

Expanded Vision Screening Study

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Expanded Vision Screening Study

I. Overview

Approximately 5 to 10% of pre-school children and 20-30% of school-aged children experience vision problems (Halle, 2002). Undiagnosed vision problems can be the root cause of academic or behavioral problems. Indeed, in schools that do not screen children for vision problems, 1 in 10 students referred for academic or behavioral problems had a vision problem that had previously gone undetected (Waigandt, 1990). In many cases, severe vision impairment can be prevented by detecting and treating conditions before the eye is fully developed or by approximately age 10 (Mills, 1999). School vision screenings provide an opportunity for nearly all children to be screened for vision problems and, if a problem is detected, referred for further evaluation.

Currently, Maine public schools conduct distance vision screening as part of a comprehensive health program. The Maine State Department of Education recommends vision screening in grades Kindergarten, 1st, 3rd, 5th, 7th, and 9th with 11th grade as optional (Department of Education, School Health Manual, 2002). Representatives from the Maine State Legislature expressed interest in expanding school vision screening to include a muscle balance test, a near vision test and an observation check list for teachers. In response to this interest, the Maine Department of Education, in collaboration with the Maine School Health Advisory Committee, conducted a study to determine if it is worthwhile to recommend to all school nurses that they conduct the expanded screenings. This report summarizes the results of this study.

II. Study Methods

Twelve school nurses volunteered to participate in the study and conducted the expanded vision screening tests in 1st, 3rd, and 5th grades during the 2001-2002 academic year. Volunteer nurses were asked to complete several forms to document students' expanded vision screening results. In addition, nurses were asked to complete a feedback form that included questions about their experience with the expanded screening. Copies of the forms are included in the Appendix.

Several research questions guided the project:

- Were a significant number of students referred because of the expanded screenings?
- Are there a significant number of students who failed the expanded screening, who did not fail the traditional vision screening of distance vision?
- Of those students referred, how many were confirmed to have a vision problem and how many were provided with treatment?

- Was the cost for screening reasonable including school nurse's time?

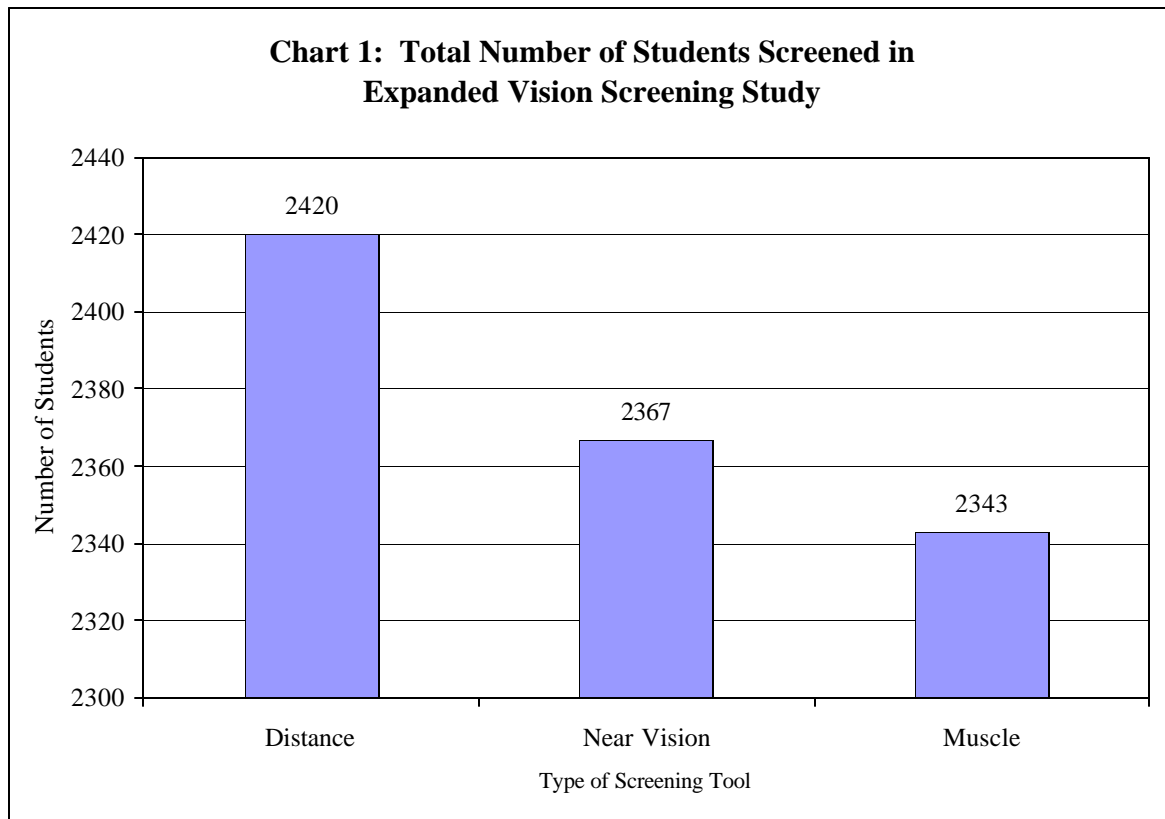
III. Limitations

The expanded vision screening study is a one-shot case study (Campbell and Stanley, 1963) using purposive sampling (Neuman, 2000). This type of design has some limitations that must be considered. Because the participating schools were not randomly selected from all schools, one cannot assume that these results are generalizable to the broader population of all schools in Maine.

IV. Screening Results

A. Description of Students Screened

Chart 1 presents the total number of students screened using the distance and expanded screening tools.



Source: School Data Form, 2001-2002

The 12 volunteer school nurses provided distance screenings to a total of 2,420 students. Of those students, 2,367 students received near vision screenings and 2,343 received muscle balance testing.

Table 1 includes a breakdown of the number of students screened by grade. Most of the students screened were in the three grades selected for the study – 1st, 3rd and 5th. Two nurses conducted the expanded screening in other grades - Kindergarten, 2nd and 7th grades. The table also includes a column indicating the percent of students enrolled in each grade who were included in the screenings. Most nurses managed to screen 90 to 100% of students in each grade. Nurses appeared to have the greatest difficulty testing all of the first graders. Nurses conducted near vision screenings with 82% of 1st graders and muscle balance with 80%.

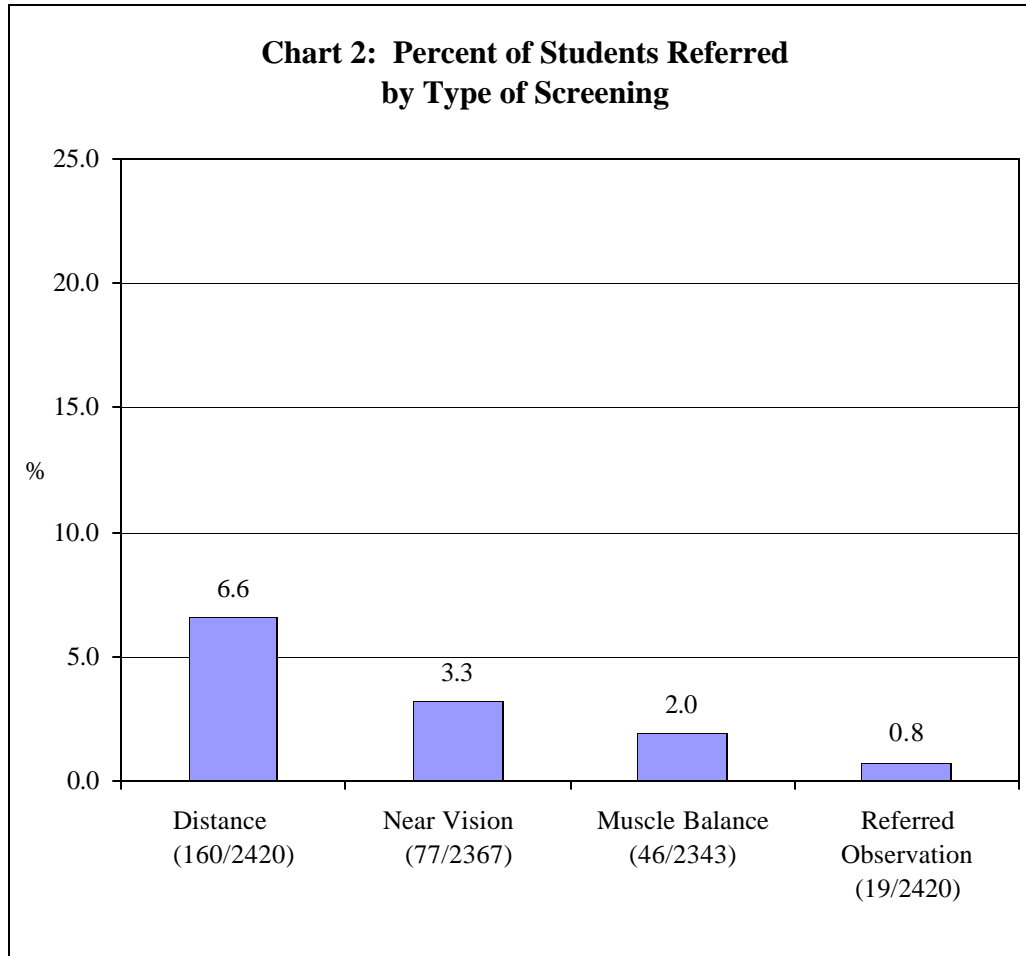
Table 1: Total Number of Students Screened by Grade

Grade	Type of Screening	Number of Students Screened	Percent of Total Enrollment
Kindergarten	# Screened Distance	26	100
	# Screened Near Vision	26	100
	# Muscle Balance	26	100
Grade 1	# Screened Distance	901	96.0
	# Screened Near Vision	770	82.1
	# Muscle Balance	754	80.4
Grade 2	# Screened Distance	59	100
	# Screened Near Vision	59	100
	# Muscle Balance	59	100
Grade 3	# Screened Distance	687	93.1
	# Screened Near Vision	714	96.7
	# Muscle Balance	703	95.3
Grade 5	# Screened Distance	729	90.3
	# Screened Near Vision	780	96.7
	# Muscle Balance	783	97.0
Grade 7	# Screened Distance	18	100
	# Screened Near Vision	18	100
	# Muscle Balance	18	100

Source: School Data Form, 2001

B. Screening Results

Chart 2 presents the number of referrals by type of screening.



Source: Student Data Form, 2002

Of the students screened, 6.6% failed the distance screening test. Three percent failed the near vision screening. Two percent failed the muscle balance test. Less than 1% were referred from teacher observation.

Chart 3 presents the number of referrals for near vision, muscle balance and teacher observation among students who passed distance screening. In other words, these are students who would **NOT** have been identified as needing a referral if the expanded vision screening tests were not in place.

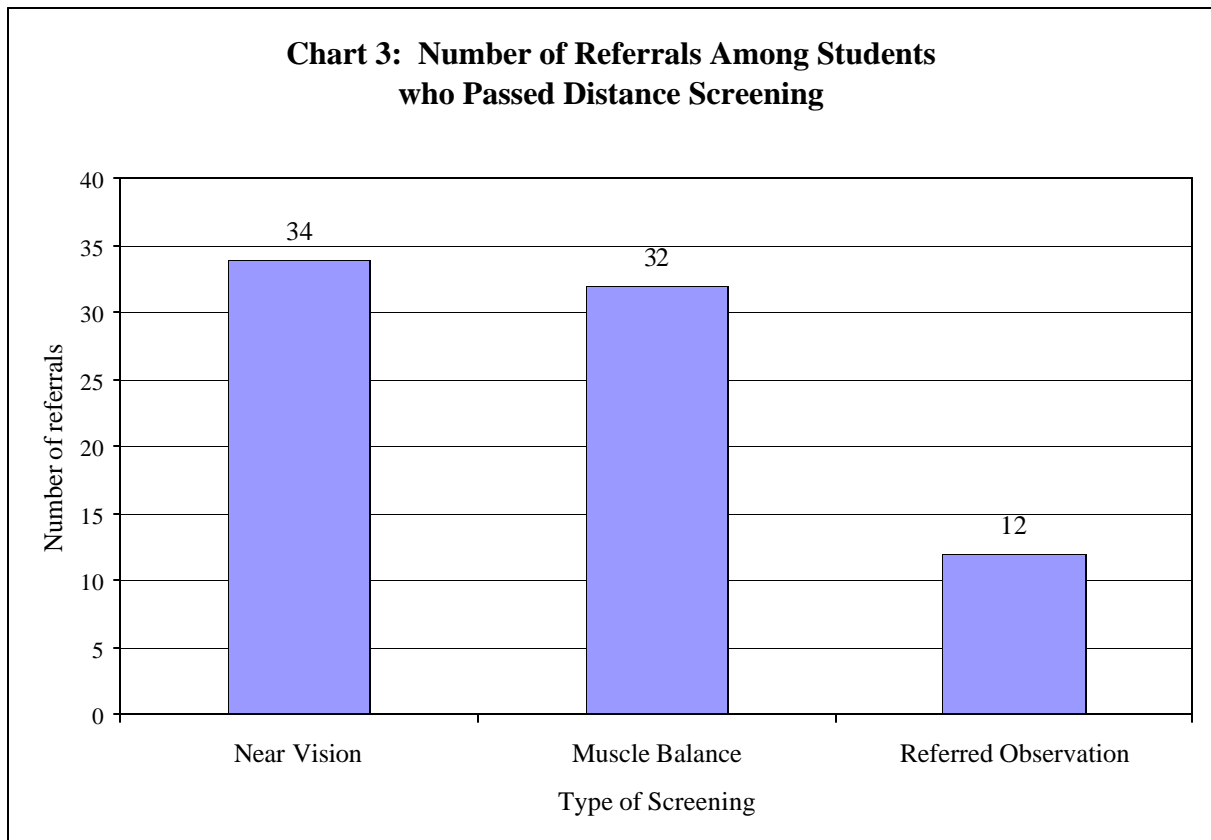
As reported above, 160, or 6.6% of students screened failed the distance screening. When near vision screening was included in the vision screening protocol, an additional 34 students were identified as needing a referral. Adding these students to the 160 who failed distance results in 8% of the total number of students referred for further

evaluation. This amounts to a 21.2% increase in the percent of students who are referred when near vision screening is used.

An additional 32 students passed the distance screening but failed the muscle balance test and were therefore identified as needing a referral. Added to the 160 who failed distance screening, this results in a total of 7.9% of the total students screened who need a referral or a 19.7% increase over the 6.6% who were referred based on distance screening alone.

Twelve students were referred based on teacher observation. When these 12 students are added to the 160 who failed distance, 7.1% of students required referral. This amounts to a 7.6% increase over distance screening alone.

In combination, expanded vision screening identified an additional 64 students or 9.3% of the total number of students screened. This amounts to a 40.9% increase in the number of students who were referred for further evaluation when expanded vision screening tools were used.



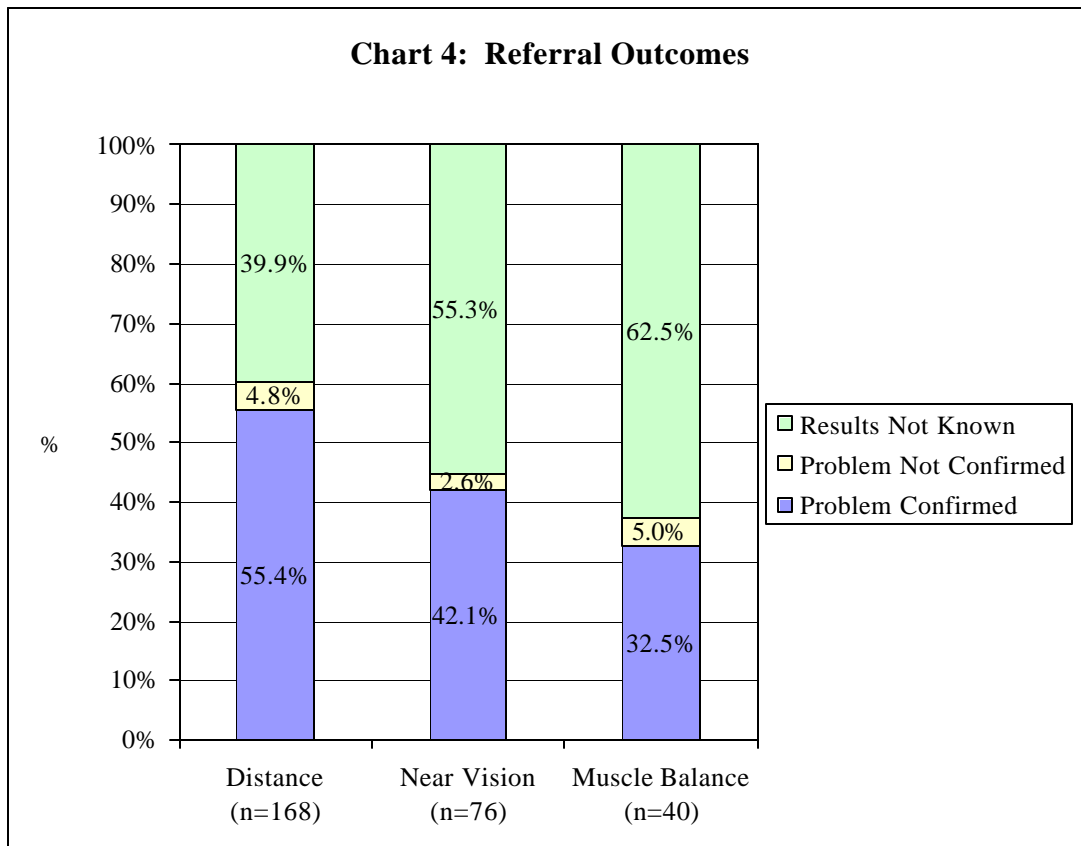
Source: Student Data Form, 2002

C. Confirmation of Problems

If a student failed the distance, near vision, or muscle balance screening, the nurse notified the parents and referred the student for further evaluation using the referral form (see Appendix). Students could also be referred for further evaluation based on teacher observation. Nurses reported whether or not the problem was confirmed on the school data form (see Appendix) based on feedback from parents.

Research suggests that referrals to ophthalmologists are not always pursued by parents (Mark, 1999; Yawn et.al, 1998). Findings from the current study are inconclusive due to a large percentage of “results unknown.” It is not clear whether results are unknown because parents did not pursue the referral or whether the paperwork was not completed for these referrals.

Chart 4 depicts the referral outcomes for the expanded vision screening. Fifty-five percent of the referrals made as a result of the distance screenings were confirmed and 42% of the referrals for near vision were confirmed. One-third of the referrals made for muscle balance were confirmed. The small percentage of “problem not confirmed” suggests that the screening identifies only a small number of “false positives.” Other studies found a much higher rate of false positives (Waigandt, 1990). The low rate found in this study is likely due to the fact that nurses, and not volunteers, conducted the tests.



Source: School Data Form, 2002

V. Nurse's Experiences with Expanded Vision Screening

At the end of the study year, the 12 volunteer nurses were asked to complete a short questionnaire describing their experiences with the expanded vision screening. All 12 nurses completed the feedback form. Topics addressed included questions about conducting the screening, difficulties encountered, the teacher checklist, and recommendations for the future of expanded vision screening.

A. Conducting the Expanded Vision Screening

Several questions addressed conducting the screenings such as time required to conduct the screenings, difficulties encountered and tricks to expedite the screening,

Nurses were asked to report the amount of time required to conduct the expanded vision screening. There was considerable variability in responses to this question. Response ranged from a low of two minutes per student to a high of 20 minutes per student.

Table 2: Number of minutes required to conduct expanded vision screening

Number of minutes	N
2 minutes	1
3 minutes	2
4 minutes	1
5 to 15 minutes	1
5 minutes	1
8 minutes	1
10 minutes	3
20 minutes	1

Table 3 presents the responses for how nurses perceived the difficulty of conducting the screenings. Nearly all of the volunteer nurses thought that it was “easy” to conduct the near vision screening. Only two rated it as “moderately difficult.”

More nurses had reported problems with the muscle balance test. Seven out of 12 reported that the test was “easy.” Four rated the muscle balance test as “moderately difficult” and one said it was “very difficult.”

Table 3: How difficult was it for you to learn the techniques of screening for near vision and muscle balance?

Response	Near Vision	Muscle Balance
Very difficult	0	1
Moderately difficult	2	4
Easy	10	7

When asked if it was difficult for students to follow directions during the screening, seven responded “yes.” These nurses reported that students had difficulty understanding how to do the muscle balance test. One mentioned the number of students in the room, that having more than four in the room at one time was too much. Four nurses responded “no,” that students did not have problems following directions during the screening.

Nurses were asked to provide tricks that they learned to expedite the screening. Responses included:

- Showed students the red line first, before having them do the procedure made it quicker to test them.
- Used a stable table and chair.
- Had next student observe.
- Had students use a non-sharpened pencil and place it over the red line.
- Attached yarn to the charts.
- Had line on the floor to put feet when sitting
- Used a hard rather than soft chair.
- Used certain wording for muscle balance.

B. Problems encountered

School nurses reported a variety of problems. The most common problem reported was that students did not understand the procedure or were not willing/able to sit still for the test. Two out of the 12 nurses reported that the expanded screening was too time consuming. A couple reported mechanical issues such as flashlight failure on the muscle balance test and false test results from the equipment being at a slight angle. Two nurses mentioned training the volunteers.

C. Teacher Checklist

A couple of questions on the feedback form addressed the observational checklist that teachers were asked to complete when they perceived a student to have vision problems in the classroom.

First, school nurses were asked about teacher support. When asked to report support for the observational checklist, half of the volunteer nurses said that teachers were very receptive and interested in using the checklist. Three nurses indicated that teachers were willing to try to use the checklist. Only three said that teachers were noncommittal.

Table 4: How receptive were teachers to using the Observational Check List?

Response	N
Very receptive and interested in using the Checklist	6
Expressed willingness to try	3
Noncommittal	3

When asked if the teachers used the checklist appropriately, nurses reported that those who gave a referral did indeed use the checklist appropriately. Nearly half of the nurses did not receive any referrals from teachers.

Table 5: Did teachers use the checklist appropriately?

Response	N
Referrals were appropriate	7
Referrals were not appropriate	0
Did not receive a referral	5

D. Responsiveness to Referrals

Nurses were asked to indicate whether parents and physicians were more or less responsive to referrals for expanded screening compared to standard distance vision screening?

Results suggest that nurses perceive parents to have the same response to expanded vision referrals. Nine nurses said parents were the same in terms of responsiveness. Two said that parents were less responsive.

Similar results were found for perceptions of physicians' responsiveness. Seven nurses said that physicians were just as responsive with expanded vision screening as they were with distance vision screening. Two said they were less responsive. Two did not know.

E. Evaluation and Recommendations

Nurses were asked to provide general evaluation of and recommendations for expanded vision screening. First, nurses were asked to rate the three expanded vision screening components on a scale of 1 to 10, with 1 being not at all valuable and 10 being extremely valuable. These results are presented in Table 6.

Table 6: How valuable do you believe the expanded screening is for detecting vision problems?

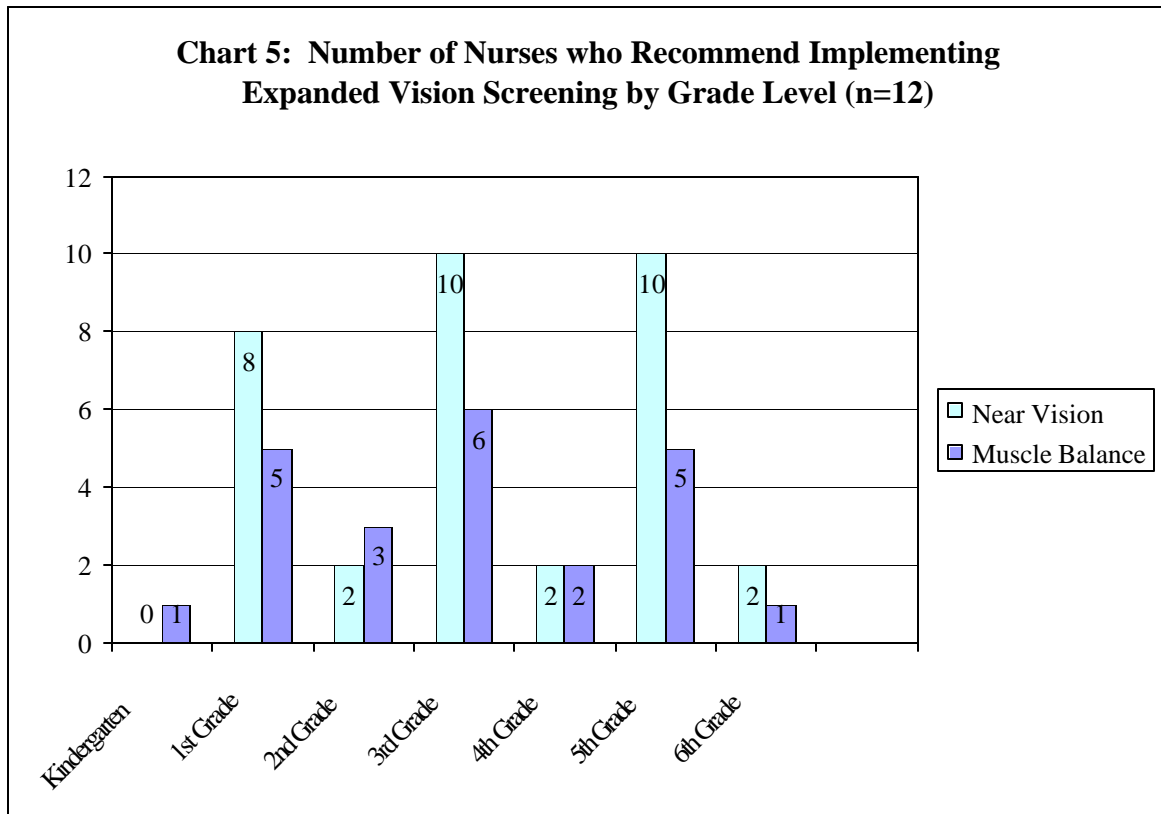
Expanded Vision Component	Mean Rating	Standard Deviation	N
Near Vision	7.5	2.5	12
Muscle Balance	3.9	2.1	11
Teacher Observation	6.4	3.6	12

Nurses rated the near vision test as the most valuable of the three components. Nurses rated the value of the near vision a 7.5 on a scale of 1 to 10 with 10 being most valuable.

Muscle balance was rated the least valuable with a score of 3.9.

Nurses rated teacher observations a 6.4. There was much greater variability in nurses' ratings of the teacher observation checklist. Four nurses rated this component a "10" while 2 nurses rated it a "1." One of the nurses who rated the teacher observation checklist a "1" wrote "teachers did not refer."

Nurses were asked to identify grade levels for which they recommend expanded vision screening be implemented. Results from this question are presented in the chart below.



Source: Expanded Vision Screening Feedback Form, 2002

Nurses are more supportive of implementing near vision screening in 1st, 3rd and 5th grades. Ten of the 12 nurses recommend implementing near vision screening in 3rd and 5th grades. Nurses are less enthusiastic about implementing muscle balance screening. Six recommend muscle balance screening for 3rd graders and 5 recommend it for 1st and 5th graders. Two nurses do not think that muscle balance screening should be provided in any grade.

VI. Conclusions

Recall the research questions that guided the evaluation of the expanded vision screening study:

- Were a significant number of students referred because of the expanded screenings?

The results show that 6.6% of students failed the distance screening, 3% failed the near vision screening, 2% percent failed the muscle balance test and less than 1% were referred based upon the teacher observation checklist.

- Are there a significant number of students who failed the expanded screening, who did not fail the traditional vision screening of distance vision?

One hundred sixty, or 6.6% of the total number of students screened, failed the distance screening. When near vision screening is included, an additional 34 students were identified as needing a referral – a 21% increase. When muscle balance is included, an additional 32 students were identified as needing a referral which is a 19.7% increase over the number identified through distance alone. Twelve students were referred based on teacher observation – a 7.6% increase. Considering the entire package of screenings by looking at the number of students who were identified by any of the screening tests, an additional 64 students or 9.3% of the total number of students screened were identified as needing a referral. This amounts to a 40.9% increase in the number of students who were referred for further evaluation when expanded vision screening tools are used.

- Of those students referred, how many were confirmed to have a vision problem and how many were provided with treatment?

Fifty-five percent of the referrals made as a result of the distance screenings were confirmed. Forty-two percent of the referrals for near vision were confirmed. One-third of the referrals made for muscle balance were confirmed. Results are unknown for a sizable percentage of referrals. Further research is necessary to determine why these results are unknown.

- Was the cost for screening reasonable including school nurse's time?

Some nurses managed to conduct the screenings in as little as two minutes while it took others as long as 20 minutes. This variability suggests that some nurses experienced greater difficulties than others. It would be helpful to hear more from the nurses who took 10 to 20 minutes to complete the screenings to understand why it took so long.

In sum, the results of the Expanded Vision Screening Study suggest that more students are identified as needing a referral for further evaluation when screenings for near distance and muscle balance and a teacher observation checklist are used. Of the confirmations that were obtained, most supported the screening results, however many

cases were unable to be confirmed. Future research should focus on the confirmation component in order to determine the validity of the expanded vision screenings. In addition to following up with referrals, a future study might include follow-ups for a random sample of students who pass the screening in order to test for false negatives as well as false positives (Robinson et.al., 1999).

References

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Appendix

Data Forms

State of Maine

School Health Screening Report – Part II Expanded Vision Screening

I. School Year: _____ (Ex. 2001-2002)
(This form may be completed for one or for multiple schools within a single SAU)

II. School Administrative Unit: _____ **County:** _____

Name: _____ **Title:** _____ **Phone #:** _____

Date: _____

Name(s) of school(s) for which you are reporting:

III. Grade: _____ **Grade:** _____ **Grade:** _____ **Grade:** _____

Enrollment _____ Enrollment _____ Enrollment _____ Enrollment _____

#Screened Distance		#Screened Distance		#Screened Distance		#Screened Distance	
# Referred		# Referred		# Referred		# Referred	
#Problem not confirmed		#Problem not confirmed		#Problem not confirmed		#Problem not confirmed	
# Problem confirmed		# Problem confirmed		# Problem confirmed		# Problem confirmed	
# Results not known		# Results not known		# Results not known		# Results not known	
# Screened Near Vision		# Screened Near Vision		# Screened Near Vision		# Screened Near Vision	
# Referred		# Referred		# Referred		# Referred	
# Prob Not confirmed		# Prob Not confirmed		# Prob Not confirmed		# Prob Not confirmed	
# Problem confirmed		# Problem confirmed		# Problem confirmed		# Problem confirmed	
# Results not known		# Results not known		# Results not known		# Results not known	
# Screened Muscle Bal.		# Screened Muscle Bal.		# Screened Muscle Bal.		# Screened Muscle Bal.	
# Referred		# Referred		# Referred		# Referred	
# Prob Not confirmed		# Prob Not confirmed		# Prob Not confirmed		# Prob Not confirmed	
# Problem confirmed		# Problem confirmed		# Problem confirmed		# Problem confirmed	
# Results not known		# Results not known		# Results not known		# Results not known	
# Referred Observation		# Referred Observation		# Referred Observation		# Referred Observation	
#Problem not confirmed		#Problem not confirmed		#Problem not confirmed		#Problem not confirmed	
# Problem confirmed		# Problem confirmed		# Problem confirmed		# Problem confirmed	
# Results not known		# Results not known		# Results not known		# Results not known	

Directions for School Health Screening Report – Part II Expanded Vision Screening

- I. Complete the school year for which you are reporting indicating both years of the school year (ex. 2001-2002)
- II. **School Administrative Unit:** Identify the school administrative unit for which you are reporting. Provide the official designation, such as the name of the municipality, the SAD, Union, or CSD number.

County: Identify the County where the school district is located. If the school district crosses county lines, use the county in which the Superintendents Office resides.

Name: Provide the name of the person completing the report.

Date: Provide the date when the report was completed.

Title: Identify the title of the person completing the report.

Phone #: List the telephone number of the person completing the report.

Name of School(s): List the name of the school or schools for which you are reporting. You may use one report for multiple schools, however, those school must all be within one SAU.
- III. **Screening Results:** Identify the grade level that you have screened and the total enrollment for that grade. Provide for each grade level, the numbers screened for distance vision, the numbers that were referred, the number referred who were not confirmed for the problem, the numbers who were confirmed, and the numbers of students for which you have no results. Provide the same information for the numbers screened for near vision, muscle balance, and those referred because of problems found from teacher referral.
- IV. Make necessary additional copies of the form if reporting more than 4 grades.

Referral Form

**Referral Form
Expanded Vision Screening**

Dear Parent,

Our school is participating in a study to see if we can identify students with vision problems not usually found with standard vision screening. Your child is being referred for further testing and we recommend that you take your child for an eye examination. When completed, please return this form to school. Thank you.

Students Name _____
Birth date _____ **School** _____
Date _____

Reason for Referral:

Failed Near Vision

Screening Results:

(Referral criteria – 20/30 each eye and more than one line difference between eyes.)

Rt Eye: _____
Lt Eye: _____
Both Eyes: _____
Line Difference Between Eyes: _____

Failed Muscle Balance

Screening Results:

(Referral criteria – Horizontal reading of 10 or more exophoria or 5 esophoria.. Vertical reading 2 or more hypophoria or hyperphoria. Unable to see red line. Excessive movement of line.)

Horizontal Reading: _____
Vertical Reading: _____
Unable to see red line:
Excessive movement of line:

Teacher Observation

See attached 'TEACHER OBSERVATION CHECKLIST FOR VISION REFERRAL'.

Failed Distance Vision

Rt Eye: _____
Lt. Eye: _____
 without glasses with glasses

Referral Response Form:

Referral Findings Confirmed: Yes No

If Yes, please identify treatment.

Provider Name _____ Date _____
Phone _____

This information may be released to the school. _____
Parent Signature

Expanded Screening Follow-up Form

For telephone calls if the referral form was not returned.

1. Have you taken you child to the doctor as a result of the vision referral?

Yes [] No []

2. If not, why? _____

3. If yes, what type of doctor did you take your child to?

Eye Doctor – Optometrist Ophthalmologist or Primary Care Physician

4. If a primary care physician, were you then referred to an eye doctor?

Yes [] No []

5. Did the doctor confirm a vision problem?

Yes [] No []

6. What type of vision problem did they find? Dx. _____

7. Is the vision problem treatable or correctable (glasses, treatment, exercises)?

Yes [] No []

8. Previously, has your child been seen by an eye doctor?

Yes [] No []

9. If so, when and what did they find? (Month and Year) _____

Dx. _____

Treatment _____

10. Other comments:

Teacher Checklist

TEACHER OBSERVATION CHECKLIST FOR VISION REFERRAL

Dear Teacher,

The Teacher Observation Checklist is a tool for you to use to help identify students with a vision problem. When you have a concern about a student, complete the form and check (X) all applicable signs/symptoms and return to the school nurse.

NAME OF CHILD _____ DATE _____
 SCHOOL _____ GRADE/CLASS _____
 SUBMITTED BY _____

PHYSICAL SIGNS

? Reddened eyes or lids	? Closing or blocking one eye when working	? Squinting
? Eye turning in or out at any time	? Tilted head or unusual posture	? Rubbing
? Eyes tear excessively		? Blinking

STUDENT COMPLAINT/SYMPTOMS

? Headache	? Tearing of eyes	? Words move around
? Pain around eyes	? Blurred vision	? Nausea/dizziness after reading
? Burning or itching eyes	? Double vision	

PERFORMANCE SIGNS

? Turns head while reading	? Difficulty copying from board	? Fatigues easily after reading
? Frequently loses place	? Difficulty staying on line when writing	or writing
? Omits/inserts/rereads words	? Poor spacing of letters/word	? Short attention span
? Uses fingers to keep place	? Hold book close to face	? Avoids close work
? Misaligns # columns		? Poor comprehension of reading material

SCHOOL PERFORMANCE:

Child is doing well ____ Child is not doing well ____

OTHER COMMENTS:

Refer to school nurse if there are any checks in the PHYSICAL SIGNS or STUDENT COMPLAINTS/SYMPTOMS or if there are three or more in the PERFORMANCE SIGNS.

Feedback Form

Feed Back Form for Volunteers who Participated in the Expanded Vision Trial Study of 2001/2002

Name _____ Date:

1. Please estimate the amount of time it took you to conduct the expanded vision screening? (Minutes per student)

2. What were the problems you encountered?

3. How receptive were teachers to using the Observational Check List?
 Very receptive and interested in using the Checklist.
 Expressed willingness to try.
 Noncommittal.
 Did not wish to participate.

4. Did teachers use the checklist appropriately?
 Referrals were appropriate.
 Referrals were not appropriate.
 Did not receive a referral.

5. How difficult was it for you to learn the techniques of screening for near vision and muscle balance?

Difficulty in learning	Near Vision	Muscle Balance
Very difficult		
Moderately difficult		
Easy		

6. What tricks did you learn to expedite the screening?

7. Was it difficult for students to follow directions during the screening? Yes
No If so, how?

8. Are parents more or less responsive to referrals for expanded screening compared to standard distance vision screening?

9. Are physicians more or less responsive to referrals for expanded screening compared to standard distance vision screening?

Feedback Form

10. On a scale of 1 – 10, with 1 being not at all valuable and 10 being extremely valuable, how valuable do you believe the expanded screening is for detecting vision problems?
- a. Near Vision –
 - b. Muscle Balance –
 - c. Observational Check list -

11. Please check the boxes indicating the grade levels for which you recommend expanded vision screening be implemented.

Test	K	1	2	3	4	5	6	None
Near Vision								
Muscle Balance								

12. If recommended, what do you believe the training requirements should be for school nurses who will adapt expanded vision screening?

13. Any other general observations, comments, or suggestions?

Thank you so much for you participation in this important study.

