Expansion of a National Newborn Screening Quality Assurance Program – Technical Assistance from CDC’s NSQAP

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9th ISNS International Meeting
The Hague, Netherlands
September, 2016
NSQAP Proactive Proficiency Testing
External Quality Assurance

Proficiency Testing
- 100% of State NBS programs participate
- Participating labs get 3 challenges of 5 blind-coded specimens per year
- 80% Consensus (US labs) for graded specimens
- Allows for accreditation of screening labs

Quality Control materials with certified values

Internet reporting site for laboratory
- Results posted and available to participating labs
- Paperless PT report
- Web location: [http://www.cdc.gov/labstandards/nsqap_reports.html](http://www.cdc.gov/labstandards/nsqap_reports.html)

Follow-up of False Negative (FN) results
- Proactive follow-up with NSQAP lab scientist
- Additional challenge specimens

Technical assistance and technology transfer to NBS labs
- Assistance to ensure analytic validity and utility of screening tests
77 Countries Participated NSQAP in 2016
N= 653
### 19 Countries with ≥ 10 Labs Enrolled in NSQAP

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Labs</th>
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</thead>
<tbody>
<tr>
<td>United States</td>
<td>89</td>
</tr>
<tr>
<td>China</td>
<td>47</td>
</tr>
<tr>
<td>Mexico</td>
<td>46</td>
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<tr>
<td>India</td>
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<td>Brazil</td>
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<td>Japan</td>
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<tr>
<td>Turkey</td>
<td>30</td>
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<tr>
<td>United Kingdom</td>
<td>25</td>
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<tr>
<td>Colombia</td>
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<tr>
<td>France</td>
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<tr>
<td>Germany</td>
<td>18</td>
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<tr>
<td>South Korea</td>
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<td>Spain</td>
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<tr>
<td>Italy</td>
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<td>Poland</td>
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<tr>
<td>Argentina</td>
<td>12</td>
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<tr>
<td>Canada</td>
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<tr>
<td>Netherlands</td>
<td>11</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>10</td>
</tr>
</tbody>
</table>

**N = 505 Labs**
(out of 653)
NSQAP Operations
A Model for National Quality Assurance Systems

- NSQAP can provide limited services to developing external QA programs (EQA)
  - Help national labs achieve a high level of quality in their testing
  - EQA Program develops DBS materials
  - NSQAP will independently evaluate EQA Program materials
  - Labs can have confidence in the EQA Program materials

- NSQAP can host lab personnel for training
Building NSQAP Bridges
Transfer of Technology and Linked Data

New Country EQA Program
Government or Professional Organization

Data
Evaluation and Summary Reports

DBS Testing

Preparation and Certification of DBS by Country EQA Program

Country EQA Program Provides Oversight for Newborn Screening LABS; NSQAP Assists if asked

NSQAP Assistance
Government to Government Technical Assistance (TA)

- In 2015, NSQAP was asked for assistance by the Director of the Philippine Newborn Screening Reference Center
  - Expansion of disorders and new laboratories
  - Need to produce their own QC and PT materials
  - Request to send NSRC staff to CDC
  - Branch and Division approval for TA
- Proficiency testing
- Quality control materials
- Validation materials
- Filter paper evaluation
- Training and consultation
- NBS translation research

Preparation of whole blood pools
Reference Material Production
Certification of Blood Spots
Packaging and Shipment to Participating Labs
Training with NSQAP
Two Filipino Quality Assurance Officers

- **Get clearance for non-US visitors (2-week visit)**
  - Bureaucratic process; submission of many documents
    - On-site finger printing
  - At least three months needed for clearance
  - Avoid the month of October (beginning of US fiscal year)

- **Define goals and type of training needed**
  - Blood and serum processing; DBS preparation
  - Method observations – immunoassays, enzymatic assays, MS/MS
    - Kits
    - Laboratory-developed tests
    - Analytical Cutoffs
  - Program management and Laboratory Performance
    - Data processing, statistics, and evaluation
    - Summary reports
Blood Preparation

- **Washing red blood cells**

  ![Maria Escoreal](image1)

  ![Charity Jomento](image2)

  ![Charity, Maria, Dr. LiXia](image3)

- **Hematocrit adjustment**

  ![Image of hematocrit measurement](image4)
Dried blood spot dispensing

- Semi-automated dispensing

Charity acts as the “Racker” – she helps the person spotting the cards by moving the completed racks.
Dried blood spot dispensing

- Automated dispensing

Placing cards on 9-card racks
Adding and removing completed racks from the robot platform
Drying, Packing, and Storing DBS

Dry DBS overnight at ambient temperature

Pack DBS with desiccant and humidity indicator cards in low-gas permeable bags

Store at -20°C
Elizabeth Hall teaches Charity and Maria how to do the TGal assay.
Dr. Timothy Lim described the chemistry used in CDC’s MS/MS derivatized method for amino acids and acylcarnitines, and demonstrates procedures done in a chemical fume hood.
PT Data Collection, Lab Evaluation, Summary Reports
Training by NSQAP Data Management Team

- Data Report Forms
  - Method
  - Quantitative Results or Qualitative Results
  - Cutoffs
  - Clinical Assessments

- Data Reporting
  - E-mail
  - Web-based

- Laboratory Evaluation
  - Keep lab identity anonymous
  - Provide individual lab assessments

- Summary data in public reports

- Used for lab accreditation
Progress to Date

- Five Philippine labs now conduct mandated NBS testing
  - Congenital Hypothyroidism
  - Congenital Adrenal Hyperplasia
  - Galactosemia
  - Phenylketonuria
  - Glucose-6-phosphate-Dehydrogenase Deficiency
  - Maple Syrup Urine Disease

- Three labs do expanded screening for >20 congenital disorders, Cystic Fibrosis, and hemoglobinopathies (since Dec. 2014)

- NSRC staff had additional MS/MS training in the US
- Procurement of new equipment, supplies and reagents in progress
- NSRC moving to a new facility, September 2016
- Preparation of DBS materials – early 2017
- NSQAP will continue to provide Technical Assistance
CDC NSQAP and Philippine NSRC
Making New Friends, Developing Connections, Visiting with Old Friends

Charity, Maria, and Elizabeth

Maria, Dr. W. Harry Hannon, and Charity
CDC Resources

- Newborn Screening Quality Assurance Program
  Joanne Mei jmei@cdc.gov
  - TSH, T4, 17-OHP, Total Galactose, Cystic Fibrosis, Sickle Cell Disease, HIV and Toxoplasma antibodies
  - TREC and LSD PT Programs, Data Management and Program Administration

- Biochemical Mass Spectrometry Laboratory
  Victor de Jesus vdejesus@cdc.gov
  - Amino Acids, Succinylacetone, Acylcarnitines, XALD
  - G6PD, Biotinidase, Uridyl transferase, Filter Paper Assays

- Newborn Screening Translation Research Initiative
  Robert Vogt rvogt@cdc.gov
  - TREC and LSD reference materials
  - Development of DBS reference materials for candidate conditions

- Molecular Quality Improvement Program
  Suzanne Cordovado scordovado@cdc.gov
  - Continuous quality improvement for molecular methods in DBS
  - Quality assurance for specific mutations involved in newborn disorders

- Data Management Team (NSQAPDMT@cdc.gov)
  Sherri Zobel Szobel@cdc.gov
  Irene Williams Iwilliams1@cdc.gov
  LoNeka Shockley Lshockley@cdc.gov
Thank You!

Newborn Screening Quality Assurance Program

For more information please contact Centers for Disease Control and Prevention

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Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.