Clinical practice guidelines for the management of conditions related to traffic collisions: a systematic review by the OPTIMa Collaboration

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Abstract

Objective: To evaluate the methodological quality and synthesize recommendations of evidence-based guidelines for the management of common traffic injuries. Study design: We conducted a systematic review and best evidence synthesis of guidelines on musculoskeletal injuries, psychological disorders and mild traumatic brain injuries (MTBI) from 1995 to 2012. Independent reviewers critically appraised eligible guidelines using the Appraisal of Guidelines for Research and Evaluation II (AGREE II) criteria. Results: We retrieved 9863 citations. Of those, 16 guidelines were eligible for critical appraisal and eight were scientifically admissible (four targeting whiplash-associated disorders (WAD), one addressing anxiety and three addressing MTBI). The inadmissible guidelines had inadequate literature searches, inexplicit links between evidence and recommendations, and ambiguous recommendations. The literature used to develop most of the admissible guidelines was outdated. Major recommendations included: (1) Advice, education and reassurance for all conditions; (2) Exercise, return-to-activity, mobilization/manipulation, analgesics and avoiding collars for WAD; (3) Psychological first aid, pharmacotherapy and cognitive behavioral therapy as first-line interventions for anxiety; and (4) Monitoring for complications, discharge criteria, advice upon discharge from the emergency room and post-discharge care for MTBI. Conclusion: Fifty percent of appraised guidelines were scientifically admissible, but most need updating. Most guidelines focus on WAD and MTBI. Few guidelines make comprehensive recommendations on a wide range of consequences from traffic collisions.

Implications for Rehabilitation

- The core components of a program of care designed to manage common traffic injuries (whiplash-associated disorders – WAD, anxiety and mild traumatic brain injuries) should include advice, education and reassurance.
- Depending on the condition, the following specific interventions should be considered: (1) WAD: exercise, early return to activity, mobilization/manipulation, analgesics and avoidance of collars; (2) Anxiety: psychological first aid, pharmacotherapy and cognitive behavioral therapy; and (3) Mild traumatic brain injuries: use of specific discharge criteria (including no factors warranting hospital admission and support structures for subsequent care), education upon discharge from emergency room and post-discharge care (e.g. monitoring for complications, gradual return to normal activity based on tolerance of individual).
- The methodological quality of guidelines varies greatly; therefore, guideline developers need to adhere to established methodological standards and conform to the evaluation criteria outlined in the Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument.

Introduction

Most traffic collisions do not lead to fatal outcomes or serious injuries for the people involved [1]. However, musculoskeletal injuries, head injuries and psychological disorders related to
traffic collisions are associated with clinically important pain and disability [2–5]. Epidemiological studies have determined that individuals injured in traffic collisions most commonly suffer from whiplash-associated disorders (WAD), shoulder pain, headaches and/or back pain [6]. These musculoskeletal injuries are frequently associated with mild traumatic brain injuries (MTBI), depressive symptomatology and/or post-traumatic stress disorders [5,7,8]. Although MTBI can be related to various mechanisms of injury (e.g. traffic collisions, falls, sports, assaults), the most common mechanisms of injury are traffic collisions and falls [5].

The majority of individuals injured in traffic collisions recover within weeks to a few months after their injuries [2,7,9]. However, a significant proportion of patients develop persistent pain and disability [4,9,10]. Those injured in traffic collisions have a greater risk of developing troublesome musculoskeletal disorders such as disabling neck pain [11]. Preventing the development of persistent pain and disability in these patients has been challenging for clinicians as few effective treatments are available [12,13]. Moreover, the prognosis for these patients is complex and influenced by initial severity of injury, psychological factors, such as passive coping, compensation factors, and the type and intensity of healthcare use [9]. Clinical guidelines providing support for initial and ongoing clinical decisions on care would be helpful.

Clinical practice guidelines are systematically developed statements designed to assist clinicians in providing quality care to patients [14,15]. Guidelines are intended to reduce the gap between research and practice for clinicians, and assist decisions at the system and population level for policymakers [16,17]. Despite recent growth in popularity, there are concerns about the methodological quality of commonly used guidelines [18]. Systematic reviews have determined that guidelines may have poor methodological quality [16,19–23]. Common flaws include poor methodology, lack of stakeholder involvement and questionable editorial independence [16]. Therefore, serious concerns have been raised about the negative impact of potentially biased guidelines on patient care and health outcomes [16,24–26].

There are many clinical practice guidelines available for the management of common traffic injuries. However, the quality of these guidelines has not been critically appraised. Poor methods in developing guidelines may impact the validity of their recommendations and the quality of patient care [27,28]. In practice, guidelines of poor methodological quality may lead clinicians to consider ineffective, costly or harmful interventions. At the organizational level, it may lead policy makers to use resources on the implementation of poorly developed recommendations. Furthermore, identified barriers to adopting guidelines include lack of understanding on how recommendations were developed, unclear recommendations and inconsistency in recommendations across guidelines [29]. Therefore, a systematic review of these guidelines is needed to assess their methodological quality and help guide appropriate management of individuals with traffic injuries.

The purpose of this systematic review was to critically appraise and synthesize the recommendations of evidence-based clinical practice guidelines for the management of common conditions related to traffic collisions.

Methods

Registration of review

The protocol for our systematic review was registered on PROSPERO (CRD42012002940) and can be accessed at www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42012002940

Literature search

The search strategy was developed in consultation with a health sciences librarian. A second librarian reviewed the search strategy using the Peer Review of Electronic Search Strategies (PRESS) Checklist [30]. The search strategy combined terms relevant to traffic injuries, traffic collisions and guidelines, and included free text words and subject headings specific to each database (Appendix IA and IB). The following databases were searched from 1 January 1995 to 25 October 2012: MEDLINE, EMBASE, CINAHL, PsycINFO, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (DARE), Cochrane Central Register of Controlled Trials, National Health Services Economic Evaluation Database, Health Technology Assessment Database and the Index to Chiropractic Literature. Reference lists of relevant guidelines were hand searched for supplemental documents relevant to the methodology of that guideline.

We searched the grey literature using the following databases and websites: National Guideline Clearinghouse (Agency for Healthcare Research and Quality), Canadian Medical Association (CMA) Infobase, Guidelines International Network, PEDro, Trip Database, American College of Physicians Clinical Recommendations, Australian Government, National Health and Medical Research Council, Health Services/Technology Assessment Texts (HSTAT), Institute for Clinical Systems Improvement (ISCI), National Institute for Health and Clinical Excellence (NICE) Guidance, NICE Pathways, New Zealand Guidelines Group, Scottish Intercollegiate Guidelines Network (SIGN) and World Health Organization (WHO) guidelines approved by the Guidelines Review Committee. We also contacted regulatory bodies and government agencies of all Canadian provinces and territories to retrieve jurisdiction-specific guidelines, programs of care, treatment protocols, technical reports, legislation, regulations and/or additional guidelines relevant to this review. Finally, we searched Google using free text words related to traffic collisions and guidelines.

Study selection

The following inclusion criteria were used: (1) English language; (2) adults and/or children with common physical, mental or psychological injuries, including WAD grades I–III (Appendix IIA and IIB); (3) related to traffic collisions; (4) guidelines, programs of care or treatment protocols; and (5) included recommendations for therapeutic management. We excluded guidelines that: (1) did not include treatment recommendations; (2) were a summary or copy of previous guidelines; (3) were developed solely on the basis of consensus; or (4) did not conduct a systematic literature search or critical appraisal of the studies that were used to derive recommendations. For psychological injuries, we also excluded guidelines that were not specific to post-collision conditions (e.g. generalized anxiety disorders not related to traffic collisions). Psychological consequences of traffic collisions are considered to have characteristics that are distinct from other types of traumatic events [31]. For example, collision-related trauma frequently involves negligence and results in litigation and/or compensation processes, which may differ from a broader range of trauma (e.g. natural disasters, sporting injuries) [31]. Prevailing compensation and legal factors have been found to be prognostic factors for recovery from WAD [9].

Title and abstract screening

We used a two-stage screening process by random pairs of independent reviewers. First, reviewers independently screened titles and abstracts for eligibility. Where eligibility could not be determined based on the title and abstracts, a second screening
stage was conducted in which reviewers independently reviewed the full text. Disagreements between pairs of reviewers were resolved by discussion to reach consensus. A third reviewer was used to settle disagreements if consensus could not be reached. Authors were contacted if additional information was necessary to determine eligibility.

**Critical appraisal of eligible studies**

Relevant guidelines were appraised by random pairs of independent reviewers. Independent reviewers appraised guidelines using the Appraisal of Guidelines for Research and Evaluation version II (AGREE II) instrument (Appendix III) [32,33]. The AGREE II instrument is widely used to assess the development and reporting of guidelines. It consists of 23 items in six quality-related domains: scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability and editorial independence of guidelines (Appendix III). Discussions were held between pairs of reviewers to reach consensus on: (1) individual AGREE II items; (2) overall quality of the guideline; (3) whether the guideline was scientifically admissible; and (4) whether modifications to the guideline would be needed for use in specific jurisdictions (e.g. updating the literature, modifying the format of the guideline). Authors were contacted if additional information or clarification was needed to complete the critical appraisal.

**Data extraction**

One reviewer extracted data from scientifically admissible guidelines into standardized data extraction forms. A second reviewer checked data extracted from each guideline by comparing extracted data with data reported by the guideline.

**Data synthesis**

Recommendations from scientifically admissible guidelines were synthesized qualitatively using evidence tables and summary statements. We aimed to summarize the recommendations of admissible guidelines. We did not derive recommendations from the synthesis, but instead descriptively reported their content. Guidelines with poorly conducted systematic searches of the literature (question 7 of AGREE II) or with inadequate methods to critically appraise the evidence (question 9 of AGREE II) were deemed to have fatal flaws and therefore scientifically inadmissible. These criteria are described as fundamental steps to the development of evidence-based guidelines [18]. Although not a fatal flaw, lack of editorial independence from the funding body (question 22 of AGREE II) was considered as an important limitation to the quality of the guideline. The absence of editorial independence would contribute to lower overall guideline quality, since this may suggest poor reporting and a lack of transparency in guideline development [16].

Recommendations from each guideline were organized by specific interventions in a table to facilitate comparisons of recommendations across guidelines. Recommendations of guidelines were classified by interventions that: (1) were recommended; (2) were recommended for consideration; (3) were recommended against; (4) had no evidence to support or refute its use. Recommended interventions by guidelines were interventions that were strongly recommended, recommended without any conditions required, or described as ‘should be used’. Interventions recommended for consideration included interventions that may be effective, should be used in combination with another intervention, or can be used given ongoing improvement for the patient.

**Results**

Our search yielded 9863 citations (Figure 1). We excluded 848 (8.6%) duplicates and screened 9015 titles and abstracts for eligibility. Of those, 8916 (90.4%) did not meet the eligibility criteria. We screened 118 citations using full text and contacted the authors of eight guidelines (5/8 responded) [34–38] to obtain additional information about the scope and development of their guidelines for eligibility. A total of 102 were deemed ineligible. We critically appraised 16 (0.2% of 9863) guidelines [39–54] and
during critical appraisal, we contacted the authors of eight guidelines (4/8 responded) [46,53,55,56] to obtain additional information necessary to assess guideline quality. After, eight (0.01%) guidelines were deemed scientifically admissible [39–46]. One of the scientifically admissible guidelines was updated in 2013, so this was also critically appraised and found to be scientifically admissible [57].

### Methodological quality

The methodological quality of the relevant guidelines varied considerably (Tables 1 and 2). Overall, most guidelines did not adequately address guideline applicability, particularly regarding facilitators and barriers, resource implication, and monitoring or auditing criteria upon implementation (10/16) [47–49,52, 53,56,58]. Half of the guidelines did not address potential competing interests of the guideline development group (8/16) [40,43,44,46,48,49,52,59].

According to individual AGREE II items, the scientifically inadmissible guidelines had major limitations with: (1) no systematic methods to search for evidence (5/8) [47,49,52,56,59]; (2) no clear description of strengths and limitations of the literature (7/8) [47–50,52,53,59]; (3) no explicit link between recommendations and supporting evidence (4/8) [47,49,53,59] (4) lack of specific and unambiguous recommendations (i.e. lacking detail regarding patient population, intervention or intended outcome) (4/8) [47,49,53,59]; or (5) did not report editorial independence from the funding body, which was considered as an important limitation but not a fatal flaw (5/8) [47–49,53,59].

Eight guidelines had minor limitations, even though they were judged scientifically admissible: (1) did not adequately address applicability domain (3/8) [43,44,46]; or (2) did not report any competing interests of the guideline development group (4/8) [40,43,44,46]. Based on judgment between reviewers regarding the overall guideline quality, it was determined that all admissible guidelines required modifications for use in specific jurisdictions. Guideline modifications primarily included updating the literature, modifying the scope of guideline to include/exclude certain interventions and improving guideline applicability. One guideline was updated within five years of the publication date of the original guideline [57].

### Scientifically admissible guidelines

Four of the eight admissible guidelines addressed the management of WAD [40,43,46,54], one addressed the management of anxiety following traffic collisions [44] and three discussed the management of brain injuries (including MTBI) (Table 3) [41,42,45]. All brain injury guidelines targeted the early management of MTBI [41,42,45], and one also addressed the management of persistent MTBI [41]. Most guidelines focused on primary care (7/8) [40–45,54] and/or emergency care (4/8) [41,42,44,45] settings. A description of the recommendations from admissible guidelines is provided below.

### Guidelines for grade I–III whiplash-associated disorders

Admissible guidelines on the management of WAD were published in 1995, 2004, 2007 and 2008 [40,43,46,54]. Recommendations pertaining to individual interventions are outlined in Table 4. These recommendations are stratified by stage of recovery (i.e. acute, subacute or chronic) or grade of WAD (i.e. grades I, II or III), based on the individual guideline.

### Recommended interventions

All guidelines recommended that the management of patients with acute WAD include education and neck exercises [40,43,46,54]. Most guidelines recommended to include these interventions in the management of subacute and chronic WAD [40,43,46]. One guideline was less supportive and recommended that these interventions can be considered for subacute or chronic WAD [54]. The following were recommended as components of education: (1) emphasis on staying active, acting as usual and promoting mobility [40,43,46,54]; (2) advice on self-management and coping strategies [40,54]; (3) reassurance about the prognosis of neck pain [40,46,54]; and (4) goals around improvement in function [40,43].

### Interventions that were recommended for consideration

All guidelines recommended that passive joint mobilization or manipulation can be considered for the management of WAD [40,43,46,54]. Three guidelines recommended that pharmacotherapy (e.g. simple analgesics, non-steroidal anti-inflammatory drugs) can be considered [40,43,46] for the early management of WAD, while one guideline did not discuss pharmacotherapy [54]. For multimodal therapy, one guideline recommended considering this intervention for subacute WAD [54], while other guideline recommended considering this for all grades of WAD [43]. Multimodal therapy was defined as a package of individual treatment modalities (e.g. joint mobilization, relaxation techniques, electrotherapies) that also included exercises and/or advice to stay active [54]. The other two guidelines did not address multimodal therapy.

### Interventions that were recommended against

All guidelines recommended against the use of cervical collars in the early management of WAD [40,43,46,54]. One guideline did not address the use of collars in subacute or chronic WAD [54]. Three guidelines recommended against surgery in the early management of WAD [40,43,46]. However, two of these guidelines recommended the consideration of surgery in WAD III with progressive neurological deficits and/or chronic debilitating pain [43,46]. In addition, two guidelines recommended against pharmacological injections for the management of WAD [40,43], one other guideline found no evidence to support or refute its use [46]. One guideline did not include injections or surgery in its scope [54].

### Interventions without evidence to support or refute their use

Three guidelines found no evidence for massage in the management of WAD [43,46,54]. However, two guidelines recommended its consideration for acute [40] or subacute WAD [54]. One guideline recommended against its use upon finding no evidence for massage [43]. For acupuncture, two guidelines found no evidence to support or refute its use [46,54], while one guideline recommended considering acupuncture for all grades of WAD [43]. Two guidelines did not find evidence for magnetic necklaces [43,46], and one of these guidelines recommended against its use until there is evidence to support its use [43]. The other guidelines did not address this intervention. For electrical nerve stimulation, two guidelines found no evidence for its use in the management of chronic WAD [54] or in any grades of WAD [46]. One guideline recommended considering electrical nerve stimulation in acute WAD but not in chronic WAD [40], while the remaining guideline did not address this intervention [43].

### Guideline for anxiety following traffic collisions

#### Interventions that were recommended

The Motor Accidents Authority of New South Wales, Australia, published a guideline in 2003 for the management of anxiety...
Table 1. AGREE II ratings of scientifically admissible guidelines.

<table>
<thead>
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<th>Overall objectives</th>
<th>Health questions</th>
<th>Population</th>
<th>GDG</th>
<th>Views of target population</th>
<th>Target users</th>
<th>Systematic search methods</th>
<th>Selection criteria</th>
<th>Strengths and limitations of evidence</th>
<th>Methods for formulating recommendations</th>
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Items 13-23

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<th>Advice and tools</th>
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aEach AGREE II item is rated on a 7-point scale, where 1 = strongly disagree or insufficient information provided and 7 = strongly agree; bRating is based on current information available; cAn update of the 2008 guideline from the Ontario Neurotrauma Foundation [57].

AGREE – Appraisal of Guidelines for Research and Evaluation; CSP – Chartered Society of Physiotherapists; GDG – Guideline Development Group; MAA - Motor Accidents Authority; MTBI = mild traumatic brain injury; ONF – Ontario Neurotrauma Foundation; NCCAC – National Collaborating Centre for Acute Care; QTF: Québec Task Force; SIGN - Scottish Intercollegiate Guidelines Network; TRACsa - South Australian Trauma Centre for Trauma and Injury Recovery; WAD – whiplash-associated disorders.
Table 2. AGREE II ratings\(^a\) of scientifically inadmissible guidelines.

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Items 13-23

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<th>Procedure for updating</th>
<th>Specific and clear recommendations</th>
<th>Options presented</th>
<th>Key recommendations</th>
<th>Facilitators and barriers</th>
<th>Advice and tools</th>
<th>Resource implication</th>
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\(^a\)Each AGREE II item is rated on a 7-point scale, where 1 = strongly disagree or insufficient information provided and 7 = strongly agree; \(^b\)Rating is based on current information available.

### Table 3. Evidence table for scientifically admissible guidelines.

<table>
<thead>
<tr>
<th>Title of guideline</th>
<th>Guideline development group, country, year</th>
<th>Search period, study designs included</th>
<th>Target users</th>
<th>Target patient population</th>
<th>Healthcare setting</th>
<th>Treatment recommendations for common traffic injuries</th>
</tr>
</thead>
</table>
| Clinical Guidelines for Best Practice Management of Acute and Chronic Whiplash-Associated Disorders [40] | South Australian Centre for Trauma and Injury Recovery, Australia, 2008 | 1999 to 2007; Systematic reviews, randomized and quasi-randomized trials (for treatment recommendations) | General practitioners and other health professionals in primary, secondary and tertiary care settings | Adults (>18 years of age) with WAD grades I–IV following traffic collision, acute and subacute (0–12 weeks) and chronic (>12 weeks) | Primary, secondary and tertiary care | Should be undertaken:  
- Acute WAD: Advice, reassurance, education, exercise  
- Chronic WAD: Advice, reassurance, exercise  
May be undertaken:  
- Acute WAD: Passive joint mobilization/manipulation, passive modalities, pharmacotherapy (non-opioid analgesics, NSAIDs) as adjuncts to care  
- Chronic WAD: Cognitive behavioural approach, passive joint mobilization/manipulation with exercise, vestibular rehabilitation, radiofrequency neurotomy, subcutaneous sterile water injections  
Should not be undertaken (without further evidence):  
- Acute WAD: Collars, surgery (except WAD IV), cervical pillows, injections  
- Chronic WAD: Injections (except sterile water injections), collars, prescribed rest, surgery, electrotherapy |

| Clinical Guidelines for the Physiotherapy Management of Whiplash Associated Disorder [54] | The Chartered Society of Physiotherapy, United Kingdom, 2004 | 1995–2004, systematic reviews, randomized trials | People with WAD, physiotherapists, health professionals involved in care of WAD, educational institutions | Adults (≥16 years of age) with WAD grades 0, I, II, III | Physiotherapy clinics | In acute stage (0–2 weeks post-injury):  
- Active exercise, education, advice on self-management, return to activity can be recommended (grade A)  
- Manual mobilization, soft tissue techniques, education about origin of pain, advice about coping strategies, relaxation, TENS may be effective (grade C)  
- Soft collars are not recommended (grade C)  
- No evidence to support or refute massage, acupuncture, pulsed electromagnetic therapy (grade C)  
- Unlikely to be effective: traction, infrared light, interferential therapy, ultrasound, laser (grade C)  
In subacute stage (2–12 weeks post-injury):  
- Evidence to support multimodal approach (including postural training, manual techniques, psychological support) (grade A)  
- Combined manipulation and mobilization, muscle retraining including deep neck flexor activity, education, advice about coping strategies, TENS, massage, soft tissue techniques may help reduce pain and improve function (grade C)  
- No evidence to support or refute acupuncture (grade C)  
- Unlikely to be effective: traction, infrared light, interferential therapy, laser, ultrasound (grade C)  
In chronic stage (>12 weeks post-injury):  
- Exercise therapy, manipulation and mobilization (may be combined), multidisciplinary psychosocial packages (by trained health professionals, including psychologists) may be effective (grade C)  
- No evidence to support or refute acupuncture, ultrasound, electromyographic biofeedback, thermotherapy, electrical stimulation, TENS, massage |

| Guidelines for the Management of Acute Whiplash-Associated Disorders for Health Professionals [43] | Motor Accidents Authority, Australia, 2007 | 1999 to 2005; Systematic reviews, randomized trials, quasi-randomized trials (for treatment recommendations) | General practitioner or other primary care health professionals in New South Wales | Adults (>18 years of age) with WAD grades I, II, III in the first 12 weeks following traffic collision | Primary care | Recommended:  
- Reassure, act as usual  
- Prescribed functional exercises (e.g. return to usual activity), rehabilitation programs (e.g. work alteration)  
- Exercise (range of motion exercises, muscle re-education)  
- Pharmacology: simple analgesics (WAD I)  
Not routinely recommended (can be considered in conjunction with other therapies, provided there is improvement):  
- Chiropractic, acupuncture, massage, cryotherapy, heat, ultrasound, transcutaneous electrical nerve stimulation, cognitive behaviour therapy, occupational therapy |

(continued)
<table>
<thead>
<tr>
<th>Title of guideline</th>
<th>Guideline development group, country, year</th>
<th>Search period, study designs included</th>
<th>Target users</th>
<th>Target patient population</th>
<th>Healthcare setting</th>
<th>Treatment recommendations for common traffic injuries</th>
</tr>
</thead>
</table>
| Scientific Monograph of the Quebec Task Force on Whiplash-Associated Disorders [46] | Quebec Task Force, Canada, 1995 | 1980 to 1993; Excluded single case reports, narrative reviews | Not specified | Adults and children with WAD grades I, II, III | Not specified | - Pharmacology: NSAIDs, non-opioid analgesics, opioid analgesics (can be considered for WAD II, III)  
- Postural advice  
- Passive joint mobilization or manipulation  
- Passive modalities (can be considered for WAD II, III)  
- Traction  
- Multimodal treatment  
- Acupuncture  
- Surgery (can be considered for WAD III with persistent pain not responsive to conservative management or rapidly progressing neurological deficit)  
Not recommended:  
- Pharmacology: muscle relaxants and psychopharmacological agents (WAD I–III)  
- High-dose intravenous methylprednisolone infusion (WAD II, III)  
- Cervical pillows  
- Immobilization, prescribed rest (>4 days), collars (>48 h)  
- Spray and stretch  
- Intra-articular and intrathecal steroid injections  
- Epidural steroid injections for WAD I, II  
- Steroid trigger point injection for patients in acute phase  
- Magnetic necklaces  
- Other interventions including Pilates, Feldenkrais, Alexander Technique, massage, homeopathy |
| Guidelines for the Management of Anxiety Following Motor Vehicle Accidents [44] | Motor Accidents Authority, Australia, 2003 | 1996 to 2001; All study designs | General practitioners and other health professionals in New South Wales | Adults with anxiety conditions following traffic collision (primarily acute stress disorder and post-traumatic stress disorder) | Primary care, emergency department | Recommended:  
- Reassure about the favourable prognosis of WAD  
- Encourage early return to usual activities  
- Use prescription drugs sparingly  
- Provide manipulative treatment for pain relief and early mobility  
- Physiotherapy should emphasize return to activity and promote mobility  
Not recommended:  
- Soft collars  
- Prescribed rest should be limited to short duration  
- Surgery rarely indicated (only for WAD III with progressive/persistent neurologic deficit) |

- Pharmacology: NSAIDs, non-opioid analgesics, opioid analgesics (can be considered for WAD II, III)  
- Postural advice  
- Passive joint mobilization or manipulation  
- Passive modalities (can be considered for WAD II, III)  
- Traction  
- Multimodal treatment  
- Acupuncture  
- Surgery (can be considered for WAD III with persistent pain not responsive to conservative management or rapidly progressing neurological deficit)  
Not recommended:  
- Pharmacology: muscle relaxants and psychopharmacological agents (WAD I–III)  
- High-dose intravenous methylprednisolone infusion (WAD II, III)  
- Cervical pillows  
- Immobilization, prescribed rest (>4 days), collars (>48 h)  
- Spray and stretch  
- Intra-articular and intrathecal steroid injections  
- Epidural steroid injections for WAD I, II  
- Steroid trigger point injection for patients in acute phase  
- Magnetic necklaces  
- Other interventions including Pilates, Feldenkrais, Alexander Technique, massage, homeopathy |
Clinical Practice Guidelines for Mild Traumatic Brain Injury and Persistent Symptoms [41,57]

Ontario Neurotrauma Foundation, Canada, 2008 (updated in 2013)

2001 to 2008 (update extended to 2013); Excluded non-systematic reviews (e.g. narrative reviews, clinical reviews), letters to editor, editorials without data

Health professionals including family physicians, neurologists, psychiatrists, psychologists, counselors, physio-therapists, occupational therapists, nurses

Adults (≥18 years of age) with mild traumatic brain injury

Emergency care, primary care

- Observation hourly in hospital for at least four hours post-injury (grade C)
- At four hours post-injury, if the patient has an A-WPTAS score of less than 18, but GCS is 15 and CT scan is normal, use judgment determine whether patient should be discharged (grade C)
- If CT is not indicated, discharge may be warranted if there are: (1) no other factors warranting a hospital admission; and (2) support structures for subsequent care (grade C)
- Upon discharge, patients receive advice verbally and on a written card. The details of the card should be discussed with the patient and care providers (communicate in other languages or means if necessary) (grade C)
- Encourage patients re-presenting to emergency with symptoms to see family physician for follow-up after discharge (grade C)
- Patients often experience reduced cognitive functioning post-injury (e.g. recalling material, speed of information processing, concentration, attention), which may take a few days to months before resolving (grade A)
- Consider factors including biopsychosocial, contextual and injury factors during management (grade A)
- Provide reassurance that recovery is generally over days to a few weeks (grade B), up to 3 months (grade A)
- Provide information on common symptoms and management strategies
- Advise patients to not drive for at least 24 hours (may require medical reassessment) (grade C)
- Follow symptomatic patients every 2–4 weeks from the time of initial contact until no longer symptomatic or until reassessment (grade C)
- Refer patients who have complications or persistent symptoms at 3 months for more comprehensive evaluation (grade A)
- Provide multidisciplinary treatment to patients with pre-injury psychiatric difficulties (grade A)
- Provide guidance on strategies for managing symptoms and resuming activity (grade A)
- Consider referral to specialist services when symptoms persist and fail to respond to treatment (grade C)
- Consider risk of depression, other mental health disorders or maladaptive psychological responses to injury during management (grade B)

2013 update:
- Significant, prolonged complaints after MTBI should lead primary care providers to consider that many factors may contribute to the persistence of post-concussive symptoms (grade A)
- All potential contributing factors should be investigated and a management strategy considered (grade A)
- All patients with persistent symptoms should be screened for mental health symptoms and disorders (grade C)
- Patients with persistent cognitive symptoms that continue to interfere in daily functioning should be considered for...
<table>
<thead>
<tr>
<th>Title of guideline</th>
<th>Guideline development group, country, year</th>
<th>Search period, study designs included</th>
<th>Target users</th>
<th>Target patient population</th>
<th>Healthcare setting</th>
<th>Treatment recommendations for common traffic injuries</th>
</tr>
</thead>
</table>
| Early Management of Patients with a Head Injury: A National Clinical Guideline [42] | Scottish Intercollegiate Guidelines Network, United Kingdom, 2009 | 2001 to 2007; Not specified | Health professionals involved in care of head injuries, including pre-hospital care, general practice, emergency departments, radiology, surgical and critical care specialties, paediatric and rehabilitation services, members of voluntary organizations, patients | Adults and children with mild, moderate and severe head injuries | Pre-hospital, emergency department, primary care, specialty care | Recommended:  
- Give patients, carers discharge advice/information in formats tailored to their needs (e.g. physical, mental, social)  
- Review and clarify discharge information with patient and relatives (for adult patients) or parent and carers (for children), ascertaining their understanding of the information  
- Send immediate discharge document to GP, in advance of a more detailed letter  
- Notify primary healthcare team, school health team and teachers of children with head injury  
- Encourage patients and carers seek prompt advice from GP or emergency department by telephone about worrying symptoms or concerns  
- Provide brief, routine follow-up with advice, education and reassurance that they are likely to recover  
- Adult patients can be discharged for observation at home with instructions if fully conscious (GCS = 15) with no risk or adverse factors  
- Observation requires a responsible adult who is available and willing to observe for at least 24h, with access to telephone, medical care and transport home  
- Each unit should have an agreed protocol for the management of agitation or aggression  
- Drug treatment should be individualized based on factors  |
| Head Injury: Triage, Assessment, Investigation and Early Management of Head Injury in Infants, Children and Adults (National Institute for Health and Clinical Excellence Clinical guideline 56) [45] | National Collaborating Centre for Acute Care, United Kingdom, 2007 | 1990 to 2007; All study designs | Health professionals in the National Health Service in England and Wales | Infants (<1 year of age), children (1–15 years of age) and adults (≥16 years of age) who present with suspected or confirmed traumatic head injury with or without other major trauma | Emergency department, hospital, primary care | Recommended:  
- Alert patients and carers that some patients make a quick recovery but go on to experience delayed complications  
- Inform patients and carers of possible long-term symptoms/diseases and available services  
- Include details of support services on patient discharge advice cards (use other formats and/or other languages if necessary)  
- Public health literature and non-medical sources of advice should encourage patients/carers with concerns to seek immediate medical advice  
- Information on the nature of head injury, any investigations and patient support organizations should be made available  
- Do not discharge patient until GCS = 15  
- For infants and young children, normal consciousness as assessed by pediatric GCS should be achieved before discharge  
- Refer to GP (and school nurse or health visitor for children) with letter or email for follow-up within 1 week after discharge  
- If problems persist, refer from primary care to professional trained in assessment and management of brain injury sequelae |

following traffic collisions, focusing on acute and post-traumatic stress disorders [44]. None of the other scientifically admissible guidelines addressed the management of post-collision anxiety. This guideline included the recommendation that first-line management should include psychological first aid, pharmacotherapy and cognitive behavioral therapy. The purpose of psychological first aid is to provide comfort, information and support to help patients cope with their injuries. Pharmacotherapy (where selective serotonin reuptake inhibitors are used first, followed by other antidepressants, if needed) was recommended to help: (1) alleviate symptoms (i.e. symptom clusters of arousal, re-experiencing and dissociation); (2) treat co-morbid conditions (i.e. depression, generalized anxiety and phobic disorders); and (3) prevent substance abuse. In addition, cognitive behavioral therapy (including cognitive therapy, exposure therapy and anxiety management) was recommended as a first-line intervention for all patients with anxiety after traffic collisions [44].

Interventions that were recommended against

Supportive counseling and eye movement desensitization and reprocessing were recommended against as first-line interventions for managing anxiety [44]. The use of relaxation training and biofeedback (when not in combination with another intervention), hypnotherapy, psychodynamic therapy and one-on-one psychological debriefing were also recommended against [44].

Guidelines for early management of MTBI

Two guidelines published in 2007 and 2009 addressed the early management of head injuries, including MTBI [42,45], and one guideline published in 2008 (updated in 2013) targeted both early and late management of MTBI [41]. Recommendations for early management pertain to in-hospital management, discharge and transition to at-home/primary care (Table 5).

Interventions that were recommended

One guideline recommended hourly observations until at least four hours post-injury for patients with MTBI first presenting to the emergency department [41]. The other two guidelines did not have recommendations for in-hospital observations specific to MTBI. All three guidelines advised not to consider discharge until patient scores on the Glasgow Coma Scale (GCS) equaled 15 for adults with MTBI [41,42,45]. One guideline recommended that normal consciousness (as assessed by the pediatric GCS) should be achieved before discharge for infants and young children with MTBI [45]. The other guidelines did not address discharge for infants or young children with MTBI. One guideline further recommended that at four hours post-injury, there should be: (1) no indication for a computed tomography scan (based on Canadian CT Head Rules [60]); (2) no factors warranting a hospital admission (e.g. drug or alcohol intoxication); and (3) the presence of support structures for subsequent care [41]. Subsequent care requires a responsible adult with access to telephone, medical care and transport home to observe an adult with MTBI for at least 24 hours [42]. One guideline advised that clinical judgment concerning discharge would be required if the patient has post-traumatic amnesia four hours post-injury [41]. Post-traumatic amnesia was defined as a score of less than 18 on the Abbreviated Westmead Post-traumatic Amnesia Scale [41]. The other two guidelines did not discuss post-traumatic amnesia specific to patients with MTBI.

Upon discharge, all guidelines recommended providing discharge advice and information to patients and caregivers [41,42,45]. Discharge advice about common symptoms and strategies to manage symptoms and resume activities should be provided verbally in addition to advice cards [41,42]. Advice should be tailored to individuals based on their individual preferences regarding language and communication approach, available resources, and other physical, mental and social needs [41,42,45]. Two guidelines recommended reassuring patients that they are likely to recover within days to a few weeks [41,45]. One guideline further recommended that reassurance and education should be provided within the first week of injury/initial assessment [41]. This guideline suggested that clinicians advise patients with MTBI that they could experience reduced cognitive functioning post-injury, which may take a few days to three months to resolve [41]. Examples of reduced cognitive function included problems with recalling material, speed of information processing, concentration and attention. The other two guidelines did not address reduced cognitive functioning specific to MTBI.

All guidelines advised clinicians to encourage patients to follow up with their physicians about worrisome symptoms or complications upon discharge [41,42,45]. Specifically, two guidelines recommended that emergency room physicians should send immediate discharge documentation to the patient’s general physician and recommended a follow-up with the physician within one week of discharge [42,45]. These two guidelines also recommended that primary healthcare teams, school health teams and teachers should be notified of the head injury for children with MTBI [42,45]. This notification should occur within one week of discharge [42,45].

One guideline recommended that patients should be advised to stop driving for at least 24 hours upon discharge [41]. A period longer than 24 hours is advised if there is loss of good judgment or motor skills, decreased intellectual capacity, post-traumatic seizures or visual impairment [41]. If there are complications, medical reassessment would be required before patients return to driving [41]. The other two guidelines did not address the issue of driving for patients with MTBI.

Guideline for MTBI after discharge from hospital

The Ontario Neurotrauma Foundation in Ontario, Canada, published a guideline in 2008 for the management of MTBI and persistent symptoms beyond the acute recovery period [41]. Persistent symptoms included post-traumatic headache, sleep disturbances, mental health disorders, cognitive difficulties, balance disorders, vision disorders, and fatigue.

None of the other guidelines addressed management of MTBI after discharge from the hospital. Symptomatic patients should be followed every two to four weeks until symptom resolution or the next reassessment. Referral to a specialized brain injury environment (definition not provided) for more comprehensive evaluation was recommended for patients with: (1) persistent symptoms at three months or (2) comorbidities or identified health or contextual risk factors (e.g. risk of mental health disorders) who did not improve after one month. This guideline recommended the referral to a specialized brain injury environment based on an adaptation of recommendations from another MTBI guideline, which was found inadmissible in our review [50].

Additional considerations were required for individuals who experience persistent symptoms or difficulties [41]. Primary care providers should rule out other contributing or confounding factors with patients experiencing prolonged complaints after MTBI. These factors included certain pre-existing medical conditions, post-injury symptoms, and personal, psychosocial or environmental factors that are associated with poor outcomes post-MTBI. Moreover, patients with pre-injury psychiatric difficulties should be provided with an early referral to a multidisciplinary treatment clinic capable of managing post-MTBI symptoms. A return to work program (including a referral to an occupational therapist) should occur for individuals...
Table 4. Recommendations from admissible guidelines for the management of WAD I–III.a

<table>
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<th>Stage or grade of WAD</th>
<th>Advice, education or reassurance</th>
<th>Return to activity, mobility or exercise</th>
<th>Collars</th>
<th>Joint mobilization or manipulation</th>
<th>Soft tissue therapies</th>
<th>Massage</th>
<th>Simple analgesics</th>
<th>NSAIDs</th>
<th>Opioid or narcotic analgesics</th>
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<th>Heat or Ice</th>
<th>TENS</th>
<th>Cervical pillows</th>
<th>Traction</th>
<th>Pulsed electro-magnetic therapy</th>
<th>Short wave diathermy</th>
<th>Infrared light</th>
<th>Interferential therapy</th>
<th>Laser</th>
<th>Ultrasound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered Society of Physio-therapists, 2004 [54]</td>
<td>Acute</td>
<td>RC</td>
<td>RA</td>
<td>NE</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Sub-acute</td>
<td>RC</td>
<td>R</td>
<td>NE</td>
<td></td>
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<tr>
<td></td>
<td>Chronic</td>
<td>NE</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>WAD I</td>
<td>R</td>
<td>RA</td>
<td>RA/NE</td>
<td>RC</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>WAD II</td>
<td>R</td>
<td>RA</td>
<td>RA/NE</td>
<td>RC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>WAD III</td>
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<td>RA/NE</td>
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<td></td>
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</tr>
<tr>
<td>Quebec Task Force, 1995 [46]</td>
<td>WAD I</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>RA</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
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<tr>
<td></td>
<td>WAD II</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>RA</td>
<td>NE</td>
<td>NE</td>
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<tr>
<td></td>
<td>WAD III</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>RA</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Australian Centre for Trauma and Injury Recovery, 2008 [40]</td>
<td>Acute</td>
<td>RC</td>
<td>RA</td>
<td>RA</td>
<td>RA</td>
<td>RA</td>
<td>RA</td>
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<tr>
<td></td>
<td>Chronic</td>
<td>RA</td>
<td>RA</td>
<td>RA</td>
<td>RC</td>
<td>RC</td>
<td>RC</td>
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</table>

<table>
<thead>
<tr>
<th>Stage or grade of WAD</th>
<th>Thermo-therapy</th>
<th>Electrical stimulation</th>
<th>EMG biofeedback</th>
<th>Cognitive behavioral therapy</th>
<th>Relaxation techniques</th>
<th>Vestibular rehabilitation</th>
<th>Psychosocial interventions</th>
<th>Spray and stretch</th>
<th>Acupuncture</th>
<th>Magnetic necklaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered Society of Physio-therapists, 2004 [54]</td>
<td>Acute</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>RC</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td></td>
<td>Sub-acute</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
<td>RA/NE</td>
<td>RC</td>
<td>RA/NE</td>
<td>RC</td>
<td>RA/NE</td>
<td>RC</td>
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<tr>
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<td>NE</td>
<td>NE</td>
<td>RA/NE</td>
<td>RC</td>
<td>RA/NE</td>
<td>RC</td>
<td>RA/NE</td>
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<tr>
<td>Motor Accidents Authority, 2007 [43]</td>
<td>WAD I</td>
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<td>NE</td>
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<td></td>
<td>WAD II</td>
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<td>NE</td>
<td>NE</td>
<td>NE</td>
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<td>NE</td>
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<tr>
<td></td>
<td>WAD III</td>
<td>NE</td>
<td>NE</td>
<td>NE</td>
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<td>NE</td>
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<tr>
<td>Quebec Task Force, 1995 [46]</td>
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<td>NE</td>
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<tr>
<td></td>
<td>WAD III</td>
<td>NE</td>
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<td>NE</td>
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<tr>
<td>South Australian Centre for Trauma and Injury Recovery, 2008 [40]</td>
<td>Acute</td>
<td>RC</td>
<td>RC</td>
<td>RC</td>
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<td>RC</td>
<td>RC</td>
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<tr>
<td></td>
<td>Chronic</td>
<td>RA</td>
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<td>RC</td>
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<td>RC</td>
<td>RC</td>
<td>RC</td>
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</tr>
</tbody>
</table>
We conducted a rigorous search and critical appraisal of the literature to evaluate the methodological quality of recommendations from clinical practice guidelines for the management of traffic injuries. It was not our aim to accept or reject recommendations of the guidelines. Instead, we aimed to provide an evidence-based overview of the methodological quality of these guidelines and the criteria used to make recommendations. The guideline review process was conducted according to the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument [57].

The majority of guidelines were scientifically admissible. Most guidelines were published in the last 10 years, which may reflect a recent increase in the number of guidelines addressing traffic injuries. We found several methodological flaws in the guidelines that compromised internal validity and external validity.

We recommend that health providers, policymakers, and other stakeholders consider the methodological quality of clinical practice guidelines when making decisions about patient care. Our findings highlight the need for more rigorously developed guidelines that are scientifically admissible and have a systematic approach to literature searches.

Future research should focus on developing a standardized approach to the development of clinical practice guidelines for traffic injuries. The goals of this approach should be to ensure the internal validity and external validity of guidelines and to promote the development of evidence-based guidelines that are useful for health providers and patients.

Clinical practice guidelines for the management of conditions related to traffic collisions

For personal use only.
Table 5. Recommendations from admissible guidelines for the early management of MTBI (in adults).

<table>
<thead>
<tr>
<th>Communication</th>
<th>Discharge criteria of MTBI</th>
<th>In-hospital observation criteria</th>
<th>Additional discharge criteria</th>
<th>Discharge advice</th>
<th>Referral to expert</th>
<th>Treatment for persistent symptoms</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seek immediate medical advice for persistent symptoms</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advise patients regarding reduced cognitive functioning</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Referral to expert in brain injuries</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cause driving for 24 + hours</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge advice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home support after discharge</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No risk or likelihood of adverse factors</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge criteria of GCS = 15</td>
<td>Recommended</td>
<td>R</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Notes: R – Recommended; RR – Required. Empty cells indicate that the intervention was not mentioned in the guideline.

The recommendations may be considered for individuals with MTBI from various mechanisms of injury (e.g. traffic collisions, falls, sports). However, it is recognized that traffic collisions and falls are the main causes of MTBI [5].

The need for trustworthiness of guidelines in general has been emphasized, since they are used to guide decisions about patients, practice measures, insurance coverage and reimbursement [18]. Attempts have been made to raise the quality of guideline development in order to improve users’ trust in guidelines. The Institute of Medicine and the American Cancer Society have adopted standards for objective, scientifically valid and consistent guideline development [18,63]. Similarly, the AGREE system has provided the most widely accepted standards for appraising quality of guidelines since 2003 [32]. Our systematic review found that the majority (6/8) of inadmissible guidelines were published after 2003. Although AGREE was widely promoted during that period, 50% (8/16) [47–50,52,53,56,59] of our eligible guidelines did not fully use recommended methodology. Our results are similar to a recent study that evaluated 130 randomly selected guidelines and determined that there was poor adherence to Institute of Medicine standards [64]. Kung and co-authors have suggested that concerted efforts from medical societies and government agencies are needed to improve adherence to guideline standards [64]. This would help ensure that guideline developers become familiar with guideline standards and that they meet these standards using objective and transparent methods.

The fundamental aspects of guideline development involve the assembling, evaluating and summarizing of evidence [18]. These aspects include a systematic review and assessment of the quality of evidence [18]. Our systematic review identified a significant proportion of guidelines that failed to satisfy this fundamental requirement. Specifically, we identified 10 guidelines deemed ineligible for review due to the absence of systematic literature searches or critical appraisal methods. Almost 50% more guidelines would meet the selection criteria of our review if these guidelines included these fundamental steps. Furthermore, more than half of the inadmissible guidelines had inadequate systematic literature searches [47,49,52,56] and most inadmissible guidelines had poor critical appraisal methods [47–50,52,53,59]. Critical appraisal methods using a validated tool are recommended to ensure that included studies are of adequate quality and appropriate for use in the guideline [65]. Specifically, these methods assess systematic reviews, randomized trials, cohort studies and/or case-control studies for risks of selection, measurement and confounding bias [66]. Adequate systematic review methods should be performed to help ensure that recommendations accurately reflect the underlying evidence.

Some recommendations varied or conflicted even among admissible guidelines that pertained to the same traffic condition. A number of factors may be influencing these conflicting recommendations. Kung and co-authors determined that fewer than half of reviewed guidelines addressed competing interests [64]. They also determined that over two-thirds of committee chairpersons had conflicts of interest among the competing interests that were reported [64]. We also identified potential competing interests that were not reported, even among guidelines that were deemed admissible. Similarly, Shaneyfelt et al. [21] described the need for judgement around the importance and weight of certain outcomes during guideline development. The priority assigned to outcomes may vary among guideline developers, which was thought to be the reason for conflicting recommendations between certain cancer screening guidelines [21]. Furthermore, it has been suggested that guidelines require
Disability and Rehabilitation: 2014; 36(12): 1103-1114

Clinical practice guidelines for the management of conditions related to traffic collisions

Angela Verven. The authors would also like to thank Trish Johns-Wilson at the University of Ontario Institute of Technology for her review of the search strategy.

Declaration of interest

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References


45. Agency for Healthcare Research and Quality (AHRQ). Triage, assessment, investigation and early management of head injury in infants, children and adults. Available from: http://guideline.gov/content.aspx?id=11468&search=(collision*+or+crash+or+crashes+or+mv*+or+accident*+or+vehicle*+or+automobile*+or+car+or+truck*+or+bus*+or+traffic*+or+motor+cycle*) [last accessed 2 Sep 2013].


Appendix IA: MEDLINE search strategy – search terms for traffic injuries

(1) exp Whiplash Injuries/
(2) exp Neck Injuries/
(3) exp Neck Pain/
(4) Neck Muscles/in [Injuries]
(5) exp Cervical Vertebrae/in [Injuries]
(6) exp Radiculopathy/
(7) exp Brachial Plexus Neuropathies/
(8) exp Torticolis/
(9) Headache/
(10) whiplash.ab,ti.
(11) "neck injur+".ab,ti.
(12) "neck pain+".ab,ti.
(13) "cervical pain+".ab,ti.
(14) "neck ache+".ab,ti.
(15) "neckache+".ab,ti.
(16) "cervicalgia+".ab,ti.
(17) "cervicodynia+".ab,ti.
(18) "radiculopath+".ab,ti.
(19) "brachial plexus neuropath+".ab,ti.
(20) torticolis.ab,ti.
(21) "headache+".ab,ti.
(22) 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
(23) exp Practice Guidelines as Topic/
(24) exp Guideline Adherence/
(25) exp Consensus Development Conference/ or exp Consensus/ or exp Consensus Development Conferences as Topic/
(26) exp Clinical Protocols/
(27) exp Evidence-Based Medicine/
(28) exp Health Planning Guidelines/
(29) guideline.pt.
(30) practice guideline.pt.
(31) consensus development conference.pt.
(32) (guideline* adj3 (clinical or consensus or practice or development of validate* or standard*)).ab,ti.
Domain 4. Clarity of presentation

14. A procedure for updating the guideline is provided.

13. The guideline has been externally reviewed by experts prior to its publication.

12. The methods for formulating the recommendations are clearly described.

11. The health benefits, side effects and risks have been considered in formulating the recommendations.

10. The methods for formulating the recommendations are clearly described.

9. The strengths and limitations of the body of evidence are clearly described.

8. The criteria for selecting the evidence are clearly described.

7. Systematic methods were used to search for evidence.

6. The target users of the guideline are clearly defined.

5. The views and preferences of the target population (patients, public, etc.) have been sought.

4. The guideline development group includes individuals from all the relevant professional groups.

3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

2. The health question(s) covered by the guideline is (are) specifically described.

1. The overall objective(s) of the guideline is (are) specifically described.

Appendix IIIB: Québec task force classification of grades of whiplash-associated disorders [46]

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Subjects with neck pain and associated symptoms in the absence of objectively physical signs</td>
</tr>
<tr>
<td>II</td>
<td>Subjects with neck pain and associated symptoms in the presence of objective physical signs and without evidence of neurollogical involvement</td>
</tr>
<tr>
<td>III</td>
<td>Subjects with neck pain and associated symptoms with evidence of neurollogical involvement including decreased or absent reflexes, decreased or limited sensation or muscular weakness</td>
</tr>
<tr>
<td>IV</td>
<td>Subjects with neck pain and associated symptoms with evidence of fracture or dislocation</td>
</tr>
</tbody>
</table>

Appendix III: The AGREE II instrument [32,33]

AGREE II Domains and Items

Domain 1. Scope and purpose

1. The overall objective(s) of the guideline is (are) specifically described.

2. The health question(s) covered by the guideline is (are) specifically described.

3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

Domain 2. Stakeholder involvement

4. The guideline development group includes individuals from all the relevant professional groups.

5. The views and preferences of the target population (patients, public, etc.) have been sought.

6. The target users of the guideline are clearly defined.

Domain 3. Rigor of development

7. Systematic methods were used to search for evidence.

8. The criteria for selecting the evidence are clearly described.

9. The strengths and limitations of the body of evidence are clearly described.

10. The methods for formulating the recommendations are clearly described.

11. The health benefits, side effects and risks have been considered in formulating the recommendations.

12. There is an explicit link between the recommendations and the supporting evidence.

13. The guideline has been externally reviewed by experts prior to its publication.

14. A procedure for updating the guideline is provided.

Domain 4. Clarity of presentation

15. The recommendations are specific and unambiguous.

16. The different options for management of the condition or health issue are clearly presented.

17. Key recommendations are easily identifiable.

(continued)
AGREE II Domains and Items

Domain 5. Applicability

18. The guideline provides advice and/or tools on how the recommendations can be put into practice.
19. The guideline describes facilitators and barriers to its application.
20. The potential resource implications of applying the recommendations have been considered.
21. The guideline presents monitoring and/or auditing criteria.

Domain 6. Editorial independence

22. The views of the funding body have not influenced the content of the guideline.
23. Competing interests of guideline development group members have been recorded and addressed.

AGREE – Appraisal of Guidelines for Research and Evaluation.