



TITLE: Screening and Tracking Technologies for Scoliosis in Children: Clinical Effectiveness and Guidelines

DATE: 14 March 2016

RESEARCH QUESTIONS

1. What is the comparative clinical effectiveness for the use of smartphone applications, smartphones with acrylic sleeves, scoliometers, and radiology or x-ray for screening and tracking changes in children with scoliosis?
2. What are the evidence-based guidelines for screening and tracking changes in children with scoliosis?

KEY FINDINGS

One evidence-based guideline was identified regarding the use of radiography to screen for scoliosis in children. No relevant health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, or non-randomized studies were identified.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. A guidelines filter was added to question #2 to limit the search by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2011 and March 7, 2016. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

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SELECTION CRITERIA

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

| Table 1: Selection Criteria | |
|------------------------------------|---|
| Population | Children (age 0-18 years) with scoliosis (congenital, neuromuscular, degenerative, or idiopathic) |
| Intervention | Scoliometer or smartphone scoliometer application; Smartphone scoliometer app with acrylic sleeve |
| Comparator | Radiology or x-ray |
| Outcomes | Q1: Clinical effectiveness; Q2: Guidelines for practice |
| Study Designs | Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, evidence-based guidelines |

RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, and evidence-based guidelines.

One evidence-based guideline was identified regarding the use of radiography to screen for scoliosis in children. No relevant health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, or non-randomized studies were identified.

Additional references of potential interest are provided in the appendix.

OVERALL SUMMARY OF FINDINGS

One guideline¹ was identified regarding EOS 2D/3D imaging system for persons with spinal deformities. This guideline refers to the American College of Radiology Practice Guidelines for the Performance of Radiography for Scoliosis in Children, which recommends posteroanterior and lateral radiography of the spine for screening or initial examination for scoliosis in children.¹

REFERENCES SUMMARIZED

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

No literature identified.

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

No literature identified.

Guidelines and Recommendations

1. The EOS 2D/3D imaging system [Internet]. London: National Institute for Health and Care Excellence; 2011 Oct 26. [cited 2016 Mar 11]. (NICE diagnostic guidance DG1). Available from: <https://www.nice.org.uk/guidance/dg1/resources/the-eos-2d3d-imaging-system-29267263429>
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APPENDIX – FURTHER INFORMATION:**Systematic Review – Alternate Outcome**

2. Prowse A, Pope R, Gerdhem P, Abbott A. Reliability and validity of inexpensive and easily administered anthropometric clinical evaluation methods of postural asymmetry measurement in adolescent idiopathic scoliosis: a systematic review. *Eur Spine J.* 2016 Feb;25(2):450-66.
[PubMed: PM25917824](#)

Non-Randomized Studies*Other Comparator*

3. Balg F, Juteau M, Theoret C, Svtelis A, Grenier G. Validity and reliability of the iPhone to measure rib hump in scoliosis. *J Pediatr Orthop.* 2014 Dec;34(8):774-9.
[PubMed: PM24787301](#)
4. Driscoll M, Fortier-Tougas C, Labelle H, Parent S, Mac-Thiong JM. Evaluation of an apparatus to be combined with a smartphone for the early detection of spinal deformities. *Scoliosis.* 2014;9:10. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4113777>
[PubMed: PM25075208](#)
5. Qiao J, Xu L, Zhu Z, Zhu F, Liu Z, Qian B, et al. Inter- and intraobserver reliability assessment of the axial trunk rotation: manual versus smartphone-aided measurement tools. *BMC Musculoskelet Disord.* 2014;15:343. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4198676>
[PubMed: PM25305758](#)
6. Chowanska J, Kotwicki T, Rosadzinski K, Sliwinski Z. School screening for scoliosis: can surface topography replace examination with scoliometer? *Scoliosis.* 2012;7(1):9. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3349618>
[PubMed: PM22472020](#)
7. Franko OI, Bray C, Newton PO. Validation of a scoliometer smartphone app to assess scoliosis. *J Pediatr Orthop.* 2012 Dec;32(8):e72-e75.
[PubMed: PM23147635](#)

Alternate Outcome - Reliability and Validity

8. Chae JM, Cheon JH, Moon JY, Oh TY. The study for reliability and validity of smartphone applications to measure scoliosis. *Physiotherapy.* 2015 May;101(supp. 1):e206.
9. Pankowski R, Walejko S, Roclawski M, Ceynowa M, Mazurek T. Intraoperative computed tomography versus Perdriolle and scoliometer evaluation of spine rotation in adolescent idiopathic scoliosis. *Biomed Res Int.* 2015;2015:460340. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4377381>
[PubMed: PM25861628](#)

10. Persson-Bunke M, Czuba T, Hagglund G, Rodby-Bousquet E. Psychometric evaluation of spinal assessment methods to screen for scoliosis in children and adolescents with cerebral palsy. *BMC Musculoskelet Disord*. 2015;16:351. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4650493>
[PubMed: PM26578150](#)
11. Coelho DM, Bonagamba GH, Oliveira AS. Scoliometer measurements of patients with idiopathic scoliosis. *Braz J Phys Ther*. 2013 Mar;17(2):179-84.
[PubMed: PM23778766](#)
12. Qiao J, Liu Z, Xu L, Wu T, Zheng X, Zhu Z, et al. Reliability analysis of a smartphone-aided measurement method for the Cobb angle of scoliosis. *J Spinal Disord Tech*. 2012 Jun;25(4):E88-E92.
[PubMed: PM22237178](#)
13. Shaw M, Adam CJ, Izatt MT, Licina P, Askin GN. Use of the iPhone for Cobb angle measurement in scoliosis. *Eur Spine J*. 2012 Jun;21(6):1062-8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3366139>
[PubMed: PM22065167](#)

Mannequin Studies

14. Izatt MT, Bateman GR, Adam CJ. Evaluation of the iPhone with an acrylic sleeve versus the Scoliometer for rib hump measurement in scoliosis. *Scoliosis and Spinal Disorders [Internet]*. 2012 Dec [cited 2016 Mar 11];7(1). Available from: <http://scoliosisjournal.biomedcentral.com/articles/10.1186/1748-7161-7-14>

Review Articles

15. Horne JP, Flannery R, Usman S. Adolescent idiopathic scoliosis: diagnosis and management. *Am Fam Physician*. 2014 Feb 1;89(3):193-8.
[PubMed: PM24506121](#)
16. Larson N. Early onset scoliosis: what the primary care provider needs to know and implications for practice. *J Am Acad Nurse Pract*. 2011 Aug;23(8):392-403.
[PubMed: PM21790832](#)

Position Statement

17. Labelle H, Richards SB, de Kleuver M, Grivas TB, Luk KD, Wong HK, et al. Screening for adolescent idiopathic scoliosis: an information statement by the scoliosis research society international task force. *Scoliosis*. 2013;8:17. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3835138>
[PubMed: PM24171910](#)