NIOSH
Coal Workers’ Health Surveillance Program

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Coal Workers’ Health Surveillance Program (CWHSP)

- Department of Health and Human Services
- Centers for Disease Control and Prevention
- National Institute for Occupational Safety and Health
- Division of Respiratory Disease Studies

NIOSH Locations
Division of Respiratory Disease Studies

Appalachian Laboratory for Occupational Safety and Health
Morgantown, WV

Coal Workers’ Health Surveillance Program (CWHSP)


To develop improved health and safety standards to protect the health and safety of the Nation’s coal and other miners
Coal Workers’ Health Surveillance Program (CWHSP)

Code of Federal Regulations
42 CFR Part 37

Program initiated in 1970

“The first priority and concern of all in the coal or other mining industry must be the health and safety of its most precious resource — the miner.”

Components of the CWHSP

- Coal Workers’ X-ray Surveillance Program (CWXSP)
- B Reader Certification Program
- National Coal Workers’ Autopsy Study
- Enhanced CWHSP

B Reader Certification Program

To train and certify physicians in the use of the International Labour Office (ILO) system for classifying chest x-rays for changes consistent with pneumoconiosis

B Reader Testing
B Reader Certification Program

- B Readers are physicians who are considered highly qualified to classify chest x-rays for lung damage caused by dust

- To become certified, physician must pass a test that includes correctly classifying a set of 125 x-rays in 6 hours

- Must recertify via similar testing, every 4 years
NIOSH B Reader Program
Past, Present and Future

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No relevant commercial interests

The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

NIOSH B Reader Program
The Past
The ILO Classification System

- In 1949 the International Labour Office (ILO) promulgated written *Guidelines for the Use of the ILO International Classification of Radiographs of Pneumoconioses* in an attempt to systematically describe and record radiographic appearances of certain abnormalities caused by the inhalation of dusts

- Goals:
  1) To standardize classification methods
  2) To facilitate international comparability of data concerning pneumoconioses research

**Two essential components** for the correct use of the ILO Classification System

1. Adherence to the Guidelines
2. Use of Standard Radiographs
• Despite the availability of the ILO Classification system, there was still great variability among readers
  – In the UK: Large divergence of opinion by expert readers (Fletcher and Oldham, 1949)

• In 1970 NIOSH was mandated by the U.S. Government to monitor the pulmonary health of active underground coal miners through the Coal Workers’ Health Surveillance Program (CWHSP)
  – To detect early CWP and prevent progression in individual miners
  – To gather information from radiographic surveillance and autopsies for evaluation of temporal and geographic trends in CWP
  – To train and certify physicians in the use of the ILO classification system of pneumoconiosis – The B Reader Program

Establishment of The B Reader Program

• Mandated by the U.S. Federal Coal Mine Health and Safety Act of 1969, amended 1977

• Initial certification examination developed between 1974 and 1976 by Dr. Russell Morgan, Johns Hopkins
  – Under contract with NIOSH

• First B Reader examinations given in 1976

• Recertification examination instituted in 1984
B Reader Applications

• Occupational medical monitoring/health surveillance

• Research
  – Epidemiologic
  – Methodologic

• Compensation or program eligibility

• Contested proceedings

• Clinical medicine

Becoming a B Reader

• U.S. Licensed physicians
  – International physicians can pursue certification

• Pre-test preparation for examination
  – NIOSH Self Study Syllabus
  – Attendance at the American College of Radiology (ACR) Symposium on Radiology of the Pneumoconioses
  – Attendance at International NIOSH Symposia
B Reader Examination / Re-examination Process

New Physician

Cert. Exam

B Reader

Recert. Exam

Pass

Every 4 years

Pass

Cert. Exam

Fail

Wait 3 months

Fail

The Test Films

- **Certification examination**
  - 125 films to classify – 6 hours

- **Re-certification examination**
  - 50 films to classify – 3 hours

- **“Correct” answers**
  - Panel of 10 experts
Abnormalities on Test Films

- Certification examination
  - Computer scored (hand review on borderline)
  - 52 films classified < 1/0
  - 15 large opacities
  - 10 diagnoses aside from pneumoconiosis
    * 4 cancer
    * 3 tuberculosis
    * 1 rheumatoid pneumoconiosis
    * 1 CHF

How to Pass the Examination

- The test is scored on the basis of a total possible score of 100 points, with a passing score being 50 or more points

- No way to “Psych” this test
  - Always use standard films for small opacities
    * Follow a systematic process
    * Determine shape/size of small opacities
    * Compare zones of involvement
  - Identify pleural abnormalities
    * Determine type, location
    * Don’t be concerned about width or extent
How to Pass the Examination

- Avoid mistakes
  - Fill in forms carefully
  - Correct numbering
  - Candidate identification
  - Follow skip patterns
  - Avoid over-reading

NIOSH B Reader Program
The Present
NIOSH Transition to Digital Classifications

- Traditional film radiography is soon to be no longer available in the U.S. and in most other countries

- Pneumoconiosis prevalence and severity is increasing
  - CWP in the U.S.
  - Silicosis in So. America
  - Asbestosis and asbestos related disease in India and China, etc

- Mining employment is expanding

- NIOSH had to:
  1. Digitize the ILO reference standards (in collaboration with ILO)
  2. Amend U.S. regulations and redesign its activities to accommodate digital, in addition to film, and
  3. Provide information and resources for radiographic facilities, B Readers and others

New digital ILO classification system now available on DVD for purchase from US and international distributors


Digitized versions of the 2000 ILO reference radiographs

Adapted to allow pneumoconiosis classification of digital (digitally acquired) x‐rays using diagnostic monitors

Examinee digital x‐rays should always be classified based on side‐by‐side comparison with new ILO 2011‐D reference images
NIOSH Guideline: Application of Digital Radiography for the Detection and Classification of Pneumoconiosis

DHHS (NIOSH) Publication Number 2011-198

• Provides technical and operational guidance for radiographic facilities and physician readers
  – Image acquisition, display, classification, etc.
  – Based upon accepted contemporary professional recommendations

NIOSH B Viewer© Software

• Designed to provide standardized viewing of digital x rays and ILO reference images using medical monitors
  – Minimizing variability from different approaches
  – ILO 2011-D reference images must be purchased and loaded into the software

• Download free of charge
  http://www.cdc.gov/niosh/topics/chestradiography/digital-images.html
What does the future hold?

- **Click and classify** – Automated recording of readings

### Parenchymal Abnormalities

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Lobe</td>
<td>A</td>
</tr>
<tr>
<td>Upper Lobe</td>
<td>B</td>
</tr>
<tr>
<td>Middle Lobe</td>
<td>C</td>
</tr>
</tbody>
</table>

### Pleural Abnormalities

- **Click and classify** – Automated recording of readings
For Physician Readers

- A New Reading Environment:
NIOSH B Reader Study Syllabus

• Pre-test preparation for the B Reader examination
  – 80 images, 33 pages of text, 51 reading sheets with answer keys

• Multiple versions:
  – Hard copy (film)
  – CD (images in TIFF format)
  – Download from NIOSH website
    http://www.cdc.gov/niosh/topics/chestradiography/breader-study-syllabus.html
    • DICOM version (NEW)
      – To be used with the NIOSH BViewer or a 3rd party DICOM viewer

NIOSH B Reader Program
The Future
B Reader Examinations

– Both film and digital examinations will be offered
  • Films have been digitized as an interim measure
    – Validation process of digital (digitized) test is currently ongoing
  • New examinations will be developed using digitally-acquired images
  • Physician’s choice of film or digital
  • No modality-specific certification

– NIOSH provides software and hardware for testing in Morgantown
  • Other sites to be considered

Morgantown Digital Test Site

8 workstations for testing
NIOSH Digital Chest Image Repository
CIR

- Database of anonymized digital chest images derived from NIOSH activities and external partners useful for research, education and training, etc.
  - This repository will be used to create the next edition of the International Labour Organization (ILO) Classification of Radiographs of Pneumoconiosis Digital Standard Radiographs, and
  - The new digital examinations and syllabus

- Health care providers/ researchers are invited to submit
  - Digitally-acquired posteroanterior (PA) chest radiographs and CTs
  - clinical/ occupational history submission form, if available

Image Submission
CIR

- Images submitted to the repository must be completely anonymized and in full DICOM file format (not compressed files)

- Contributors will be acknowledged on the NIOSH web site
  – This recognition will not include disclosure of any individually identifiable health information
Disease Categories

- coal workers’ pneumoconiosis (simple and complicated) of various levels of small opacity profusion, based on the International Labour Office (ILO) classification (e.g., 0/1, 1/0, 1/1, up to 3/+)

- silicosis (simple and complicated) of various levels of profusion (0/1, 1/0, 1/1, up to 3/+)

- asbestosis and asbestos-related pleural disease of varying severity, extent, location, presence of calcification, etc.

- other pneumoconioses

Technical Support

CIR

- The Electronic Radiology Laboratory (ERL), at the Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, MO will provide contributors with expertise, technical support and infrastructure for image submission
  - ERL will provide a secure web site for image transfer (currently under construction) and
  - Free software for removal of protected health information (PHI) from the DICOM files to assure that images are de-identified before insertion into the repository
Legal and Ethical Issues

• Contributors will be required to electronically sign a “click through agreement” on the repository website certifying that they are the original source of the data, and that release of the data is permitted by their local authorities, laws and regulations, when applicable
  – Every effort will be made to remove protected health information (PHI) from images and associated information, both by the submitter and again by tested automatic de-identification processes by ERL, as required by HIPAA for data use agreements [45CFR164.514(e)(4)], i.e., appropriate safeguards to ensure that protected health information (PHI) is not used or disclosed inappropriately

Contact

• If interested in collaborating or need further information, please email
  WoRLD-Images@cdc.gov