A Quality Control Surveillance System of Practitioner Compliance with Newborn Screening Statutes in Oregon

by

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BACKGROUND

Oregon has tested infants for the presence of biochemical disorders since 1962, when it became the first place in the country to use Guthrie's bacterial inhibition assay for early detection of phenylketonuria (PKU) (Ostergren, 1964). The efficacy of this test in diagnosing PKU before irreversible brain damage occurs is well established, and screening has now become a routine part of newborn care in virtually every civilized country in the world (Reilly, 1976).

The Oregon Public Health Laboratory performs newborn screening for all infants born in the Pacific Northwest region. Approximately 120,000 specimens per year are submitted for the 70,000 infants born in Oregon, Idaho, and Nevada. The screening battery includes 9 separate assays for 7 disorders: congenital hypothyroidism, phenylketonuria, galactosemia, maple syrup urine disease, homocystinuria, tyrosinemia, and biotinidase deficiency. Approximately one baby in 4,000 is affected with one of these disorders (McKusick, 1983). Rapid accurate screening with diagnosis and treatment in the first weeks of life can result in normal growth and development for these infants.

The goal of the newborn screening program is to identify all affected infants before damage is done; to do so virtually every baby must be screened, which requires coordinated efforts from three groups of health providers. The Public Health Laboratory is responsible for performing the tests and providing prompt accurate results. Consultants at the Oregon Health Sciences University provide immediate follow up for the 700 infants found each year to have abnormal tests, treat the affected infants, and provide counseling to their families and health care providers. Since 1977, the consultant team has also provided information about the program to both practitioners and the lay public. The third group involved in the program consists of the hundreds of nurses, physicians, and midwives responsible for obtaining the screening specimens.

In Oregon, approximately 2,500 practitioners care for the 40,000 newborns each year, either in a hospital, birth center or the home. It is their responsibility to obtain adequate specimens from every infant at the appropriate times, provide correct and current information to the parents, and interpret and follow up on test results. The term "newborn screening practice" encompasses these actions and the decisions of practitioners in the collection and handling of screening specimens.

Oregon has devised sophisticated quality control measures for the laboratory and follow-up components of the program, and since the inception of the screening no infant has been missed as a result of laboratory error or because follow up was not provided. Unfortunately, in the last 10 years 3 infants were missed or diagnosed late due to errors committed by the practitioners responsible for obtaining the screening specimens. These tragedies occurred despite a mandatory screening law and the availability of educational materials. Clearly, comprehensive quality control measures are also required for newborn screening practice if all affected infants are to be found.

The need for quality assurance in screening practice has become particularly acute because of two major changes in perinatal care--an increase in out-of-hospital births and the early discharge of infants from hospitals. When screening programs were started, mandatory screening laws were passed in many states, including Oregon (Reilly, 1976). Since most babies were born in hospitals, mandatory discharge screening was an effective way to ensure that every baby was tested. Today, however, 5% of infants are born outside hospitals, in birth centers or in the home (Oregon Vital Statistics, 1985). While screening is still required for these infants, there is no way to ensure that it takes place and there is no penalty for not screening,

or for performing the test incorrectly. Furthermore, hospitals now offer early discharge, for some as soon as 4 hours after delivery. While many studies have supported the efficacy and safety of early discharge, this practice has created a crisis for screening programs across the country (Hellman, Kohl, & Palmer, 1963; Proceedings of National Newborn Screening Symposiums, 1984 & 1985; Scopholme, 1971; Simmons & Bernstein, 1983).

Experts have always known that the validity of the screening tests is dependent on the amount of protein and lactose feedings the infant has received prior to sample collection (Guthrie & Susi, 1963; Holtzman, Mellits, & Kallman, 1974; Starfield & Holtzman, 1975). The exact amount required to produce abnormal results for all disorders in every affected baby is unknown, since there is wide biologic variation (Stanbury, Wyngaarden, & Fredrickson, 1983). To avoid false negative results, the Academy of Pediatrics recommends retesting all infants initially tested before 24 hours of age (Committee on Fetus and Newborn, 1980). Indeed, the latest and most comprehensive study suggests that 40% of infants with PKU may be missed if the sample is taken within the first 24 hours of life, given a 4% mg cutoff for abnormals (McCabe, McCabe, Mosher, Allen, & Berman, 1983).

Oregon has always taken a conservative approach to screening, requiring a routine repeat test for all infants. In 1981, in response to a dramatic increase in early discharge, the legislature amended the screening statute to require repeat tests by 14 days of age for infants tested before 48 hours. Random sampling of these infants' screening specimens, however, has revealed that up to 80% are not being retested according to the State statute (Public Health Laboratory statistics, 1979-1985). Increasing numbers of infants are receiving incomplete or invalid screening because of practitioner errors in the collection and handling of specimens. Thus, for the first time since the inception of screening programs, practitioner noncompliance is a growing threat to the quality of the program. Unfortunately, while major efforts to educate practitioners about screening recommendations have been underway in Oregon since 1980, no systematic surveillance of screening practices existed until 1985, so until recently it was impossible to know which hospitals or practitioners were most in need of help. Further, existing measures of screening practice errors, primarily random samples or year-end totals, are too crude to identify individual infants with incomplete screening or the specific facilities with high error rates. Finally, without an effective measure of screening errors it is

difficult to assess the effects of interventions aimed at improving practices.

In cooperation with the State Health Division and the Public Health Laboratory, a quality control program for newborn screening practice is now being developed. In addition to program and reporting changes, a computer-based surveillance system has been developed to track:

1. Individual infants through the screening process to ensure timely and complete follow up;
2. Screening practice errors in hospitals and birth centers and among individual practitioners so that those with high error rates can be identified;
3. Changes in error rates over time so that education efforts can be evaluated.

The primary aim of this study was to evaluate the newly available computer data on five categories of screening practice errors in birth facilities in order to measure the magnitude of the practice problem and provide direction for future study and program planning. A second aim was to determine differences in the error rates of Oregon facilities based on their type, location, and the number of specimens submitted, in order to identify basic distribution patterns for the various errors and to plan interventions.

METHODS

Design

The frequency of five major screening practice errors in birth facilities in Oregon was determined with data from the Public Health Laboratory computer for 4 consecutive months. Error rates for each category were compared by facility characteristics, which included type, number of specimens submitted, and location.

Sample

All 116 birth facilities in Oregon that submitted standard newborn screening specimens between November 1, 1985, and February 28, 1986, were included in the study.

Three types of facilities, hospitals, birth centers, and home, were represented. Hospitals were defined as traditional facilities providing a full range of delivery services, where births are attended by physicians, osteopaths, chiropractors, or certified nurse midwives. Birth centers were defined as nonhospital facilities whose primary function is to deliver low risk infants, and which are staffed by one or more practitioners who may be physicians, chiropractors, nurse or lay midwives. Home

births were those occurring in private residences, usually attended by lay midwives, although some physicians and nurse midwives perform home deliveries

All of Oregon's maternity hospitals were represented, 80% of the birth centers, and 45% of the home birth practitioners. There were 63 hospitals, 12 birth centers, and 41 home birth practitioners. A total of 23,718 specimens were submitted by these facilities over the 4-month period.

Facilities were identified as submitting high, medium high, medium low, and low numbers of specimens. The total number of specimens submitted over the 4-month period was determined for each facility. As the range of specimens per facility was expected to be large, the semi-interquartile range (Q) was chosen to measure variability. Semi-interquartile range divides the numbers of specimens per facility into 4 equal parts where Q1 represents the 25% of facilities with the lowest number of specimens and Q4 represents the 25% of facilities with the larges number of specimens.

Facilities were grouped into 10 nonrandom locations or educational catchment areas around the State, defined as areas in which facilities could be reached by a traveling education team in less than 4 days. Differences in error rates between these areas were examined to facilitate

educational planning. The type and number of facilities in each area are shown in Appendix 1.

Variables and Measurement

Standards of Practice and Definition of Errors

In Oregon, the law mandates two tests on every baby, specifies the age of the infant at which specimens should be collected, and identifies the hospital and/or practitioner as responsible for obtaining the tests (ORS: 431.210-431.325, 1981). The Oregon State Health Division, through administrative rules, further specifies what constituted an adequate blood sample, the demographic data required, and the time between collection and mailing of specimens. Given these standards, it is possible to distinguish six major categories of screening practice errors:

1. delay of the specimen in transit,
2. incorrect timing of the two specimens,
3. failure to obtain the second specimen,
4. inadequate specimen,
5. failure to provide key demographic data,
6. failure to test the infant at all. (These errors were not included in the present study since a mechanism for reliable identification through birth certificates is not yet perfected. Yearly

estimates are 1%-3%, calculated by subtracting first specimens from registered births.)

Several types of errors were defined in each major category, as described below.

Delay in Transit

Practice Standard: All specimens are to be mailed within 24 hours after collection. Under normal conditions, mail can be delivered across the state in 2-3 days.

Transit Error: All samples more than 5 days old when received by the laboratory.

Measurement: The age of each specimen was determined by subtracting the date of receipt from the date of collection.

Incorrect Timing of the Two Specimens

Practice Standard: State statutes specify the age of infants at specimen collection as follows:

- If the first specimen is collected at less than 48 hours of age or before 24 hours of protein/lactose ingestion, then the second specimen is to be collected no later than the 14th day of life.

- If the first specimen is collected after 48 hours of age, then the second specimen is to be collected between 14-56 days of age.

- Every baby must have the first specimen collected by the 10th day of life.

Timing Errors: Six timing errors were identified:

1. 1st specimen more than 10 days; 2nd specimen between 14-56 days

2. 1st specimen more than 10 days; 2nd specimen less than 14 days

3. 1st specimen more than 10 days; 2nd specimen more than 56 days

4. 1st specimen 2-10 days; 2nd specimen less than 14 days

5. 1st specimen 2-10 days; 2nd specimen more than 56 days

6. 1st specimen less than 48 hours; 2nd specimen more than 14 days

Measurement: The age of the infant at specimen collection was determined by subtracting birthdate and time from the sample date and time. The 1st and 2nd specimens were distinguished either by the age of the infant or whether the specimen was submitted on the 1st or 2nd requisition of the two-part kit.

Failure to Obtain the Second Specimen or Retest

Practice Standard: Oregon law mandates that all infants are to be retested.

Retest Errors: Infants who were not retested were divided into four groups based on their age at the first test:

1. 1st specimen less than 48 hours
2. 1st specimen 2-10 days
3. 1st specimen more than 10 days
4. 1st specimen: age unknown due to omission of birth date or sample date from the first specimen

Measurement: Allowing at least 5 days in transit, infants for whom a second specimen had not been received by 62 days of age were considered not retested.

Inadequate Specimens

Practice Standard: A minimum of 3 fresh blood-soaked circles of uncontaminated filter paper are required to complete the test battery for all seven disorders.

Inadequate Specimen Errors: Four types of inadequate specimens were identified:

1. Insufficient blood to complete the test battery
2. Contaminated filter paper
3. Old blood spots
4. Other

Measurement: Inadequate specimens were determined by visual inspection of each filter paper specimen by experienced laboratory technicians.

Failure to Provide Key Demographic Data

Practice Standard: The current Oregon screening requisition asks the practitioner to provide 18 pieces of information for each specimen. Five of these are considered important to identify the infant or to evaluate abnormal results.

Demographic Errors: All specimens on which one or more of the following pieces of information were not specified:

1. Birthdate (includes date and time)
2. Sample date (includes date and time)
3. Baby's name
4. Maturity at birth (full term or premature)
5. Feeding history (breast/bottle; well/poorly; at least 24 hours of feedings)

Measurement: Each omission was counted independently on each sample; for example, if all the key data were missing, five errors were counted. If the infant's name or the requisition was unreadable, this was also counted as an error, making six possible demographic errors.

Data Collection and Analysis

As specimens are received by the laboratory, data are entered into the computer. The results on each infant are tracked up to 4 months or until all tests have been

completed on both specimens or on abnormal repeat specimens. Individual code numbers identify the facility and/or practitioner who submitted the specimen. Monthly summaries of the 21 errors are generated for each facility and practitioner in the state.

The reliability of these data are affected by errors made in computer data entry. The accuracy of data entry is monitored by comparing random samples of requisitions with the computer data. During the period of this study these errors remained constant at 1/9000 keystrokes. Each specimen has an average of 50 keystrokes. Therefore, one data entry error can be expected to occur on one in 180 specimens.

In the present study, screening practice error rates were calculated by adding individual errors in each category, dividing by the total number of specimens, and multiplying that number by 100 to yield the number of errors per 100 specimens. Error rates in each category were computed for each month and for the total study period.

The percent of total errors was calculated by dividing the total number of errors for each category by the total number of errors for all categories.

Analysis of variance was used to test for differences between mean error rates for each type of error category by type of facility, location, and the number of specimens submitted. The level of significance was set at 0.05.

RESULTS

Screening Practice Results

Hospitals submitted 97.5% of the 23,718 specimens submitted during the 4-month study period, birth centers submitted 1.5%, and home birth practitioners, 1.0%. Appendix 2 summarizes the total number of specimens by type of facility.

Using Oregon recommendations for a standard, 58.3% of the specimens were submitted incorrectly. There were 20,216 total errors in 13,823 specimens. There were more errors than specimens because many specimens had more than one error. Monthly and total mean error rates for each category are shown in Figure 1.

Transit Delays

There were 3,626 specimens older than 5 days upon arrival at the laboratory, accounting for 18% of the total errors. The rate of transit errors for this study was certainly affected by Christmas postal delays as the rate for December was much higher than the other months (Figure 1). One would expect this fluctuation during times of mail overload.

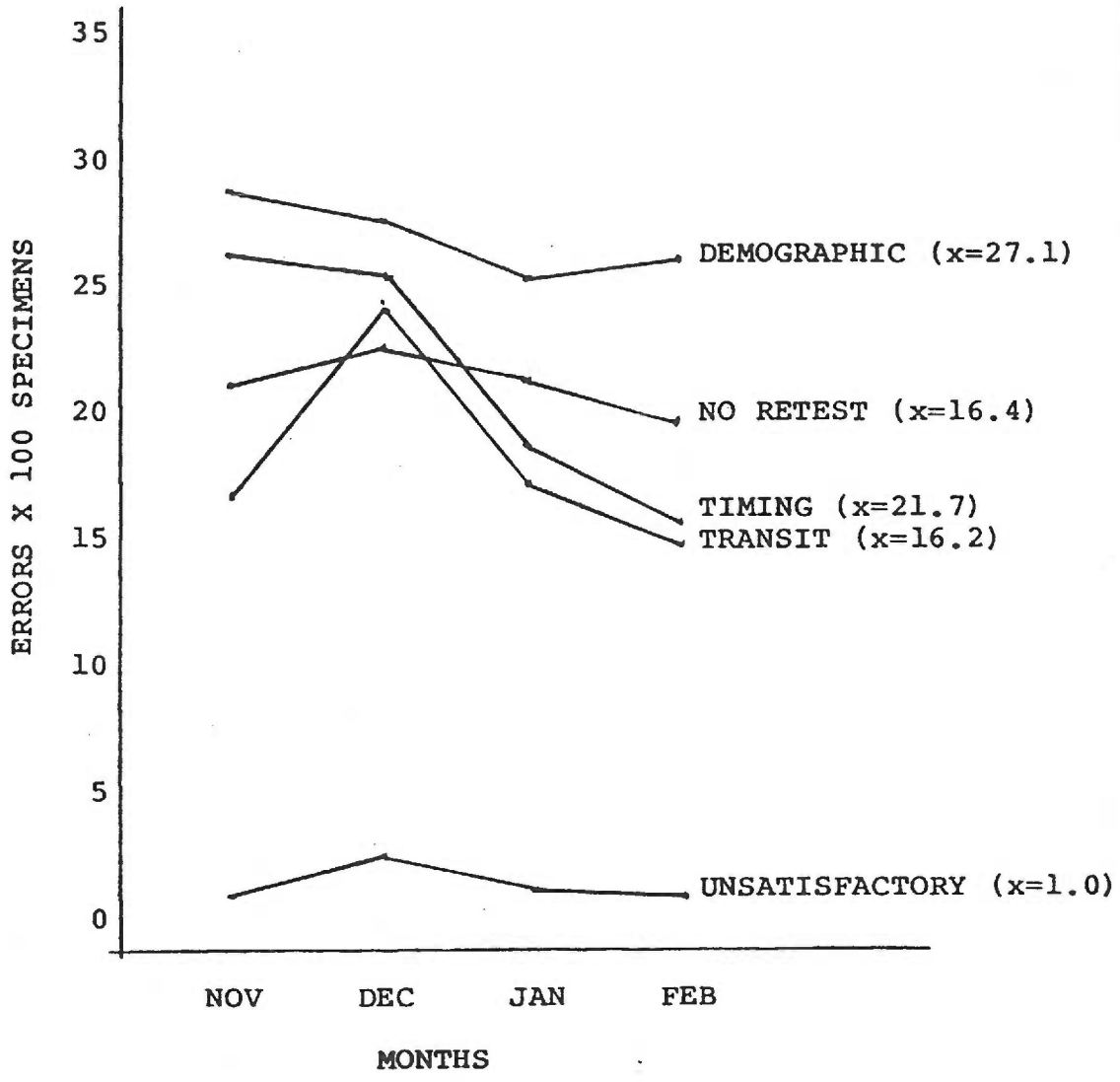

Figure 1. Monthly and total mean error rates for 116 Oregon birth facilities.

Timing Errors

Failure to collect the first and second specimens at the recommended times accounted for 27% of the total errors (Table 1). With the exception of first specimens collected after 10 days of age, timing errors occurred when the second specimen was obtained, usually by private practitioners and not the hospitals. The vast majority of timing errors (75%) occurred in early tested infants who were not retested until after 2 weeks of age, usually between 4-6 weeks.

TABLE 1

INCORRECT TIMING OF THE 1ST AND 2ND SPECIMENS IN 116 FACILITIES IN 4 MONTHS

Timing Errors	Number	Percent
1st > 10 days; 2nd 19-56 days	17	0.4
1st > 10 days; 2nd < 14 days	44	1.0
1st > 10 days; 2nd > 56 days	34	0.6
1st 2-10 days; 2nd < 14 days	897	17.0
1st 2-10 days; 2nd > 56 days	328	6.0
1st < 48 hours; 2nd > 14 days	4053	75.0
Total	5373	100.0

Retest Errors

Failure to collect a second specimen accounted for 15% of the errors (Table 2). The largest group of infants not retested (45.4%) were those initially tested at less than 48 hours of age. The age at initial testing could not be determined in over 30% of the babies because the birthdate or sample date was omitted from the first specimen.

TABLE 2

FAILURE TO OBTAIN A 2ND SPECIMEN IN 116 FACILITIES IN 4 MONTHS

No Retest	Number	Percent
1st < 48 hours	1366	45.4
1st 2-10 days	721	24.0
1st > 10 days	5	0.1
Age at 1st unknown	917	30.5
Total	3009	100.0

Inadequate Specimens

Inadequate specimens comprised 0.7% of all errors, with 81% of these due to insufficient blood to complete the screening battery (Table 3).

TABLE 3

INADEQUATE SPECIMENS SUBMITTED BY 116 FACILITIES IN 4 MONTHS

Inadequate Specimens	Number	Percent
Insufficient blood	111	81.0
Contaminated	4	3.0
Old blood spots	1	1.0
Other	21	15.0
Total	137	100.0

Demographic Errors

The most common error, accounting for 33% of the total, was the failure of practitioners to supply key demographic data (Table 4). It is disturbing that 25.5%

TABLE 4

TOTAL OMISSIONS OF DEMOGRAPHIC DATA BY 116 FACILITIES IN 4 MONTHS

Demographic Omission	Number	Percent
Birth date	27	0.5
Sample name	1330	20.0
Infant's name	163	2.5
Maturity at birth	1171	17.5
Feeding history	2442	36.5
Unreadable requisition	1558	23.0
Total	6691	100.0

of these errors involved specimens that could not be read or on which the infant's name was not given.

Comparison of Error Rates by Characteristics of Facilities

Type of Facility

Hospitals and birth centers had significantly higher rates of timing and demographic errors than did home birth practitioners (Appendix 3). Home practitioners, however, submitted twice as many inadequate samples as did the hospitals.

Number of Specimens Per Facility

The number of specimens submitted by the facilities varied from 1 to 1636 over the 4 months. Generally, home birth practitioners submitted the fewest, followed by birth centers and small hospitals. Those facilities that submitted three or less specimens had the lowest error rates in all categories; as might be expected, the number of timing and demographic errors increased with the number of specimens submitted (Appendix 4).

Location

Significant differences in transit errors were found depending on the distance a specimen had to travel to the laboratory. Facilities furthest from the laboratory had

the highest error rates (Appendix 5). Distance was not the only factor, however, as Portland facilities are all within five miles of the laboratory and their transit delays were three times higher than facilities on the north coast, over 100 miles away.

DISCUSSION AND CONCLUSIONS

Discussion

As a result of errors in the collection and handling of specimens, over 58% of Oregon newborns born during a 4-month period received less than optimum screening as defined by state statutes and Public Health Laboratory recommendations. An additional 1%-3% of babies were not tested at all. These errors increase the chances that an affected infant may be missed or that diagnosis and treatment may be delayed.

Transit Delays

Specimens older than 5 days upon receipt by the laboratory accounted for 18% of all errors. The most serious consequences of a transit error may be unnecessary delay in diagnosis and treatment for an affected baby. Infants with galactosemia and maple syrup urine disease become sick so rapidly after birth, they could die. The most common problem, however, is deterioration of the enzyme activity in the blood spots, which can cause false positive results.

While some of the delays may be due to postal overload, most were caused by failure of the practitioners or facilities to mail them within 24 hours of collection. Home birth practitioners may simply forget to mail the specimen, while small hospitals and birth centers may hold them over several days for batch mailing in order to save postage. Large facilities, on the other hand, are more likely to have sluggish in-house mail. For example, 33% of the transit delays for Portland facilities occurred in one large hospital less than a mile from the laboratory (Appendix 5).

Interventions to decrease these errors will vary depending on the reason they are occurring. For example, efforts to reduce transit delays caused by in-hospital mail problems or batch mailing must be directed toward hospital administrators rather than nursing staff.

Timing Errors

Timing errors are most serious for infants tested before 48 hours of age, as the ingestion of protein and lactose may not be sufficient to exclude biochemical abnormalities. Failure to obtain a retest by 14 days of age could be fatal for infants with galactosemia or maple syrup urine disease, while those with PKU or hypothyroidism may have diagnosis and treatment delayed several weeks.

Timing errors accounted for 27% of all the errors and the majority of these occurred in hospitals and birth centers, which must screen all infants at discharge despite inadequate intakes of protein and lactose. Failure of the private practitioner to obtain the second test at the correct time suggests a lack of communication between hospital, practitioner, and parent. It also implies that may private practitioners have not adjusted their screening practices to accommodate these infants. Hospital staff must improve their communication with private practitioners and their education of parents, so that early tested infants are returned for retests at the optimum times. This is obviously not a problem for home birth practitioners, who usually obtain both tests. They also have more control over the timing of the first test, since they do not have to contend with a "discharge." Many may delay the first test until the third day, which then provides a larger range for obtaining the repeat.

Retest Errors

Apart from those infants who are not tested at all, infants at the greatest risk of being missed by the screening program are those who are tested early and never retested. While the number of retest errors in Oregon has remained between 10%-15% over the years, the proportion of

early tested babies in this group has risen, representing 45.4% in this study. Of the infants not retested, 24.2% received their initial test after 2 days and were at very low risk of having undetected metabolic disorders; however, 10% of Oregon's hypothyroid cases are found on routine repeat screens. It is the responsibility of the private practitioners to obtain retests. These data suggest that some practitioners are neglecting this duty or that parents are not returning the newborns to medical care. Efforts to improve the retest rate must therefore be directed at private practitioners and the parents.

Inadequate Specimens

The chances of missing an infant due to an inadequate specimen are less than for timing, retest, and transit errors, as the numbers of inadequate specimens are relatively small and the laboratory uses whatever blood is available to test for the more common disorders. However, these errors do cause delays in completing the test battery and increase parental anxiety and expense, as the infant must be brought in for another test.

Inadequate specimens are caused by improper collection techniques. Home birth practitioners had twice the rate of inadequate specimens than hospitals (Appendix 3). Personal experiences with these practitioners, often lay midwives,

have revealed they are reluctant to "hurt the baby" and if a good flow of blood is not obtained on the first poke, many will not stick the infant again.

Demographic Omissions

While demographic omissions were the most frequent type of error, as a group they are the least serious for an affected infant because the laboratory or follow-up team can rapidly obtain the missing data by phone in the event of an abnormal result. However, unreadable specimens or those with no name are difficult and time consuming to match with the right infant, especially in large facilities. These errors may result in serious and unnecessary delays in diagnosis.

The most common cause for unreadable requisitions were addressograph cards used to quickly stamp the infant's name onto the requisition. High rates of demographic omissions by hospitals are likely due to haste and/or carelessness on the part of nurses or laboratory technicians responsible for collecting specimens.

Conclusions

The screening practice errors monitored for this study and for the near future in the Northwest Regional Screening Program are those which can be obtained from specimen

requisitions. Reliability is enhanced because the data is provided by the practitioners themselves. While this method does not measure the whole of screening practice, such as the use of cord blood or how well parents are instructed, it is the first known attempt to develop routine surveillance for screening practice.

This study provides baseline data for long term surveillance of screening practice errors in Oregon. These and future data will provide a unique "moving picture" of screening errors to direct and evaluate the education efforts. Top priority for education will be given to those facilities with the largest number of transit, timing, and retest errors, as these are the most serious. These facilities were identified in this study; the next step is to carefully evaluate individual error profiles and plan appropriate interventions. For the first time, the education team can direct its efforts at specific, measurable errors within a facility or area in the state. Continuous tracking by the computer will monitor the short- and long-term effectiveness of these efforts.

Continuous rapid surveillance of all specimens for a large number of errors also provides an opportunity to improve the quality of individual infants' screening, as the computer in many cases will identify those with substandard screening in time for valid tests to be

obtained. Computer generated test results for individual infants will soon list all serious errors and recommendations for retesting.

As the trend toward early discharge continues to grow and more infants are delivered out of hospitals, the issue of practitioner compliance becomes more important to the reliability and validity of the screening tests. Many screening laboratories in the United States and around the world have initiated computer tracking for individual infants as part of in-house quality control. Oregon has expanded this system to include routine monitoring of 21 screening practice errors that can be obtained from specimen requisitions. Other screening programs could adapt their own computers to track whichever information is important to them.

The success of newborn screening programs is reflected in a whole generation of people with PKU and congenital hypothyroidism who will lead normal productive lives. As more tests for other treatable disorders are incorporated into screening batteries, the number of babies saved from death or disability will grow larger. Successful identification of every affected baby requires quality assurance for all three components of a screening program: laboratory, follow up, and screening practice. It is

important to remember that the ultimate goal is not to criticize either facilities or practitioners, but to form a cooperative team to identify and treat affected infants in the face of continued changes in perinatal care and screening technology.

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APPENDICES

APPENDIX A

TYPE AND NUMBER OF FACILITIES BY CATCHMENT AREA

	Type of Facility			
Location	Hospital	Birth Center	Home Practitioner	Total
A	9	3	8	20
B	6	2	9	17
C	4	-	1	5
D	6	1	4	11
E	6	1	1	7
F	10	1	3	14
G	4	-	5	9
H	10	2	2	14
I	3	3	5	11
J	5	-	3	8
TOTAL	63	12	41	116

APPENDIX 2

NUMBER OF SPECIMENS SUBMITTED CORRECTLY AND INCORRECTLY BY TYPE OF FACILITY

Type of Facility	Number of Specimens		
	Correct	Incorrect	Total
Hospitals	9,688	13,472	23,160
(n = 63)	(41.8%)	(58.2%)	(100%)
Birth Centers	132	233	365
(n = 12)	(36.2%)	(63.8%)	(100%)
Home Practitioners	75	118	193
(n = 41)	(38.9%)	(61.1%)	(100%)
TOTAL	9,895	13,823	23,717
N = 116	(41.7%)	(58.3%)	(100%)

APPENDIX 4

DIFFERENCES IN ERROR RATES BY NUMBER OF SPECIMENS PER FACILITY

Type of Error	Q1 n=1-3	Q2 n=4-41	Q3 n=42-216	Q4 n=217-1636
Inadequate	0.5	2.0	1.0	0.8
No Retest*	12.3	23.4	17.9	18.8
Timing*	5.0	12.3	22.2	24.4
Demographic*	5.6	18.5	28.2	27.3
Transit*	6.8	17.2	17.1	15.4

*Significant at 0.05 level.

Notes: Q = Quartile percentile. N = Specimens.

APPENDIX 5

DIFFERENCES IN ERROR RATES BY GEOGRAPHIC LOCATION
OF OREGON BIRTH FACILITIES

Type of Error	Portland (n=20)	Tri-County (n=17)	North Coast (n=5)	Willamette Valley (n=11)	North Central (n=7)	Eastern (n=14)	South-east (n=9)	Southern (n=14)	Mid-Coast (n=11)	Eugene (n=8)
Inadequate	0.8	1.8	0.7	0.4	4.0	1.1	0.2	1.4	0.8	0.6
No Retest*	11.8	19.7	11.1	6.3	16.2	15.1	33.0	19.1	18.6	20.3
Timing	14.4	11.6	17.9	16.7	22.2	17.5	22.1	16.6	13.3	19.3
Demographic	20.0	16.2	19.7	19.9	23.6	27.5	20.7	24.4	12.1	21.3
Transit*	15.5	6.7	5.5	12.6	15.0	20.5	18.1	20.5	15.5	12.2

*Significant at 0.05 level.

ABSTRACT

The Oregon Public Health Laboratory computer, which tracks individual newborn screening specimens and results in the laboratory has been expanded to monitor hospital and practitioner compliance with State screening recommendations.

The system tracks 21 screening practice errors in five major categories, all of which can affect the quality of an infant's screening tests. This study examined computer generated data for 23,718 specimens submitted by 116 Oregon birthing facilities over a 4-month period to identify patterns of screening practice errors around the state. Differences in error rates were compared to three characteristics of the facilities: type, number of specimens submitted, and location. Results show that 58.3% of the specimens were submitted incorrectly according to current recommendations. Specific facilities have been identified that have the highest error rates. These will be targeted for corrective action and the computer system will monitor the effectiveness of these interventions over time. This study has provided baseline error rates for ongoing surveillance of screening practices, which is part of an overall program of quality control for newborn screening practice.

ABSTRACT

A Quality Control Surveillance System
of Practitioner Compliance With Newborn
Screening Statutes in Oregon

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