Editor’s Note  Screening for scoliosis among schoolchildren has gained considerable popularity in North America, and the assumption that earlier detection leads to a better health outcome seems plausible enough. However, this methodical stocktaking of the scientific basis for such screening exposes major gaps in the infrastructure of solid scientific knowledge on which a confident recommendation for any screening procedure must be based.

Introduction

This review of the literature from 1977 forward is addressed particularly to benefits of screening for adolescent idiopathic scoliosis. The literature yielded little experimental or quasi-experimental evidence. Therefore, the chapter is based mainly on descriptive studies.

Screening for Adolescent Idiopathic Scoliosis

Authorities who favor screening for adolescent idiopathic scoliosis do so on the premise that screening and early detection will lead to earlier, more effective, conservative treatment, thus reducing the costs of scoliosis to both the individual and society. Determinations of the efficacy and effectiveness of screening, however, require consideration of several factors, including disease prevalence, the characteristics of the maneuver, the costs of screening, and the effect of screening on treatment.

Prevalence

All studies of scoliosis are based on prevalence of the condition rather than incidence. Interpretation of prevalence rates is difficult, due to incomplete description of the relevant features of the population to be screened and methodologic differences in categorizing children who are scoliotic and those who have benign structural changes or normal spines. Some prevalence rates are based on radiographs that confirm school screening; others are based on patients referred for treatment. In reports of school screening, rates of prevalence from 0.3% to 15.3% are reported. The degree of curvature classified as scoliotic also varies, being as low as a 5 degree Cobb angle, despite evidence that curves of this magnitude are frequently not disabling. When only larger curves are included (> 10-degree Cobb angle), prevalence rates range from 1% to 3%, averaging 1.5% to 2%. Generally, prevalence appears to decrease as curve magnitude increases. Morais and colleagues reported that of 2,868 schoolchildren, aged 8–15 years, confirmed to have idiopathic scoliosis, 80.9% of girls’ curves and 91.8% of boys’ measured < 15°. The same study reported prevalence among 5–8-year-olds to be higher in girls (51.9 per 1000) than among boys (32.0 per 1000). In addition, prevalence rate increases with age between these years, more markedly for girls than for boys. In girls, there appears to be a direct association between age and the severity of the curve. The
prevalence of both large and small curves is higher in girls. In both sexes, the prevalence of cases needing treatment is very low.

Numbers Referred for Treatment or Further Inspection

The number and percentage of children referred for further assessment and treatment vary from 8.3% to 17.8%. Referral may follow directly from school screening or from further physician checks following screening. In some instances, children with positive screening tests are rescreened by the person performing the initial screening prior to referral.

Referral is either to the family physician or to an orthopedic surgeon, and in almost all cases, an x-ray is recommended to confirm the diagnosis.

Of all children referred, many of whom will be subjected to ongoing clinical and radiologic examinations, the cases of confirmed scoliosis and numbers brought to treatment are small. Morais and coworkers confirmed 1,227 cases of scoliosis in 29,195 screened; 68 were brought to treatment. Lonstein and colleagues screened 255,707 children. Scoliosis was confirmed in 3,069; 106 cases were brought to treatment. Wynne in 8,010 screened, found 42 confirmed cases, of which 12 were brought to treatment. Of 21,000 Dublin schoolchildren screened, 300 were confirmed as having a deformity of the spine, 68 were scoliotic and only 25 required treatment. The large number of overreferrals is not confined to nurse-managed screening. Even experienced physicians, who referred 21.9% of those they screened, had the diagnosis confirmed in only 70%. In addition, it has been noted that when adolescents are x-rayed, almost all will have a measurable scoliosis, but in half this is secondary to a tilted spine. These curves have shown no potential for progression.

Characteristics of the Screening Tests

The most common screening maneuver is the Adams forward-bending test. Although the test is simple and need not be administered by a physician, even specially trained nurses have failed to detect a significant proportion (26%) of curves of 10 degrees or greater.

Almost without exception, scoliosis screening has produced an unacceptably large number of false-positive findings. Though generally, specificity is acceptably high, because the prevalence of the condition is low, the positive predictive value of the test will be low.

Table 22.1 illustrates the characteristics of the test as observed from published reports. Comparability is made difficult by differences in the degree of spinal curvature that is classified as scoliotic.

In addition to these studies, Morais et al reported positive predictive values of 42.8%, 17.9% and 6.4% when curves of 5, 10, and 15 degrees, respectively, are considered. In children with curves of > 20 degrees, the positive predictive value is only 3.5%. As noted, not only does the test result in an unacceptably high false-positive rate, but it also identifies a large number of children who are true positives but not in need of treatment. Goldberg and colleagues reported that parents of children who had positive screening tests but did not require x-ray seemed satisfied with the explanation. In many instances, however, children with mild deformities, which are unlikely to progress or to cause disability, may receive needless periodic x-rays and may become self-conscious about a cosmetic problem that might not otherwise have been drawn to their attention.

Costs of Screening

Proponents of scoliosis screening state that it is relatively inexpensive for the benefit derived. Lonstein et al reviewing six years of screening in Minnesota schools, estimated benefit, based on a reduction of children requiring bracing or surgery from 0.14% to 0.04%, which they presumed to be in part the result of earlier detection. Annual pro-