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Appendix A—Literature Search Details

The review of the evidence for this CPG encompassed a consideration of the range of physical impairments that may be relevant when making a differential diagnosis after a concussive event, with the goal of determining the underlying cause(s) of presenting signs and symptoms and matching them with intervention priorities. The GDG worked with a librarian from the University of North Carolina at Chapel Hill to engage in the two phases of the literature search process (Preliminary Searches and Systematic Searches) as recommended by the APTA Clinical Practice Guideline Process Manual. EndNote X8 (Clarivate Analytics; Boston, Massachusetts) and DistillerSR software (Evidence Partners; Ottawa, Ontario, Canada) were used to manage the literature searches, coordinate evidence selection, carry out critical appraisals, and store notes and information about the evidence sources.

The first phase of the literature searching process was conducted in October of 2014 and entailed preliminary searches to help determine the extent to which a reasonable body of evidence was present to support the development of a guideline and identify existing guidelines and systematic reviews available at the time on concussion management. The preliminary searches explored the use of the following key words separately and in various combinations: “concussion,” “mild traumatic brain injury,” “mild closed head injury,” “rehabilitation,” “physical therapy,” “physiotherapy,” and “exercise.” Databases searched included PubMed, SportDiscus, and PsychInfo. The preliminary searches helped identify previously published CPGs, systematic reviews, and meta-analyses pertaining to the topic of concussion. From these preliminary searches, the GDG refined the scope and plan for the CPG and developed a formal strategy for the second phase.

The second phase entailed iterative systematic searches performed for studies up through April 30th, 2015; May 1st, 2015 – October 31st, 2015; November 1st, 2016 - March 31st, 2017; April 1st, 2017 – April 30th, 2018; and May 1st, 2018 - December 31, 2018. The second phase searches entailed the high-level key word searches from Phase 1 and added the following additional search terms separate and in combination to ensure a wide breadth and comprehensive search process to capture impairments in vestibular, cervical, physical exertion, and functional mobility. The electronic systematic searches were supplemented through manual searching of journals and bibliographies, Google and Google Scholar searches, and word-of-mouth.
**SEARCH STRATEGIES FOR ALL DATABASES SEARCHED**

**MEDLINE, CINAHL, EMBASE**

<table>
<thead>
<tr>
<th>Search Strategy</th>
<th>Details</th>
</tr>
</thead>
</table>

Searches related to common impairment patterns

Expanded search to include SPORTDISCUS, PSYCHINFO

<table>
<thead>
<tr>
<th>Impairment Pattern</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical and dizziness, cervical and concussion, cervical and mTBI, cervicogenic dizziness and concussion, cervicogenic and mTBI</td>
<td></td>
</tr>
<tr>
<td>Balance and concussion, balance and mTBI, balance and cervical</td>
<td></td>
</tr>
<tr>
<td>Dizziness and concussion, dizziness and mTBI, vertigo and concussion, vertigo and mTBI</td>
<td></td>
</tr>
<tr>
<td>Concussion and Fatigue, concussion and mTBI, concussion and exertion, exertion and mTBI</td>
<td></td>
</tr>
<tr>
<td>Dual task and concussion, dual task and mTBI</td>
<td></td>
</tr>
<tr>
<td>Vision and concussion, vision and mTBI, Ocular motor and concussion, ocular motor and mTBI</td>
<td></td>
</tr>
</tbody>
</table>

**Cervical Complications**

<table>
<thead>
<tr>
<th>Search Strategy</th>
<th>Details</th>
</tr>
</thead>
</table>

**Balance**

<table>
<thead>
<tr>
<th>Search Strategy</th>
<th>Details</th>
</tr>
</thead>
</table>
Appendix B—Search Results

<table>
<thead>
<tr>
<th>Date Conducted</th>
<th>Results with all Databases Combined, Duplicates Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 30th, 2015</td>
<td>210</td>
</tr>
<tr>
<td>October 31st, 2015</td>
<td>823</td>
</tr>
<tr>
<td>March 31st, 2017</td>
<td>103</td>
</tr>
<tr>
<td>December 31, 2018</td>
<td>1136</td>
</tr>
<tr>
<td>Total</td>
<td>2,272</td>
</tr>
</tbody>
</table>

Appendix C—Article Inclusion and Exclusion Criteria

Inclusion Criteria

Clinical Practice Guidelines:
- Published January 1, 2015 or later
- Included a multi-disciplinary team for authorship
- Recommendations based off of a systematic review and appraisal of the literature
- Included recommendations that pertained to movement-related impairments
- Determined to be acceptable based on critical appraisal by two trained independent reviewers using criteria on the AGREE II tool

Original Studies and Systematic Reviews
- Included human participants with clear designation of a concussion or history of concussive event
- Two trained independent reviewers appraised it as relevant to scope of the CPG
- Critical review of document by two trained independent reviewers appraised it as an acceptable level of quality for inclusion

Expert Consensus Documents
- Two trained independent reviewers appraised it as relevant to scope of the CPG
- Based off of a systematic search of the literature OR a Delphi study methodology
- Described sound methods for consensus generation
- Adequate evidence of applicable expertise of participants/authors was provided
- Critical review of document by two trained independent reviewers appraised it as an acceptable level of quality for inclusion

Conceptual and Theoretical Documents:
- Two trained independent reviewers appraised it as relevant to scope of the CPG
- Source perceived as trustworthy
- Critical review of document by two trained independent reviewers appraised it as an acceptable level of quality for inclusion

Exclusion Criteria
- Not available in English
- Determined to not be relevant for the CPG scope by two independent reviewers
- Inclusion of only healthy participants (no participants with history of concussive event)
- No clear delineation of outcomes specific to individuals with concussion/mild traumatic brain injury when the study also included participants with more severe brain injury
- Participants or target population mean age younger than 8 years of age
- Case study/series with fewer than four participants
- Commentary that was not evidence-based
- Critical appraisal resulted in rating of unacceptable quality

**Appendix C—Flow Chart of Articles**

```
2,272
Titles and abstracts screened after duplicates removed

432
Selected for full-text review

73
Articles identified through hand search

135
Selected for inclusion for recommendations

370 Excluded:
- Outside of scope/Background only (317)
- Not specific to concussion (17)
- Unacceptable quality (10)
- Commentary that was not evidence-based (21)
- Case study/series with fewer than 4 participants (5)
```

**Appendix D—Articles Included in Recommendations by Topic**

**COMPONENT 1: DETERMINE APPROPRIATENESS OF PHYSICAL THERAPY EXAMINATION**

*Early Diagnosis*


Screen for Indicators of Emergency Conditions

Determination of Appropriateness of Concussion Diagnosis

Comprehensive Intake Interview
COMPONENT 2: EXAMINATION AND EVALUATION

Systems to be Examined


Sequencing of Examination Based on Levels of Irritability


**Examination for Vestibulo-oculomotor Impairments**


**Examination for Exertional Tolerance**


**Examination for Motor Function Impairments**


**Classification**

**Psychological and Sociological Factors**
Outcome Measure Selection


COMPONENT 3: PLAN OF CARE DEVELOPMENT AND IMPLEMENTATION

Communication and Education


**Physical Therapy Interventions for Movement-Related Impairments**


**Cervical Musculoskeletal Interventions**


**Vestibulo-oculomotor Interventions**


**Exertional Tolerance and Aerobic Exercise Interventions**


Motor Function

Appendix E—Levels of Evidence Table
## Appendix F—Procedures for Assigning Levels of Evidence

<table>
<thead>
<tr>
<th>Level</th>
<th>Intervention/Prevention</th>
<th>Pathoanatomic/Risk/Clinical Course/Prognosis/Differential Diagnosis</th>
<th>Diagnosis/Diagnostic Accuracy</th>
<th>Prevalence of Condition/Disorder</th>
<th>Examination/Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Systematic review of high-quality RCTs High-quality RCT(^b)</td>
<td>Systematic review of prospective cohort studies High-quality prospective cohort study (^d)</td>
<td>Systematic review of high-quality diagnostic studies High-quality diagnostic study(^d) with validation</td>
<td>Systematic review of high-quality cross-sectional studies High-quality cross-sectional study(^d)</td>
<td>Systematic review of prospective cohort studies High-quality prospective cohort study</td>
</tr>
<tr>
<td>II</td>
<td>Systematic review of high-quality cohort studies High-quality cohort study(^d) Outcomes study or ecological study Lower-quality RCT(^d)</td>
<td>Systematic review of retrospective cohort study Lower-quality prospective cohort study Consecutive cohort High-quality retrospective cohort study Consecutive cohort Consecutive cohort Consecutive cohort</td>
<td>Systematic review of exploratory diagnostic studies or consecutive cohort studies High-quality exploratory diagnostic studies Consecutive retrospective cohort</td>
<td>Systematic review of studies that allows relevant estimate Lower estimate Lower estimate Lower estimate Lower estimate</td>
<td>Systematic review of lower-quality prospective cohort studies Lower-quality prospective cohort study</td>
</tr>
<tr>
<td>III</td>
<td>Systematic reviews of case-control studies High-quality case-control study Lower-quality cohort study</td>
<td>Lower-quality retrospective cohort study High-quality cross-sectional study Case-control study</td>
<td>Lower-quality exploratory diagnostic studies Nonconsecutive retrospective cohort</td>
<td>Local nonrandom study High-quality cross-sectional study</td>
<td>High-quality cross-sectional study</td>
</tr>
<tr>
<td>IV</td>
<td>Case series</td>
<td>Case series</td>
<td>Case-control study ...</td>
<td>Lower-quality cross-sectional study</td>
<td>Lower-quality cross-sectional study</td>
</tr>
<tr>
<td>V</td>
<td>Expert opinion</td>
<td>Expert opinion</td>
<td>Expert opinion</td>
<td>Expert opinion</td>
<td>Expert opinion</td>
</tr>
</tbody>
</table>

Abbreviation: RCT, randomized clinical trial.

*Adapted from Phillips et al*\(^6\) (http://www.cebm.net/index.aspx?o=1021). See also Appendix G.

1. High quality includes RCTs with greater than 80% follow-up, blinding, and appropriate randomization procedures.
2. High-quality cohort study includes greater than 80% follow-up.
3. High-quality diagnostic study includes consistently applied reference standard and blinding.
4. High-quality prevalence study is a cross-sectional study that uses a local and current random sample or census.
5. Weaker diagnostic criteria and reference standards, improper randomization, no blinding, and less than 80% follow-up may add bias and threats to validity.
Appendix H—Appraisals

Tables in progress—Completed tables will provide critical appraisal process summaries for all included articles.