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Will see “great” and “really awful” eye charts manufactured by The Good-Lite Company and marketed through Good-Lite and School Health Corporation, but focus is not to push product from the podium

- Focus is to use power of podium to encourage appropriate and evidence-based vision screening as part of a strong vision health system of care
1. Describe 3 components of a standardized eye chart for optotype-based screening.

2. Describe 3 steps to consider when using devices for instrument-based screening.
Two types of vision screening:
- Optotype-based
- Instrument-based
  - Or combination

Optotype = name of picture, symbol, letter to identify

Optotype-based screening measures visual acuity

Instrument-based screening measures for presence of amblyopia risk factors:
- Significant refractive error
- Asymmetry of refractive error
- Misalignment of eyes
- Presence of cataract
Optotype-Based Screening - (a.k.a. Test of Visual Acuity)
Threshold vs. Critical Line for Optotype-Based Screening

 thresholdscreening
 - Move down chart until child cannot correctly identify majority of optotypes

 criticallinescreening
 - Use only line child needs to pass according to child’s age
Research supports using single, LEA Symbols optotypes surrounded with bars at 5 feet for children aged 3 to 5 years.

Many of you use threshold eye charts as a test of visual acuity—this session will focus on threshold eye charts.
• “Visual acuity scores can be significantly affected by the chart design.” (p. 1248)

• Excluding optotype size, “each visual acuity level on a test chart should present an essentially equivalent task”. (p. 740)
Standardized eye charts meeting national and international eye chart design guidelines offer this equivalent test task.

Many commonly used eye charts do not.

If you use an eye chart for optotype-based screening, how do you know if the chart is standardized?
National and International Distance Visual Acuity Eye Chart Recommendations

- **1980 - National Academy of Sciences-National Research Council (NAS-NRC)**
  - Recommended Standard Procedures for the Clinical Measurement and Specification of Visual Acuity

- **1984 - International Council of Ophthalmology (ICO)**
  - Visual acuity measurement standard.

- **2003 - World Health Organization Prevention of Blindness & Deafness (WHO)**
  - Consultation on Development of Standards for Characterization of Vision Loss and Visual Functioning

- **2010 – American National Standards Institute, Inc.**
  - Performance standard for the optical design of optotypes used in clinical visual acuity measurement systems
Optotypes approximately equal in legibility

Horizontal between-optotype spacing = 1 optotype width

Vertical between-line spacing = height of next line down

Geometric progression of optotype sizes of 0.1 log units (logMAR, ETDRS)

5 optotypes per line

Optotypes black on white background with luminance between 80 cd/m² and 160 cd/m²

Similar recommendations across guidelines

Design guidelines = “ETDRS Design”
Tips:

• Line outside optotypes = inverted pyramid, NOT rectangle
• 20/32 vs. 20/30
• 10 feet vs. 20 feet
Challenges With 5 Common Eye Charts

Snellen Letters

Kindergarten Test Chart

Tumbling E

Allen Pictures

Lighthouse or “House, Apple, Umbrella”
2 Challenges With “Snellen Charts”

- Do not meet national/international eye chart design guidelines
- Are not standardized
- Some optotypes are easier to guess than others

“Sailboat” Chart Lacks Scientific Evidence

- Does not meet national/international eye chart design guidelines
- Optotypes of different sizes on same line
- NEVER on recommended list of eye charts from American Academy of Pediatrics
- Chart’s history and developer unknown
- No supporting research to validate
2 Challenges With Tumbling E

1. Children’s orientation and direction challenges with directional optotypes
   a. Emerging cognitive skill
   b. Up/down emerges before left/right
   c. Usually in place by ages 8 or 10 years

2. Ability to guess optotype at threshold


“Because of the difficulty in inducing children and stupid illiterates to name the position of the Snellen E, or to hold its duplicate in the hand in the same direction as the character on the chart, the author constructed a set of test-type for illiterates in

1886”...
3 Challenges With Allen Pictures

1. Asking young children to make a “whole” picture from “parts”
2. Cultural bias
3. Calibrated against Snellen 30-ft E, not Landolt C (international standard)
Optotypes easy to guess

Poor visual acuity results when compared with international Landolt C standard

Not on list of charts recommended by:
- American Academy of Pediatrics
- American Association of Certified Orthoptists
- American Association for Pediatric Ophthalmology and Strabismus
- American Academy of Ophthalmology


Preferred Optotypes for Pediatric Eye Charts

LEA Symbols

HOTV
LEA Symbols

- Only pediatric eye chart with optotypes that blur equally at threshold
- Culturally neutral
- Children call optotypes what they want
  - i.e., Square may be an iPad
  - Circle may be hula-hoop
Beware of ...
“Linear-Spaced” Eye Charts

- 100% spacing between optotypes (1 optotype-width)
- Unequal spacing BETWEEN lines
**“Wide-Spaced” Eye Charts**

- Between-optotype spacing >100%
- Unequal spacing BETWEEN lines
- Basically contains lines of single optotypes
• Visual acuity results, on average, 3 lines worse on charts with lines vs. single, non-crowded optotypes

• For example, 20/32 with single, isolated optotype and 20/80 with line chart


A Historical Review of Distance Vision Screening Eye Charts
What to Toss, What to Keep, and What to Replace

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Geoffrey E. Bradford, MD, West Virginia

Vision screening protocol and equipment guidelines differ among schools across the United States. Budget cuts are forcing many school nurses to reevaluate their vision screening programs, as well as items in their vision screening toolboxes. School nurses tasked with inventorying those toolboxes to determine which items to toss, buy, or replace are oftentimes perplexed by the copious choices featured in vendor catalogs and websites. For school nurses who want their vision screening toolboxes to include eye charts, national and international eye chart design guidelines are available to help ensure selected eye charts are standardized. A national consensus policy exists that recommends specific eye charts. And, a large body of vision screening literature is available to help school nurses make informed decisions. Current documents suggest that LEA Symbols are appropriate for young children and Sloan Letters are a better choice than "Snellen" charts for older children.

Keywords: preschool vision screening; school-aged vision screening; LEA Symbols; HOTV; Sloan Letters; eye charts; eye chart design recommendations

The first state-supported vision screening program in a school setting started in Connecticut in 1899 with a distance visual acuity Snellen chart as the testing tool (Appelboom, 1980). Though some school nurses across the United States have added vision testing devices to their toolboxes during the last 112 years, the time-honored eye chart continues to hold a primary and prominent space in those toolboxes.

Technology-based vision screening tools include computerized vision screening software, instruments with slides, autorefractors, and photoscreeners. The choice of vision screening tools often depends on a budget line item and a school nurse’s comfort with using instrument-based technology.

Budget cuts are forcing many school nurses to reevaluate the vision screening tools they use or replace. Effective distance wall charts may be a better fit for a tight budget.

Distance Visual Acuity Optotype Charts as Gold Standard

Optotype letters, numbers, and pictures/charts continue to serve as the most common test for assessing visual acuity in clinical practice (Ehrmann, Feldke, & Radel, 2009). In schools, distance visual acuity eye charts have been the gold standard for decades (Practor, 2005). Eye charts “are time-honored, considerably less expensive than vision testing machines and other similar equipment, and effective for screening. If appropriately selected and used” (Practor, 2005, p. 33).

Challenges in Choosing Optotype Distance Visual Acuity Charts

Countless eye charts have emerged since Herman Snellen introduced his optotypes in 1862 (Bennett, 1965). The “Snellen” chart concept has withstood the test of time, although this chart, as well as others, has design challenges that may reduce the accuracy of screening vision in children. Selecting appropriate eye charts is challenging because no one particular national standard exists to guide school nurses in selecting distance visual acuity eye charts to use in the school setting.

Eye chart recommendations differ among the 30 states, and the District of Columbia, with school vision screening requirements (The Vision Council, 2009). Vendor catalogs and websites offer

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Instrument-Based Screening
Instruments
- Require no child response or interaction

Machines, such as Titmus
- Not considered an instrument
- Use slides or cards
  - Require child response or interaction

## Child Ages for Optotypes and Instruments

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<thead>
<tr>
<th>AGE</th>
<th>OPTOTYPE</th>
<th>INSTRUMENT</th>
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<tbody>
<tr>
<td>Preverbal children</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Preliterate children</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6 months to 3 years</td>
<td></td>
<td>X</td>
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<td>3 to 5 years</td>
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<td>&gt;5 years</td>
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Children aged 3 to 5 years:

- Instrument-based screening has not been shown to be superior or inferior to optotype-based screening.

Most experts believe cannot convert instrument measurement to visual acuity

If use instruments, have test of visual acuity as back-up
  o Forgot to charge battery
  o Device malfunctions
  o Cannot achieve a reading

Head Start children in Vision in Preschoolers Study
  o Could “nearly always” participate in instrument-based screening if unable to participate in optotype-based screening, and vice versa

Welch Allyn SureSight
- Calibrated every 18 months
- Set in child mode
- Set in “minus” calibration until you can upgrade to recent software
- Upgrade software to Version 2.25

PediaVision Spot
- Updated with most recent software
- Discuss referral criteria with local eye care professional

Plusoptix S09, S12R, or S12C
- Updated with most recent software
- Discuss referral criteria with local eye care professional
Thank You for Your Time and Attention!!!!