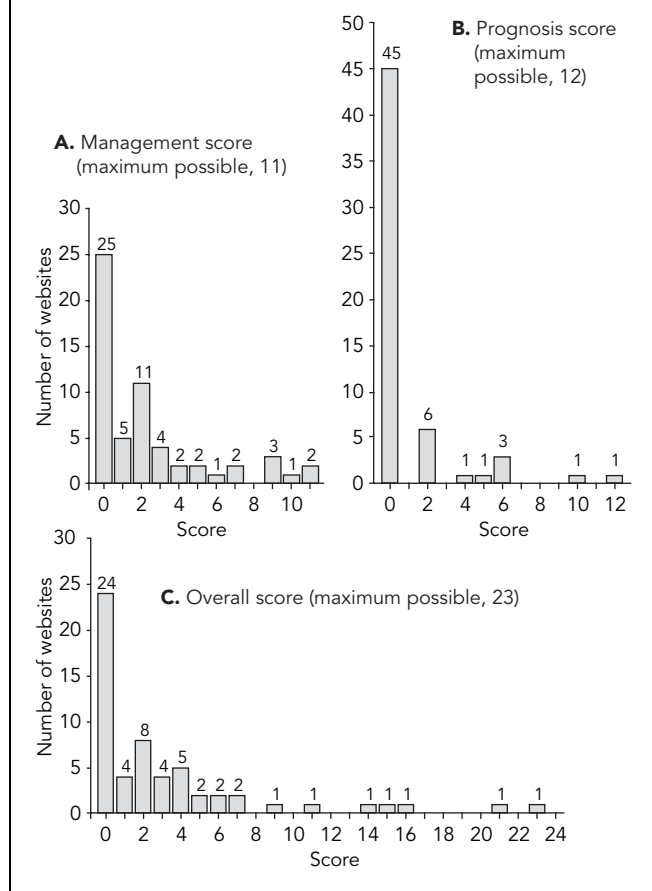
### Inter-observer reliability

The agreement between the first and second authors was estimated with a weighted  $\kappa$  as 0.69 for both management and prognosis content scores and 0.72 for overall content score. Overall scores given by the two authors were identical for 19 websites (58%), and differed by 1 or less for 28 (85%) and by 2 or less for 31 (97%). The mean difference in scores was 0.03 (95% CI, –0.37 to 0.43).

### Retrieval of websites

The seven search engines Google, Yahoo, Microsoft Search, Excite, AskJeeves, InfoSpace and Lycos returned from 64 to 50 700 websites each. In total 140 websites were retrieved

**Figure 2. Distribution of scores for quality of website content (n = 58)**



in the website evaluation database (the first 20 from each search engine): 77 were excluded as duplicated websites; two for language other than English; two for providing only links to other sites; and one for restricted access. Fifty-eight unique websites were thus available for evaluation: 32 from the first 10 websites searched, and 26 from the second 10 websites searched. Full details of the website search are summarised in Figure 1, and the addresses of all 58 websites evaluated are listed in Appendix 3.

### Website characteristics

Of the 58 websites included, 30 disclosed authorship details (doctor, 70%; layperson, 20%; nurse, 6%; and allied health professional, 4%) and 48 disclosed sponsorship details (hospital, 40%; commercial organisation, 31%; academic institution, 17%; other, 6%; private practice, 4%; and government department, 2%). Twenty-five websites declared financial incentives (42%), 40 provided contact details (67%), 14 contained advertisements (23%), 23 were

updated within the previous year (39%), and one had an HON credential (2%).

### Quality of website content

The maximum possible score for website content was 23 (11 for management and 12 for prognosis). The median total score was 2 (interquartile range, 0–4). Only one out of 58 websites provided complete management and prognosis information. Management, prognosis and total scores ranged widely and are summarised in Figure 2. Many websites had a total score of 0. The distribution was skewed to the lower score end. Instances of inaccurate information were noted.

Of the 58 websites assessed for quality of hyperlinks, 31 had no hyperlinks, seven had one, seven had 2–10, 11 had 11–100, and two had more than 100 (303 and 699, respectively). Therefore, most websites (66%) had either no hyperlinks or just one hyperlink, but a small proportion of websites had a very large number of hyperlinks, including two with more than 100. In total, there were 1487 hyperlinks associated with the 58 websites, of which 286 (19%) were medical, 669 (45%) were publicly sponsored, 522 (35%) were private, and five (< 1%) were unknown.

### Data analysis

The results of analysis of correlation between content quality and website characteristics are summarised in Table 1. These results suggest positive correlations with public sponsorship, medical authorship, and being in the second 10 websites retrieved by a search engine, and negative correlations with financial incentive and advertisement. Multiple regression analysis resulted in financial incentive and the second 10 retrieved websites being independently associated with content quality.

### Discussion

The search strategy of our study was designed to emulate how a layperson might find information on head injury in an ICU setting. The results showed that the information obtained on this topic by common search engines was of poor quality. Most websites had scores for content quality less than half the maximum score, and many scored zero. Both management content and, in particular, prognosis content were poor. Instances of inaccurate information were also noted. This in turn could result in misconception, misperception and unrealistic expectations of outcome of head injury.

**Table 1. Correlation of website characteristics with scores for content quality**

Quality measure	Odds ratio*	95% CI	P
Sponsorship (public against others)	6.3	1.9–20	0.002
Authorship (medical against others)	5.6	1.6–20	0.008
Order (first 10 against second 10 sites)	3.1	1.0–9.3	0.047
Update	0.65	0.22–1.9	0.4
Contact details	0.61	0.19–2.0	0.4
Advertisement	0.19	0.05–0.70	0.01
Financial incentive	0.07	0.02–0.29	<0.001

\* The odds ratio indicates the impact of the website characteristic on the quality of information. For example, medical authors have more than 5× the odds of providing useful information compared with all other authors. Websites with advertisement have almost 80% lower odds of providing useful information compared with those with no advertisement.

CI = confidence interval.

The reasons for poor content quality are debatable, and correlations with website characteristics may provide some insights. The correlation analysis suggests that medical authorship, public sponsorship and being among the second 10 websites retrieved by search engines are associated with higher scores and hence higher quality, whereas financial incentive and advertisement are associated with lower scores. We were unable to compare individual search engines because of the small sample size.

One of the advantages of the Internet is its dynamic nature, but only 39% of sites had been updated within the previous year. Furthermore, recent updates (< 1 year) did not appear to be associated with higher content quality. In addition, only 19% of available hyperlinks were medical, and a further 45% were public sponsors, which suggest useful medical information may not be readily available.

It was both interesting and disturbing to note that the second 10 websites retrieved by search engines had better content quality than the first 10 websites. Google uses PageRank to examine the entire link structure of the web, and ranks web pages in order of importance. It then conducts hypertext-matching analysis to determine which pages are relevant to the specific search being conducted.<sup>13</sup> Yahoo ranks web pages according to their relevance to a particular search by analysing document features, such as text, title and description accuracy, source and associated links.<sup>14</sup> Our results suggest that these strategies are unable

to rank health websites in terms of content quality. In addition, our results suggest that duplications and, to a lesser extent, restricted access were common.

Credential certification by HON and URAC is a recent effort to improve the quality of information on the Internet, but our results suggest that either certification is not commonly used, or that most websites do not meet the criteria for HON or URAC certification. We cannot draw conclusions about the effectiveness of HON and URAC certification as we found only one certified website, which, in fact, scored poorly.

There was satisfactory agreement between the first and second authors which suggests that inter-observer reliability was adequate and unlikely to be a source of bias. Content analysis researchers generally consider  $\kappa > 0.8$  as suggesting good reliability, with  $\kappa$  of 0.67–0.8 allowing tentative conclusions to be drawn.<sup>15,16</sup>

### Limitations of the study

We believe that the first 20 websites from the top seven search engines should provide an adequate selection of websites that a layperson would most likely visit. It is possible that a more detailed search beyond 20 websites may have produced different results. A limitation of this study is that it was a cross-sectional analysis performed at a particular time, while website content may change daily. Because of wide variations in Internet-browsing skill, no attempt was made to measure the time needed to retrieve health information, which is also an important measure of Internet usefulness. Our binary all-or-none scoring method biased the results to the higher score end, as any mention of a topic received a maximum score. It is possible that a more extensive graded scoring system might distinguish more subtle differences between websites. Only one ICU-related medical condition was analysed, and extrapolation to medical information in general is another potential weakness of this study. Despite these limitations, our study has highlighted the potential for misconceptions and misinformation among patients about medical issues.

### Strengths of the study

This is the first study to investigate Internet health information on an ICU condition. The combination of strategies used is also unique in comparison with other published studies. The use of a pilot questionnaire study to determine search terms, rating of inter-observer reliability, comparison with a gold standard, creation of an adequate database of websites that a layperson would most likely visit, and correlation analysis also distinguish this study from other existing studies.

### Conclusion

This study has demonstrated that information retrieved by the public on head injury from non-medical websites may be incomplete and inaccurate. The study has also identified a number of website characteristics associated with poor content quality. Given the dynamic nature of the Internet, it is difficult to recommend the “best website” for head injury. However, we suggest that hospitals be aware of this problem, caution families about the quality of information on the Internet and provide patient information sheets about specific conditions.

### Acknowledgement

This study was presented as a free paper at the Felicity Hawker medal session at the inaugural Annual Scientific Meeting of the Joint Faculty of Intensive Care Medicine in June 2005.

### Author details

Benjamin K Cheung, Registrar<sup>1</sup>

Conrad J Morze, Registrar<sup>2</sup>

Mark A Jones, Biostatistician<sup>3</sup>

Bala Venkatesh, Intensivist, and Associate Professor<sup>4</sup>

1 Department of Intensive Care, Princess Alexandra Hospital, Brisbane, QLD.

2 Department of Intensive Care, Ipswich Hospital, Ipswich, QLD.

3 Queensland Clinical Trials Centre, University of Queensland, Brisbane, QLD.

4 Department of Intensive Care, Princess Alexandra and Wesley Hospitals, and University of Queensland, Brisbane, QLD.

**Correspondence:** bala\_venkatesh@health.qld.gov.au

### References

- Peroutka SJ. Analysis of Internet sites for headache. *Cephalalgia* 2001; 21: 20-4.
- Impicciatore P, Pandolfini C, Casella, N, et al. Reliability of health information for the public on the world wide web: systematic survey of advice on managing fever in children at home. *BMJ* 1997; 314: 1875-9.
- Lee C, Smith C, Hall J, et al. Bladder cancer facts: accuracy of information on the internet. *J Urol* 2003; 170: 1756-60.
- Zun L, Blume J, Simpson G, et al. Accuracy of emergency medical information on the web. *Am J Emerg Med* 2004; 22: 94-7.
- URAC. Programs and services. Available at: <http://www.urac.org> (accessed Oct 2005).
- Landro L. Online health groups to set up attempts to enforce standards. *Wall Street Journal* 2001; July 20: B1.
- Butler L, Foster N. Back pain online. *Spine* 2003; 28: 395-401.
- Moshirfar A, Campbell J, Khasraghi F, Wenz J. Evaluating the quality of Internet-derived information on plantar fasciitis. *Clin Orthop Relat Res* 2004; 421: 60-3.

- 9 The Brain Trauma Foundation. The American Association of Neurological Surgeons. The Joint Section on Neurotrauma and Critical Care. Trauma systems. *J Neurotrauma* 2000; 17: 457-62.
- 10 Brain Trauma Foundation. Guidelines. Available at: <http://www.braintrauma.org> (accessed May 2004).
- 11 SearchEngineWatch. Internet survey 2004. Available at: <http://searchenginewatch.com> (accessed May 2004).
- 12 Search engine optimization marketing news. Available at: [www.autobytel.com](http://www.autobytel.com) (accessed Apr 2005).
- 13 Technology overview. Google. Available at: [www.google.com/intl/en/corporate/tech.html](http://www.google.com/intl/en/corporate/tech.html) (accessed Jul 2005).
- 14 Yahoo! Search technology. Available at: [www.help.yahoo.com/help/us/search/basics/basics17.html](http://www.help.yahoo.com/help/us/search/basics/basics17.html) (accessed Jul 2005).
- 15 Soeken K, Prescott P. Issues in the use of kappa to assess reliability. *Med Care* 1986; 24: 733-43.
- 16 Altman DG. Practical statistics for medical research. London: Chapman and Hall, 1991. □

### Appendix 1. Checklist for website characteristics

**Authorship:** Doctor, nurse, allied health professional, layperson or unidentified

**Sponsorship:** Government department, academic institution, hospital, commercial organisation, other or unidentified

**Financial incentive:** Present or not declared

**Contact details:** Present or absent

**Product/service advertisement:** Present or absent

**Date of last update:** < 1 year, > 1 year or unknown

**Credential label such as HON or URAC:** Present or absent

---

HON = Health on the Net. URAC = American Accreditation HealthCare Commission. ◆

### Appendix 2. Checklist for website content

#### Management

- Trauma systems decrease mortality
- Initial management: restore circulatory volume, blood pressure (BP), oxygen and ventilation
- Do not hyperventilate, administer intravenous mannitol (unless increased intracranial pressure (ICP))
- Monitor ICP if:
  - Comatose head injury (Glasgow Coma Score, 3–8), with abnormality on cranial computed tomography (CT) scan
  - Comatose head injury with normal cranial CT scan but two of the following: age > 40 years; unilateral or bilateral posturing; or systolic BP < 90 mmHg
  - Not routine for mild or moderate head injury (clinician-dependent)
- Treat high ICP:
  - ICP threshold for treatment, 20–25 mmHg
  - Use ventricular or parenchymal catheter tip transducer
- Aim for cerebral perfusion pressure > 60 mmHg (2003 update)
- Hyperventilation:
  - Avoid chronic prolonged hyperventilation therapy in normal ICP
  - Avoid hyperventilation during first 24 hours post-traumatic brain injury
  - Avoid hyperventilation in first 5 days
- Mannitol for ICP control:
  - Avoid serum osmolality > 320 mOsm
  - Indication — signs of transtentorial herniation or progressive decrease in neurological function

- Barbiturate:
  - Prophylactic barbiturate not recommended
  - Oligoemic hypoxia may be induced in some patients, consider arteriovenous saturation monitoring
- Steroid NOT recommended
- Nutrition:
  - Non-feeding increases mortality
  - Need full feed by Day 7 (start within 72 hours)
  - No method better than others
- Anti-seizure prophylaxis for the first week:
  - > 1 week is not recommended
  - Use carbamazepine/phenytoin for first week for early PTS

#### Prognosis

- Glasgow Coma Score (GCS):
  - Initial measurement is unreliable
  - Imprecise to predict good outcome if initial GCS is low (10% of those with initial low GCS have functional survival)
- Age: children better than adults better than > 60 years of age
- Use pupillary light reflexes as prognosis parameter
- Hypotension is associated with poor prognosis
- Hypoxia is associated with poor prognosis
- CT scan:
  - Basal cistern status, subarachnoid haemorrhage, midline shift > 5 mm, mass lesion and volume of haematoma associated with poor prognosis
  - Worst category of intracranial abbreviated injury score (AIS) on initial CT scan associated with poor 6-month outcome

**Appendix 3. List of evaluated websites**

[www.medicineau.net.au/clinical/ICU/procedures/headinj.html](http://www.medicineau.net.au/clinical/ICU/procedures/headinj.html)  
[www.pedscm.wustl.edu/All-Net/english](http://www.pedscm.wustl.edu/All-Net/english)  
[www.neurosurgerytoday.org/what/patient\\_e/head.asp](http://www.neurosurgerytoday.org/what/patient_e/head.asp)  
[www.bja.oupjournals.org/cgi/content/abstract/aeH249v1](http://www.bja.oupjournals.org/cgi/content/abstract/aeH249v1)  
[www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=retrieve&db=PubMed&list\\_uids=10447546&dopt=abstract](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=retrieve&db=PubMed&list_uids=10447546&dopt=abstract)  
[www.patienteducation.upmc.com/Pdf/HeadInjury.pdf](http://www.patienteducation.upmc.com/Pdf/HeadInjury.pdf)  
[www.homestead.com/emguidemaps/files/headinjury.html](http://www.homestead.com/emguidemaps/files/headinjury.html)  
[www.crit-care.com/hipreicu.htm](http://www.crit-care.com/hipreicu.htm)  
[www.anwicu.org/headinjury/new\\_page\\_1.htm](http://www.anwicu.org/headinjury/new_page_1.htm)  
[www.tbilaw.com/attorney\\_brain\\_injury\\_u.html](http://www.tbilaw.com/attorney_brain_injury_u.html)  
[www.bcinjurylaw.com/braininjuryanswer5a.html](http://www.bcinjurylaw.com/braininjuryanswer5a.html)  
[www.vh.org/adult/provider/radiology/ElectricPE/Patients/Case12.html](http://www.vh.org/adult/provider/radiology/ElectricPE/Patients/Case12.html)  
[www.waiting.com/comawaiting.html](http://www.waiting.com/comawaiting.html)  
[www.barttersite.com/mgandheadinjury.htm](http://www.barttersite.com/mgandheadinjury.htm)  
[www.gla.ac.uk/departments/surgicalpaediatrics/head.htm](http://www.gla.ac.uk/departments/surgicalpaediatrics/head.htm)  
[www.inboxrobot.com/news/Headinjury](http://www.inboxrobot.com/news/Headinjury)  
[www.bestbets.org/cgi-bin/bets.pl?record=00146](http://www.bestbets.org/cgi-bin/bets.pl?record=00146)  
[www.finr.net/BrainInjuryGlossary](http://www.finr.net/BrainInjuryGlossary)  
[www.cephalon.dk/monitor\\_trolley.htm](http://www.cephalon.dk/monitor_trolley.htm)  
[www.sw.org/sw/portal/.cmd/SWActionDispatcher/\\_pagr/107/\\_pa.107/11](http://www.sw.org/sw/portal/.cmd/SWActionDispatcher/_pagr/107/_pa.107/11)  
[www.ajrccm.atsjournals.org/cgi/content/abstract/159/1/188](http://www.ajrccm.atsjournals.org/cgi/content/abstract/159/1/188)  
[www.intra.ccgh.com/CareSource8th/isc/0202611f.htm](http://www.intra.ccgh.com/CareSource8th/isc/0202611f.htm)  
[www.ninds.nih.gov/news\\_and\\_events/headinjurywkshp.htm](http://www.ninds.nih.gov/news_and_events/headinjurywkshp.htm)  
[www.finr.net/brainInjuryRehab](http://www.finr.net/brainInjuryRehab)  
[www.keepmedia.com](http://www.keepmedia.com)  
[www.speechgeneratingdevice.com](http://www.speechgeneratingdevice.com)  
[www.brainlaw.com](http://www.brainlaw.com)  
[www.ahs.uwaterloo.ca/~cahr/headfall.htm](http://www.ahs.uwaterloo.ca/~cahr/headfall.htm)  
[www.headinjury.com](http://www.headinjury.com)  
[www.neurorecre.com](http://www.neurorecre.com)  
[www.cprslaw.com](http://www.cprslaw.com)  
[www.igothurt.com](http://www.igothurt.com)  
[www.aemj.org/cgi/content/abstract/10/5/495-a](http://www.aemj.org/cgi/content/abstract/10/5/495-a)  
[www.mssm.edu/neurosurgery/head\\_injury/](http://www.mssm.edu/neurosurgery/head_injury/)  
[http://emj.bmjournals.com/cgi/content/abstract/21/4/433](http://http://emj.bmjournals.com/cgi/content/abstract/21/4/433)  
[www.neurosurgery.org/sections/section.aspx?Section=TR&Page=eastern.asp](http://www.neurosurgery.org/sections/section.aspx?Section=TR&Page=eastern.asp)  
[www.dah.mvm.edu.ac.uk/brain\\_acute\\_injury.htm](http://www.dah.mvm.edu.ac.uk/brain_acute_injury.htm)  
[www.kyliestory.com/interest.htm](http://www.kyliestory.com/interest.htm)  
[http://home.gwu.edu/~orthopod/Femur%20Fx%20in%20polytrauma.htm](http://http://home.gwu.edu/~orthopod/Femur%20Fx%20in%20polytrauma.htm)  
[www.thealphaco.com/index.php?..&docID=Head+Injury](http://www.thealphaco.com/index.php?..&docID=Head+Injury)  
[www.chirs.com/AboutBrainInjury.htm](http://www.chirs.com/AboutBrainInjury.htm)  
[www.theexpertsmedicalconsultant.com/page30.html](http://www.theexpertsmedicalconsultant.com/page30.html)  
[www.chestjournal.org/cgi/content/full/122/2/699](http://www.chestjournal.org/cgi/content/full/122/2/699)  
[www.mgh.harvard.edu/trauma/trauma\\_physicianinfo.htm](http://www.mgh.harvard.edu/trauma/trauma_physicianinfo.htm)  
[www.nursing.drexel.edu/nlc/courses/ce/ce469/start.htm?CourseKey=4192](http://www.nursing.drexel.edu/nlc/courses/ce/ce469/start.htm?CourseKey=4192)  
[www.emedicine.com/ped/topic929.htm](http://www.emedicine.com/ped/topic929.htm)  
[www.nhejazi.com/eng-brain%20injury.htm](http://www.nhejazi.com/eng-brain%20injury.htm)  
[www.sch.edu.au/geschn/ncpg/head\\_injury\\_cpg.pdf](http://www.sch.edu.au/geschn/ncpg/head_injury_cpg.pdf)  
[www.bja.oupjournals.org/cgi/content/abstract/84/5/661](http://www.bja.oupjournals.org/cgi/content/abstract/84/5/661)  
[www.anzics.com.au/teaching/RBH/ahi/hi\\_inj.htm](http://www.anzics.com.au/teaching/RBH/ahi/hi_inj.htm)  
[www.archsurg.ama-assn.org/cgi/content/abstract/131/5/533](http://www.archsurg.ama-assn.org/cgi/content/abstract/131/5/533)  
[www.selectcounsel.com](http://www.selectcounsel.com)  
[www.personal-injury-group.com](http://www.personal-injury-group.com)  
[www.kidshealth.org/parent/firstaid\\_safe/emergencies/head\\_injury.html](http://www.kidshealth.org/parent/firstaid_safe/emergencies/head_injury.html)  
[www.car-accident-lawyer-network.com/head-brain.html](http://www.car-accident-lawyer-network.com/head-brain.html)  
[www.psychiatrymatters.md](http://www.psychiatrymatters.md)  
[www.georgiacriminaldefense.com](http://www.georgiacriminaldefense.com)  
[www.ahif.com](http://www.ahif.com)

◆