Disclosures

- Faculty relationship with AAP
- Board member relationship with the Missouri State Orthopaedic Association
- Board member relationship with the Mid-Central States Orthopaedic Society
- Advocacy member relationship with the Pediatric Orthopaedic Society of North America
- I do not intend to discuss a unapproved/investigative use of a commercial product/device in our presentation
Purpose

- To make the argument that school screening for scoliosis should not be abandoned
School screening

- It is effective
- It might be cost effective
- Prevents late presenting cases
- Recent data on effectiveness of bracing makes it even more valuable
Natural History Long Term

- Long term studies at Univ. Iowa
- Following skeletal maturity
  - Curves < 30 tended not to progress
  - Curves >50 progressed at 1 degree/year
- Untreated scoliosis at 50 year follow up had 100% increase in mortality rate
  - Cardiopulmonary complications most common cause of death
  - Slightly higher rates of disability and back pain
Adams forward bend test in combination with scoliometer

Bunnell, Spine 1993

At 7 degree ATR for referral, 3% referral rate and 95% “treatment eligible” curves detected

False negatives: if 7 degrees ATR chosen, 12% of 20 degree curves, 8% of 25 degree curves, 5% of 30 degree curves missed

Balance between referral rate and missed “treatment eligible” curves
Scoliometer (introduced in 1984)

- Quantitatively assesses spinal asymmetry
History of School Screening for Scoliosis

Early 1970’s

- Programs for screening began in the state of Minnesota

In 1978:

- States began passing legislation for scoliosis screening to be performed in schools

By 2002, 21 states had passed legislation to provide school screening for scoliosis
21 STATES LEGISLATED

- 2002 - VIRGINIA
- 1996 - UTAH
- 1987 - ARKANSAS
- 1985 - TEXAS
- 1984 - ALABAMA, INDIANA,
- 1983 - GEORGIA, NEVADA,
- 1982 - CONNECTICUT, KENTUCKY,
  MARYLAND, PENNSYLVANIA
- 1981 - MAINE, RHODE ISLAND
- 1980 - CALIFORNIA, MASSACHUSETTS
- 1979 - WASHINGTON, FLORIDA
- 1978 - DELAWARE, NEW JERSEY, NEW YORK
1984 AAOS and SRS formally endorsed school screening for early detection.

1996- USPSTF insufficient evidence to make a recommendation.

2004 USPSTF recommended against routine screening of asymptomatic adolescents due to low predictive value of screening, small % who progress, and unnecessary treatment including brace use.

2008 AAOS, SRS, POSNA and AAP- informational statement that explained the pertinent aspects of the issue of screening. “If scoliosis screening is undertaken, then females should be screened twice at ages 10 and 12 years, and boys once at age 13 or 14 years.

Also stressed importance of education of screening personnel, avoiding unnecessary referrals, appropriate and selective use of spine radiographs.
The Challenge to Screening.....

United States Preventive Service Task Force (USPSTF)

An independent panel of non-Federal experts in prevention and evidence-based medicine

- Composed of primary care providers (such as internists, pediatricians, family physicians, gynecologists/obstetricians, nurses, and health behavior specialists)

- No spinal deformity surgeons or orthopaedic surgeons

- Conducts scientific evidence reviews of a broad range of clinical preventive health care services (such as screening) and develops “Recommendation Statements” for primary care clinicians and health systems.
USPSTF Rationale

- Did not find good evidence that screening asymptomatic adolescents detects idiopathic scoliosis at an earlier stage than detection without screening.
- The accuracy of the most common screening test—the forward bending test with or without a scoliometer—in identifying adolescents with idiopathic scoliosis is variable.
- Evidence of poor followup of adolescents with idiopathic scoliosis who are identified in community screening programs.
- Found fair evidence that treatment of idiopathic scoliosis during adolescence leads to health benefits (decreased pain and disability) in only a small proportion of people.
Most cases detected through screening will not progress to a clinically significant form of scoliosis.

Scoliosis needing aggressive treatment, such as surgery, is likely to be detected without screening.

Fair evidence that treatment of adolescents with idiopathic scoliosis detected through screening leads to moderate harms, including unnecessary brace wear and unnecessary referral for specialty care.

As a result, the USPSTF concluded that the harms of screening adolescents for idiopathic scoliosis exceed the potential benefits.
The problem with this information....

- This represented a change in the USPSTF’s previous 1996 recommendation, and this change was largely based on a difference in methodological approach that was taken by the USPSTF, rather than any real change in available information.
Although the AAOS, SRS, POSNA, and AAP recognize that support for scoliosis screening has limitations, the potential benefits that patients with idiopathic scoliosis receive from early treatment of their deformities can be substantial.

- Scoliosis screening, whether in the physician’s office, nurses’ clinics, or school environment, provides the opportunity to diagnose the condition and make referral for appropriate medical care.
As a result of this new USPSTF recommendation...

- Two states have subsequently rescinded legislated school screening,
  .....and a number of other organizations are making efforts to end organized school screening.
SCHOOL SCREENING IN U.S.A.

21 STATES LEGISLATED

- 2002 - VIRGINIA
- 1996-UTAH
- 1987-ARKANSAS
- 1985-Texas
- 1984-ALABAMA, INDIANA
- 1983 - GEORGIA, NEVADA,
- 1982-CONNECTICUT, KENTUCKY,
  MARYLAND, PENNSYLVANIA
- 1981-MAINE, RHODE ISLAND
- 1980-CALIFORNIA, MASSACHUSETTS
- 1979-WASHINGTON, FLORIDA
- 1978-DELWARE, NEW JERSEY, NEW YORK

LEGISLATED
RECOMMENDED
NO RECOMMENDATION
School screening poorly done has left a bad impression.

Assumption has been that since school screening has so many problems, then early detection in the medical home is also flawed.

Therefore don’t look for spine problems in the office.

- AAP recommendation until 2016!
Screening for Scoliosis in 2016

- 2013 Labelle et al published consensus statement of an international task force of the SRS.
- Systematic review of the literature through 2012
- Modified Delphi process to reach a consensus following WHO framework on the validity of a screening program.
- Panel reached consensus supporting the value of screening on 4 of 5 domains- technical efficacy, clinical, program and treatment effectiveness.
- There was insufficient evidence to make a statement with respect to cost effectiveness.
Clinical Effectiveness of Screening

- Population based retrospective cohort study in Rochester Minnesota.
  - Yawn et al JAMA 1999
    - 68 of 2242 (4.1%) screened positive. Positive predictive value was low (0.05) and 450 children would need to be screened for every child who received treatment as a result of screening.
    - Considered flawed due to small sample size

- Retrospective study of 115,190 students followed until age 19 years
  - Luk et al Spine 2010
    - Positive predictive value for scoliosis with curve >20 deg was 43.8% and 9.8% for treatment
    - Sensitivity 90% for diagnosis and treatment
What happens without it?

- Adobor et al. Scoliosis 2012
  - Prospective analysis of 752 spine clinic referrals from 2003-11 in the absence of school screening
  - Compared to cohort of treated patients from 1976-1988 when school screening was performed
  - 40% had curves $\geq 40^\circ$ at time of referral in 2003-11 group
  - Brace treatment in 68% during years of screening vs. 38% without screening
  - Surgery for 32% with screening and 62% without
The AAOS, SRS, and POSNA believe that effective screening programs must have well trained screening personnel who can utilize forward bending tests and scoliometer measurements to correctly identify and appropriately refer individuals with AIS for further investigation.
Cost of Screening

- Total cost of a school screening program. (Yawn et al 2000)
  - $34.40/child screened
  - $4,198/case identified
  - $15,115 per child treated

- Other study estimates (Lee et al. Spine 2010)
  - $18/child screened
  - $8018 cost of brace treatment
  - $27538 cost of surgery (but 5-10% need revision)

- Adobor et al. Scoliosis 2014
  - Model based cost minimization analysis
  - Cost saving when only girls are screened
  - The cost of bracing dominated in with screening and the cost of surgery for non-screening
Treatment of Those Detected to have Scoliosis

- Effective treatment of patients referred from scoliosis screening
  - Alter risk of progression and surgery
  - If surgery needed, do it when deformity is mild and less risky to correct
- Goal of brace treatment is to avoid surgery.
- Modern brace treatment is effective and dose (time in brace) dependent. 12 hour/day cut off (Katz et al. JBJS 2010)
- Scoliosis specific exercises can be effective for mild curves to prevent progression to bracing range.
**BrAIST (Bracing in Adolescent AIS Trial)**

- Multicenter, prospective NIH funded study.
- Inclusion: skeletal immaturity with 20-40 deg AIS
- Study stopped early by DSMB due to better outcome in braced group.
  - 75% braced group vs 42% observed group at maturity had <50 deg
  - 56% reduction relative risk of needing surgery
  - However NNT was 3 patients in brace for every surgery prevented
  - No difference in quality of life or adverse events
  - This study has conclusively shown need for early detection
The American Academy of Orthopaedic Surgeons (AAOS), the Scoliosis Research Society (SRS), and the Pediatric Orthopaedic Society of North America (POSNA) believe that there has been additional useful research in the early detection and management of adolescent idiopathic scoliosis (AIS) since the review performed by the United States Preventive Services Task Force (USPTF) review of 2004. This information should be available for use by patients, treating health care providers, and policy makers in assessing the relative risks and benefits of the early identification and management of AIS.
Current AAP (Bright Futures) Recommendations

- Early Adolescence:
  - “As indicated by symptoms, signs, or concerns (e.g., hip pain, back pain) perform visual inspection, range of motion testing, and palpation of the back. **Routine scoliosis screening is not recommended**”

- This will be changing soon due to recent evidence showing benefits of early detection
The AAOS, SRS, POSNA, and AAP believe that there are documented benefits of earlier detection and non-operative management of AIS, earlier identification of severe deformities that are surgically treated, and incorporation of screening of children for AIS by knowledgeable health care providers as a part of their care.
The bottom line

- We shouldn’t eliminate school screening for the same reasons the AAP, POSNA, AAOS and SRS have advised to reinstate screening in primary care offices.
- 6% of children in the USA are uninsured
- Plaszewski and Bettany-Saltikov. Eur Spine J 2014:

“As the existing recommendations supporting screening are based on moderate quality evidence whilst the recommendations against screening are based on low-quality evidence, the latter recommendations appear to be both unconvincing and methodologically invalid.”
More of this and less of that

More

Less
More of this and less of that

If surgery is necessary, less crooked is better than more crooked