Individual Monitoring and Occupational Dose Record Management in China

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Contents

• Radiation workers and Law requirements on Individual Monitoring (IM)
• IM service and central database
• Dose record management
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1. Radiation workers and requirements by law and order

No. of radiation Units: ~ 60,000
most of them are located in eastern region.

No. of radiation workers:
more than 300 thousands

- Medical Use: 70 - 80% (223,000 workers)

- Nuclear Industry: ~30,000 increasing in NPPs.

- Industrial Use: 10%

- Others: 10%.
Distribution of radiation workers in hospitals in China in 2012

Medical Imaging, 72%
Dental, 1%
Nuclear medicine, 3%
Interventional Radiology (IVR), 9%
Radiation therapy, 8%
Others and unknown, 7%

Distribution by job (CRRW data, 2012, 223 thousands.)
Regulatory agencies and their duties

National Health and Family Planning Commission (NHFPC)

Ministry of Environmental Protection (MEP)

Ministry of Public Security (MPS)

State Administration of Work Safety (SAWS)

Responsibility mainly on Health:
- Occupational Health Evaluation
- Occupational Health Administration (medical institution)
- Health Surveillance and Health Care
- Occupational Disease Diagnosis
  - Individual Monitoring

Responsibility mainly on Environment:
- Environment Hazard Evaluation
- Radiation Safety licensure

Responsibility mainly on Radioactive Source Security:
- Security of Storage
- Security of Road Transportation

Responsibility mainly on Work Safety concerning radiation:
- Occupational Health Administration (except medical institution)
Main authority and duties concerning the control of occupational exposure

- **National Commission of Health and Family Planning (i.e., the former Ministry of Health):** supervision and regulation of radiation workers in medical field; accreditation and regulation of individual monitoring service provider
- **State Administration of Work Safety:** Supervision and regulation of radiation workers in all other fields;
- **Ministry of Environmental Protection:** supervision and regulation of radiation source safety;
- **Ministry of Public Security:** Security of radiation source
Law on Prevention and Control of occupational disease

- Adopted in 2001, put in force since May 1, 2002
- Amended extensively in 2012 (re-arranged the supervision and management function among the various ministries and agency).

Article 26, 34, 35 and 36, clear requirements for individual monitoring, notification of occupational health hazard, education and training, health examination
Health Ministry Order No. 55 on administration of occupational health for radiation workers

- More detailed requirements are presented in ministry-level document, i.e. the No. 55 order by Health Ministry.
- Adopted on March 23, 2007
- Put in force since November 1, 2007
- 7 chapters 46 articles
Main contents of No.55 administration of occupational health for radiation workers

- Pass the **training** and text before taking the radiation work, and renew the training every 2 years
- **Health checkup** before taking the radiation work, and renew the checkup every 2 years
- Holding the **Certificate/pass**
- Covering by individual monitoring (**IM**)  
- may take 2-4 weeks **special leave**, and receive special allowance
- **Diagnosis and treatment** of disease caused with occupational exposure to ionizing radiation
- Others
2. IM service and central register/database in China

- Before 1985, IM was enforced only in nuclear industry
  - It was started in 1950s.
  - Dose management system was also established and updated since then.
- 1981, the first IM meeting was held in China.
- Since 1985, mainland China started the IM in non-nuclear industries.
National standards for IM

- Specification of individual monitoring for occupational external exposure (GBZ 128-2002)
- Specification of individual monitoring for occupational internal exposure (GBZ 129-2002)
- Specifications of individual monitoring radioactive contamination at occupational worker’s skin (GBZ 166-2005)
- Performance testing criteria of personal dosimetry for external exposure (GBZ 207-2008)

“Performance testing criteria for radio-bioassasy” is being drafted.
IM service providers

• 203 certificated IM service providers are now running; increased from 190 providers in 2009.
  – Medical field: 80% (CDC/institutions of prevention and treatment of occupational disease)
  – Nuclear cycles: Several providers act as self-serve in nuclear facilities, 1 service provider for uranium miners.
    – Commercial ones developed well
  
    – All can measure X/γ radiation
    – 23 can measure neutrons, 12 for beta surface contamination
    – 2 can measure internal exposure
IM service providers

• Most of the providers are small, only about 10 covers more than 4000 radiation workers, about 3 covers 10,000 workers

• >1000 workers, 30 providers
• >4000 workers, 10 providers
• >10,000 workers, 3 providers
TLD badges and materials

TLD: Record dosimeter
EPD: Alarm and ALARA

• TLD materials: >95% service providers use LiF(Mg, Cu, P)
• Chips or powder
• Hp(10), Hp(0.07)
National dose registry
Establishment of national dose registry with IAEA help

In Aug 2004, IAEA ORPAS strongly suggested China to establish a national central database, and improve QC/QA of IM
Establishment of national dose registry with IAEA help

• The *China Registry of Radiation Workers (CRRW)* began to be built since 2005 under IAEA CPR Project (CPR/9/037, CPR 05047)
  – SV to Canada, Germany, Australia
  – Fellowship to Germany, Australia
  – Visited dose registry in Japan

• The objectives of CPR Project 9/0/37:
  – To establish a national management system for individual monitoring and health registry covering all various fields including medical practice, industrial and research practice and others.

• At the same time, National Institute for Radiological Protection (since 2005) and Ministry of health (2009) provided funds to develop the system
Structure of System: offline PC version + web version
中华人民共和国卫生部
放射工作人员职业健康管理系统
一、放射防护个人监测管理子系统

密码：

卫生部放射工作人员职业健康管理系统
一、放射防护个人监测管理子系统

注：详细内容请参见系统帮助文档。

放射防护个人监测管理子系统
一、放射防护个人监测管理子系统

图示说明：

1. 新建：新建个人基本信息（包括个人信息、单位信息等）。
2. 预览：预览个人基本信息内容。
3. 删除：删除已有的个人基本信息。
4. 导入：导入Excel或其他数据文件。
5. 导出：导出个人基本信息到其他文件。
6. 增加：增加新的个人基本信息。
7. 修改：修改已有的个人基本信息。
8. 删除：删除已有的个人基本信息。

外部辐射监测管理
一、外部辐射监测管理

图示说明：

1. 新建：新建外部辐射监测数据。
2. 预览：预览外部辐射监测数据内容。
3. 删除：删除已有的外部辐射监测数据。
4. 导入：导入外部辐射监测数据文件。
5. 导出：导出外部辐射监测数据到其他文件。
6. 增加：增加新的外部辐射监测数据。
7. 修改：修改已有的外部辐射监测数据。
8. 删除：删除已有的外部辐射监测数据。

系统管理
一、系统管理

图示说明：

1. 新建：新建系统管理内容。
2. 预览：预览系统管理内容。
3. 删除：删除已有的系统管理内容。
4. 导入：导入系统管理文件。
5. 导出：导出系统管理到其他文件。
6. 增加：增加新的系统管理内容。
7. 修改：修改已有的系统管理内容。
8. 删除：删除已有的系统管理内容。

安全标准
一、安全标准

图示说明：

1. 新建：新建安全标准。
2. 预览：预览安全标准内容。
3. 删除：删除已有的安全标准。
4. 导入：导入安全标准文件。
5. 导出：导出安全标准到其他文件。
6. 增加：增加新的安全标准。
7. 修改：修改已有的安全标准。
8. 删除：删除已有的安全标准。

学习培训班
一、学习培训班

图示说明：

1. 新建：新建学习培训班。
2. 预览：预览学习培训班内容。
3. 删除：删除已有的学习培训班。
4. 导入：导入学习培训班文件。
5. 导出：导出学习培训班到其他文件。
6. 增加：增加新的学习培训班。
7. 修改：修改已有的学习培训班。
8. 删除：删除已有的学习培训班。

流程管理
一、流程管理

图示说明：

1. 新建：新建流程管理。
2. 预览：预览流程管理内容。
3. 删除：删除已有的流程管理。
4. 导入：导入流程管理文件。
5. 导出：导出流程管理到其他文件。
6. 增加：增加新的流程管理。
7. 修改：修改已有的流程管理。
8. 删除：删除已有的流程管理。
### 中华人民共和国卫生部
### 放射工作人员职业健康管理信息系统

#### 2009年版

![Web Version](image-url)

#### 年度结果

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<th>姓名</th>
<th>性别</th>
<th>年龄</th>
<th>单位名称</th>
<th>职业病种</th>
<th>监测状态</th>
<th>职业类别</th>
<th>组织机构名称</th>
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</thead>
<tbody>
<tr>
<td>刘华</td>
<td>男</td>
<td>38</td>
<td>北京市肿瘤医院</td>
<td>放射线外照射</td>
<td>监测中</td>
<td>放射医学</td>
<td>北京市卫生局</td>
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<tr>
<td>李明</td>
<td>男</td>
<td>42</td>
<td>上海市放射性肿瘤医院</td>
<td>放射线外照射</td>
<td>监测中</td>
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<tr>
<td>王丽</td>
<td>女</td>
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<td>广州市肿瘤医院</td>
<td>放射线内照射</td>
<td>监测中</td>
<td>放射医学</td>
<td>广州市卫生局</td>
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<td>张伟</td>
<td>男</td>
<td>45</td>
<td>成都市放射性肿瘤医院</td>
<td>放射线外照射</td>
<td>监测中</td>
<td>放射医学</td>
<td>成都市卫生局</td>
</tr>
</tbody>
</table>

#### 统计分析

- 年度报告
- 放射工作人员职业病病案
- 放射工作人员健康检查
- 放射工作人员健康检查
- 放射工作人员健康检查

#### 个人登录

![用户登录](image-url)

#### 新增检测

- 基本信息
- 职业史
- 既往史
- 个人史
- 家族史
- 临床检查
- 辅助检查

#### 系统管理

- 用户管理
- 权限管理
- 日志管理
- 系统设置

#### 帮助与支持

- 帮助文档
- 联系我们
- 系统维护

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#### 最后更新

今天是2009年3月31日
CRRW was officially released by Ministry of Health in Nov. 25th, 2009

卫生部司（局）便函

卫监督便函〔2009〕452号

卫生部监督局关于启用个人剂量监测信息管理系统的通知

（发往：自治区、直辖市卫生厅局监督处（法监处），新疆生产建设兵团卫生局监督处，中国疾病预防控制中心、卫生部卫生监督中心）

为加强放射工作人员个人剂量监测管理工作，切实保护放射工作人员的健康，实现全国放射工作人员个人剂量监测信息的互联互通、数据共享和统一管理，卫生部建立了“放射工作人员职业健康管理系统—外照射个人剂量监测子系统”（以下简称“个人剂量管理系统”），现就正式启用该系统有关事项通知如下：

一、各地卫生行政部门要按照《卫生部办公厅关于加强放射工作人员个人剂量监测管理工作的通知》（卫办监督发〔2009〕43号）要求，进一步加强对放射工作人员个人剂量监测机构的监督管理，依法严肃查处未取得资质擅自开展放射工作人员个人剂量监测工作等违法行为，同时要求取得资质的机构使用“个人剂量管理系统”，及时上报相关信息。

二、放射工作人员个人剂量监测机构应当在2009年12月31日前完成以往个人剂量监测数据的录入、上传工作。

在完成周期个人剂量监测工作后，要及时登陆信息系统录入周期监测数据，按照系统要求的统一格式出具监测报告。未获得“个人剂量管理系统”授权的监测机构，应及时与中国疾病预防控制中心辐射防护与核安全医学所（以下简称辐射安全所）联系。

三、委托辐射安全所负责“个人剂量管理系统”的技术服务、维护、管理以及对地方的技术指导工作。要进一步研究完善“个人剂量管理系统”，及时解决系统中出现的问题，同时，分别按季度和年度对上报数据进行分析与评价，形成书面报告上报我局。

如系统使用过程中出现问题，请及时报告我局或辐射安全所。

联系人：卫生部监督局 袁龙、张伟力
010—68792982，68792124
辐射安全所 钟成文
010—62389931

二〇〇九年十一月二十五日

（信息公开形式：主动公开）
IM coverage rate

- Stable increase since 1985
- In 2005, the coverage rate is 62.8% in hospitals. Now it is 90% in hospitals.
- However, a big difference exists in different regions and industries.
Annual dose per worker （mSv/a）

Note: The data during 2009-2012 comes from CRRW.
Averaged annual dose (mSv) for radiation workers in medical field
3. Occupational Dose Record Management requirements

• Law on Prevention and Control of occupational disease: Articles 21 and 37: Employer establish and keeps the IM records.

• Ministry of Health, Order #55, Article 11, Employer establish the IM records and keep them for the worker’s lifetime.
Record of IM results in Radiation worker’s pass, but bad practice
Uniformed IM Report & suspicious data inspection sheet, but no requirement for keeping the glow curve from the TLD reader as permanent record.
• The employer keeps the IM reports, which provided by IM service provider, usually 1 report for three-month period, 4 reports in a year, for each worker

• Paper-based documents, no electronic version, no very good backup system, no duple copies
4. Summary and challenges

• There are more than 300,000 radiation workers among 60,000 employers in China.

• Since 1985, IM coverage rate increased significantly, about 90% in hospitals by now.

• China’s national registry system for radiation workers (CRRW) has been developed and put in place since 2009, but still need to be improved.

• QA/QC of IM need to be improved, especially for internal contamination monitoring.
  – support competent services, more big service providers?
  – proficiency testing, intercomparison
4. Summary and challenges

In 2014, the first intercomparison of WBC measurement and dose assessment among China’s 10 NPPs was held by CIRP and Daya Bay.

- 14 WBC equipments participated.
- BOMAB-CRAM (Chinese Reference Adult Male) phantoms
- filled with six radionuclides, based on ISO 28218-2010.

More information please refer to: liuliye@cirp.org.cn
4. Summary and challenges

• Expand the scope of radiation workers (Miners and aircrew workers)
  – 4 millions non-coal miners in China.
  – 15% of the underground mines exceeded 1000 Bq/m³. Currently no radon monitoring.
4. Summary and challenges

• weakly penetration and Eye-lens dosimetry
  – An investigation research project (2014-2017) has been initiated by CIRP & CNNO (the CNNC’s operators of NPPs).
    • The ratio of $Hp(3)/Hp(10)$, $Hp(0.07)/Hp(10)$ in PWR/Candu NPPs.
    • Field characterization, beta/gamma energy spectrum, source term.
    • Eye-D dosimeters for measuring $H(3)$ were purchased from Radcard.
    • The first measurement campaign was just finished one week ago, data analysis is on-going.

More information please refer to: liuliye@cirp.org.cn
Thanks for your attention.

E-mail: qfusun@gmail.com