**WEB APPENDIX:**

Level of Evidence Summary Table for Studies of Risk

**Lumbar and Cervical Degeneration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Methodological Principle | Coric (2011) | Eckman (2009) | Kanayama (2001) | Kim (2009) | Maldonado (2011) | Park (2012) | Satoh (2006) |
| Study design |  |  |  |  |  |  |  |
| Prospective cohort study  | √ | √ |  | √ | √ | √ |  |
| Retrospective cohort study |  |  | √ |  |  | √ | √ |
| Case-series  |  |  |  |  |  |  |  |
| Patients at similar point in the course of their disease or treatment | √ | √ | √ | √ | √ | √ | √ |
| Patients followed long enough for outcomes to occur | √ | √ | √ |  | √ | √ | √ |
| Complete follow-up of >80% | √ | √ |  |  | √ |  |  |
| Accounting for other prognostic factors\* | √ | √ | √ | √ | √ | √ | √ |
| Evidence Level | I | I | III | III | I | III | III |

\*Authors must consider other factors that might influence patient outcomes.

**Trauma**

|  |  |  |  |
| --- | --- | --- | --- |
| Methodological Principle | Koller (2009) | Goffin (1995) | Song (2010) |
| Study design |  |  |  |
| Prospective cohort study  |  | √ |  |
| Retrospective cohort study | √ |  | √ |
| Case-series  |  |  |  |
| Patients at similar point in the course of their disease or treatment | √ | √ | √ |
| Patients followed long enough for outcomes to occur | √ | √ | √ |
| Complete follow-up of >80% | √ |  |  |
| Accounting for other prognostic factors\* | √ |  |  |
| Evidence Level | II | III | III |

\*Authors must consider other factors that might influence patient outcomes.

**Congenital Fusion (Klippel-Feil Syndrome)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Methodological Principle | Guille (1995) | Ritterbusch (1991) | Rouvreau (1998) | Ulmer (1993) | Pizzutillo (1994) |
| Study design |  |  |  |  |  |
| Prospective cohort study  |  |  |  |  |  |
| Retrospective cohort study | √ | √ | √ | √ | √ |
| Case-series  |  |  |  |  |  |
| Patients at similar point in the course of their disease or treatment | √ | √ | √ | √ | √ |
| Patients followed long enough for outcomes to occur | √ | √ | √ | √ | √ |
| Complete follow-up of >80% |  |  |  |  | √ |
| Accounting for other prognostic factors\* | √ | √ | √ | √ | √ |
| Evidence Level | III | III | III | III | II |

\*Authors must consider other factors that might influence patient outcomes.

**Pediatric Conditions (Adolescent Idiopathic Scoliosis)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Methodological Principle | Helgeson (2010 | Hollenbeck (2008) | Kim (2005) | Lee (1999) | Wang (2010) | Kim (2007) |
| Study design |  |  |  |  |  |  |
| Prospective cohort study  |  |  |  |  |  |  |
| Retrospective cohort study | √ | √ | √ | √ | √ | √ |
| Case-series  |  |  |  |  |  |  |
| Patients at similar point in the course of their disease or treatment | √ | √ | √ | √ | √ | √ |
| Patients followed long enough for outcomes to occur |  | √ | √ |  |  |  |
| Complete follow-up of >80% |  | √ |  |  | √ |  |
| Accounting for other prognostic factors\* | √ | √ | √ | √ | √ | √ |
| Evidence Level | III | II | III | III | III | III |

\*Authors must consider other factors that might influence patient outcomes.

Level of evidence for Prognostic Studies

|  |  |
| --- | --- |
|  | **Studies of Prognosis** |
| **Level** | **Study design** | **Criteria** |
| **I** | Good quality cohort\* | * Prospective design
* Patients at similar point in the course of their disease or treatment
* F/U rate of 80%+†
* Patients followed long enough for outcomes to occur
* Accounting for other prognostic factors‡
 |
| **II** | Moderate quality cohort | * Prospective design, with violation of one of the other criteria for good quality cohort study
* Retrospective design, meeting all the rest of the criteria in level I
 |
| **III** | Poor quality cohortGood quality case-control or cross-sectional study | * Prospective design with violation of 2 or more criteria for good quality cohort, or
* Retrospective design with violation of 1 or more criteria for good quality cohort
* A good case-control study§
* A good cross-sectional study\*\*
 |
| **IV** | Poor quality case-control or cross-sectionalCase series§ | * Other than a good case-control study
* Other than a good cross-sectional study
* Any case series†† design
 |
|

\*Cohort studies follow individuals with the exposure of interest over time and monitor for occurrence of the outcome of interest.

†Applies to cohort studies only.

‡Authors must consider other factors that might influence patient outcomes.

§A good case-control study must have the all of the following: all incident cases from the defined population over a specified time period, controls that represent the population from which the cases come, exposure that precedes an outcome of interest, and accounting for other prognostic factors.

\*\*A good cross-sectional study must have all of the following: a representative sample of the population of interest, an exposure that precedes an outcome of interest (e.g., sex, genetic factor), an accounting for other prognostic factors, and for surveys, at least a 80% return rate.

††A case-series design for prognosis is one where all the patients in the study have the exposure of interest. Since all the patients have the exposure, risks of an outcome can be calculated only for those with the exposure, but cannot be compared with those who do not have the exposure. For example, a case-series evaluating the effect of smoking on spine fusion that only recruits patients who smoke can simply provide the risk of patients who smoke that result in pseudarthrosis but cannot compare this risk to those that do not smoke.

**EXCLUDED STUDIES AFTER FULL TEXT REVIEW**

|  |  |
| --- | --- |
| **Author** | **Reason for exclusion** |
| **Congenital** |  |
| Samartzis 06 | no radiographic evaluation of ASDeg |
| Van Kerckhoven 89 | no radiographic evaluation of ASDeg |
| Samartizis 08 | no radiographic evaluation of ASDeg |
| Samartizis 11 | no radiographic evaluation of ASDeg |
| **Adolescents** |  |
| Winter 73 | no radiographic evaluation of ASDeg |
| Anderson 06 | no follow-up as an adult |
| **Trauma** |  |
| Liu 2010 | kypho-vertebroplasty |
| Campbell 2008 | review |
| Nakase 2006 | only 2 patients with trauma |
| Cho 2011 | no incidence stratified by trauma |
| Hauerberg 2008 | no incidence stratified by trauma |
| Lunsford 1980 | no ASDeg reported |
| Ahn 2011 | fracture as an outcome |
| Goffin 2004 | trauma and degeneration patients – results not segregated |
| Moller 2007 | no fusion following fracture |
| Toyone 2010 | fracture as an outcome |
| Fürderer 2001 | no fusion following fracture |
| Oner 1998 | no evaluation of adjacent level |
| **Degeneration** |  |
| Kadanka 11 | no radiographic evaluation of ASD |
| Kadanka 02 | no radiographic evaluation of ASD |
| Wu 11 | no radiographic evaluation of ASD |
| Kadanka 00 | no radiographic evaluation of ASD |
| Persson 97 | no radiographic evaluation of ASD |
| Persson 97 | no radiographic evaluation of ASD |
| Amundsen | no radiographic evaluation of ASD |
| Atlas 2000 | no radiographic evaluation of ASD |
| Atlas 2005 | no radiographic evaluation of ASD |
| Atlas 2005 | no radiographic evaluation of ASD |
| Chang | no radiographic evaluation of ASD |
| Herno | no radiographic evaluation of ASD |
| Slatis | no radiographic evaluation of ASD |
| Weinstein 07 | no radiographic evaluation of ASD |
| Weinstein 08 | no radiographic evaluation of ASD |
| Osterman | no radiographic evaluation of ASD |
| Brox 2010 | no radiographic evaluation of ASD |
| Ekman 05 | no radiographic evaluation of ASD |
| Harris | no radiographic evaluation of ASD |
| Brox | no radiographic evaluation of ASD |
| Fairbank | no radiographic evaluation of ASD |
| Fritzell | no radiographic evaluation of ASD |
| Malmivaara | no radiographic evaluation of ASD |
| Moller | no radiographic evaluation of ASD |
| Ohtori | no radiographic evaluation of ASD |
| Peul 08 | no radiographic evaluation of ASD |
| Peul 07 | no radiographic evaluation of ASD |
| Zucherman | no radiographic evaluation of ASD |
| Zucherman | no radiographic evaluation of ASD |