QUALITY IMPROVEMENT ON A GLOBAL LEVEL- HOW CAN THIS TASK BE ACCOMPLISHED?

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Chair, Alliance for Radiation Safety in Pediatric Imaging
Corning Benton Endowed Chair for Radiology Education
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Quality Improvement on a global level- how can this task be accomplished?

The purpose of this talk is to review successful strategies that have promoted large scale quality improvement. While there is an increasing body of work that discussed practice quality improvement at a facility level, how can this knowledge be leveraged for quality improvement on a much larger scale in medical physics? This talk will review successful strategies and discuss how these strategies can be applied to the medical physicist community for the purpose of optimizing radiation dose and improving care of children worldwide.
Goal

- At the end of the talk, the participant will understand strategies to improve quality in radiology practice and how this can be applied to the world community.
Objectives

- Review an example of large scale quality improvement
- Define the steps of the PQI cycle
- Discuss the QMP role as part of team
- Provide example of PQI at a local and international level
- Use of Image Gently resources for PQI
Objectives

- Review an example of large scale quality improvement
- Define the steps of the PQI cycle
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The Small Book About Large System Change

Sir John Oldham

Foreword by
Dr. Donald M Berwick
Actions to achieve large system improvement
Roman Empire 100 AD

- Systematic transfer of knowledge
- Creation of an environment that facilitated the uptake of ideas
- Unified policy framework and infrastructure for spread – adapted locally
- Create an army to spread change
What is the justification for practice quality improvement?
Why do we care about Practice Quality Improvement (PQI)?

- In 1999, the Institute of Medicine (IOM), a scientific advisory group, issued a report called *To Err is Human: Building a Safe Health System*.

- It stated that medical error was a significant cause of morbidity and mortality in the United States (US).

- Medical error is a more common cause of death in the U.S. than breast cancer or motor vehicle accidents.

*Corrigan JM, Kohn LT, Donalsons, MS, eds. To Err is Human: Building a Safe Health System, Institute of Medicine*
Quality and safety in radiology

“First, do no harm”

After the Hippocratic oath
Medical error in radiology

THE RADIATION BOOM

After Stroke Scans, Patients Face Serious Health Risks
By WALT BOGDANICH
Published: July 31, 2010

When Alain Reyes’s hair suddenly fell out in a freakish band circling his head, he was not the only one worried about his health. His co-workers at a shipping
Medical error in radiology

Oct 30, 2008 9:19 pm US/Pacific

CBS13 Investigates: Radiation Overexposure

Radiation Overexposure Involving A 2-Year-Old Child

ARCATA (CBS13) — Inside the tiny frame of two-year-old Jacoby Roth no one really knows for sure what's going on.

"I just want him to be ok," says Carrie Roth, Jacoby's mother.

But Jacoby's mother Carrie, and his father Padre and Jacoby himself may very well live the rest of their lives not knowing.
X-Rays and Unshielded Infants

It was well after midnight when Dr. Salvatore J. A. Sclafani finally hit the “send” button.

The Radiation Boom

Articles in this series are examining issues arising from the increasing use of medical radiation and the new technologies that deliver it.

Multimedia

Soon, colleagues would awake to his e-mail, expressing his anguish and shame over the discovery that the tiniest, most vulnerable of all patients — premature babies — had been over-radiated in the department he ran at State University of New York Downstate Medical Center in Brooklyn.

A day earlier, Dr. Sclafani noticed that a newborn had been irradiated from head to toe — with no gonadal shielding — even though only a simple chest X-ray had been ordered.
Goals of PQI

- Improve quality of care for patients
- Reduce error
- Minimize medical legal risk
- Save money
Objectives

- Review an example of large scale quality improvement
- Define the steps of the PQI cycle
- Discuss the QMP role as part of team
- Provide example of PQI at a local and international level
- Use of Image Gently resources for PQI
What is Practice Quality Improvement?

“Ongoing, organization-wide framework to monitor all aspects of an organization’s activities for the purpose of continuous improvement.”

Applegate KE. Continuous Quality Improvement for Radiologists

Acad Radiol 2004;11:155-161
The American College of Radiology summarizes PQI as:

\[ \textit{PQI is a path to establish best practices, determine variations in practice, and standardize these practices to minimize error} \]

The United Kingdom Health Foundation stresses the following key principles:

**Safe**
Avoiding harm to patients from care that is intended to help them.

**Equitable**
Providing care that does not vary in quality because of a person's characteristics.

Courtesy of UK Health Foundation:
Used with permission
Quality can be difficult to assess in a complex medical system.

Break the process into simple steps or *metrics*:

- a standard of measurement
- a reference point against which other things can be measured

Important components of PQI

- Focus on the patient
- Break down the process into steps
- Understand variation that may lead to error
- Test on a small scale before implementing
- Teamwork
Implementing practice quality improvement

PLAN DO STUDY ACT (PDSA) is an improvement method that includes 4 steps:
1. Plan a test
2. Do the test
3. Study the outcomes of the test
4. Act on knowledge gained from the test
PQI project: Reduce variation

A goal of PQI in pediatric CT is to reduce the variation for CT scans of the same body part for patients of the same body size. While a facility has protocols for patient of the same age, weight or size (the preferred method), what process is in place to ensure that this happens? Monitoring variation through the use of a chart may be helpful.
PLAN the test

Example:

- Identify a problem: wide variability in image quality in 2008
- Verify problem exists based on data from previous scans
- Create a corrective plan of action
- Establish a goal of 95% compliance

Baseline scan

Follow-up is 2X dose!

Follow-up a month later
DO the test

- Developed an intervention to ensure that CT scans are performed reliably and with minimal variation based on patient body size
- Test on small scale
- Re-test on a larger scale
STUDY the test

- Is the subjective image quality the same for a patient of the same size for the same scan indication?
- What is the variation?
ACT on the results

- Evaluate for best practice
- Check for outliers
- Data collection and feedback continue until 95% compliance achieved
RESULTS: Reducing variation in image noise

Objectives

- Review an example of large scale quality improvement
- Define the steps of the PQI cycle
- Discuss the QMP role as part of team
- Provide example of PQI at a local and international level
- Use of Image Gently resources for PQI
PQI takes team-work

Medical Imaging Physicist

Manufacturer

Radiologist

Radiologic Technologist
AAPM REPORT NO. 42

THE ROLE OF THE CLINICAL MEDICAL PHYSICIST IN DIAGNOSTIC RADIOLOGY

DESCRIPTION OF THE ROLE OF THE CLINICAL MEDICAL PHYSICIST IN DIAGNOSTIC IMAGING

REPORT OF TASK GROUP 2
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This statement follows that entitled “The Role, Responsibilities, and Status of the Clinical Medical Physicist,” issued by the AAPM in 1986 [1], and concentrates on the role and relationships of the clinical medical physicist practicing in diagnostic imaging.

January 1994
Responsibilities of the Clinical Medical Physicists

In diagnostic imaging, it is appropriate that the medical physicists participate in the planning for resource allocation for both diagnostic imaging and medical physics. Important contributions should be expected for:

1. Delineation of the Physical Aspects of Diagnostic Imaging Systems
   - Specification of new equipment performance;
   - Supervision of acceptance testing and performance verification;
   - Supervision of calibration, preventive maintenance, repair of equipment and documentation of all relevant information;
   - Development and maintenance of a quality management program for all imaging equipment to facilitate the production of images of optimum quality while minimizing radiation doses to patients;
   - Responsibility for all instrumentation required for quality control, image quality, and patient exposure measurements;
   - Determination of doses from radiological procedures;
   - Assurance of the use of good radiological technique by the technologists, e.g., collimation, radiation protection, etc.
Medical Physics Practice Quality Improvement Guidelines

M Yester¹*, (1) UAB Medical Center, Birmingham, AL

SU-C-Salon EF-2 Sunday 1:30:00 PM - 3:30:00 PM Room: Salon EF

Currently, a common initiative in many fields is quality improvement. This endeavor is especially prominent in the medical community with concerns of patient safety and reduction of medical errors. As part of its certification oversight, the American Board of Medical Specialties (ABMS) has made QI one of the four sections of its Maintenance of Certification (MOC) process. This is particularly relevant to those medical physicists with time limited ABR certificates or for other ABR Diplomates voluntarily enrolled in the MOC program. One of the key aspects of The ABR expectation for Practice Quality Improvement (PQI), Part IV of the ABR MOC program, is that Diplomates provide evidence of an ongoing program of improvement of practice either as an individual or within the system the individual is employed. For physicists, this may seem somewhat nebulous due to the many duties and responsibilities for quality in the clinical realm. For diagnostic physicists, this may seem even more undefined, especially for consultants.

As a beginning dialogue related to PQI, suggestions for projects appropriate for medical physicists are presented. Another method for fulfillment of the PQI section is participation in society based PQI programs. Such programs are under development within AAPM and formulations of a programs for physicists is presented.

Learning Objectives:
At the conclusion of the presentation, an individual will
1. Gain knowledge of the basic aspects of PQI as regards to project types, basic ingredients of projects.
2. Learn about examples of projects for demonstration of PQI for medical physicists.
3. Learn about the developments of society based program for PQI for Physicists within the AAPM.
Objectives

- Review an example of large scale quality improvement
- Define the steps of the PQI cycle
- Discuss the QMP role as part of team
- Provide example of PQI at a local and international level
- Use of Image Gently resources for PQI
PQI is a science
Global Quality Imaging: Improvement Actions
Lawrence S. Lau, MBBS\textsuperscript{a}, Maria R. Pérez, MD\textsuperscript{b}, Kimberly E. Applegate, MD, MS\textsuperscript{c}, Madan M. Rehani, PhD\textsuperscript{d}, Hans G. Ringertz, MD, PhD\textsuperscript{e}, Robert George, ARMIT, Dip Pract Man\textsuperscript{f}

Workforce shortage, workload increase, workplace changes, and budget challenges are emerging issues around the world, which could place quality imaging at risk. It is important for imaging stakeholders to collaborate, ensure patient safety, improve the quality of care, and address these issues. There is no single panacea. A range of improvement measures, strategies, and actions are required. Examples of improvement actions supporting the 3 quality measures are described under 5 strategies: conducting research, promoting awareness, providing education and training, strengthening infrastructure, and implementing policies. The challenge is to develop long-term, cost-effective, system-based improvement actions that will bring better outcomes and underpin a sustainable future for quality imaging. In an imaging practice, these actions will result in selecting the right procedure (justification), using the right dose (optimization), and preventing errors along the patient journey. To realize this vision and implement these improvement actions, a range of expertise and adequate resources are required. Stakeholders should collaborate and work together. In today’s globalized environment, collaboration is strength and provides synergy to achieve better outcomes and greater success.

Key Words: Quality and safety, quality improvement, radiation protection, radiation safety, procedure justification, optimization of protection, radiology errors, adverse events, referral guidelines


IMPROVEMENT STRATEGIES
Quality actions can be discussed under 5 strategies:

- conduct research
- promote awareness
- provide education and training
- strengthen infrastructure
- implement policies

and clinical elements. The World Health Organization (WHO) aims to promote a research agenda on radiation risk assessment, with particular attention to children and pregnant women \cite{1}. Studies in atomic bomb and Chernobyl accident survivors who had received fetal or childhood exposure showed a higher cancer risk. Second cancers \cite{2} were reported following childhood radiotherapy after sufficiently long follow-up. Many factors contribute to this risk after radiation exposure.
Examples of large scale quality improvement in Radiology
Conduct research
National survey of doses from CT in the UK: 2003

P C Shrimpton, PhD¹, M C Hillier, HNC¹, M A Lewis, MSc¹
and M Dunn, MSc¹

Author Affiliations

Dr Paul C Shrimpton, Radiation Protection Division, Health Protection Agency, Chilton, Didcot, Oxon OX11 0RQ, UK. E-mail: paul.shrimpton@hpa-rp.org.uk

A review of patient doses from CT examinations in the UK for 2003 has been conducted on the basis of data received from over a quarter of all UK scanners, of which 37% had multislice capability. Questionnaires were employed to collect scan details both for the standard protocols established at each scanner for 12 common types of CT
## Large scale improvement

<table>
<thead>
<tr>
<th>Data Year(s)</th>
<th>P Pediatric (predom or solely)</th>
<th>No. of centers</th>
<th>% MSCT</th>
<th>% 64 slice</th>
<th>Data – Patient (P) Phantom (Ph) Protocol (Pr)</th>
<th>Body CT 16cm / 32cm phantom</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK 05 Shrimpton</td>
<td>G + P</td>
<td>20-50</td>
<td>37</td>
<td>0</td>
<td>Pr (P)</td>
<td>16</td>
</tr>
<tr>
<td>Germany 07 Galanski</td>
<td>P</td>
<td>42</td>
<td>85</td>
<td>? 5-10</td>
<td>Pr  P</td>
<td>16 + 32</td>
</tr>
<tr>
<td>Switzerland 08 Verdun</td>
<td>P</td>
<td>9</td>
<td>66</td>
<td>11</td>
<td>Pr</td>
<td>16</td>
</tr>
<tr>
<td>France 09 Brisse</td>
<td>P</td>
<td>20</td>
<td>100</td>
<td>36</td>
<td>Pr</td>
<td>32</td>
</tr>
<tr>
<td>Greece 09 Yakoumakis</td>
<td>G 83% P 17%</td>
<td>12</td>
<td>58</td>
<td>0</td>
<td>Ph</td>
<td>16</td>
</tr>
<tr>
<td>Belgium 10 Buls</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Slide courtesy of Dr. Karen Thomas, Sick Kids Hospital, Toronto
Applications of the PDSA cycle

To analyze estimated radiation dose from a hospital or facility enrolled in the ACR Dose Index Registry (DIR)

- To compare its pediatric doses to those from similar facilities
  - For patients of the same body size
  - For the same clinical scan indication
Promote awareness
International organizations that promote radiology protection for children on a large scale
There are many international organizations that work toward radiation protection

ALATRO: Latin American Society of Therapeutic Radiology and Oncology
ASTRO: American Society of Therapeutic Radiology and Oncology
EANM: European Association of Nuclear Medicine
EC: European Commission
ESTRO: European Society of Therapeutic Radiology and Oncology
FORO: Iberoamerican Forum of Nuclear Regulators.
IAEA: International Atomic Energy Agency
IAMRA: International Association of Medical Regulatory Authorities;
ICRP: International Commission on Radiological Protection
IFMSA: International Federation of Medical Students' Associations
ILO: International Labour Organization
IOMP: International Organization of Medical Physics
IRPA: International Radiation Protection Association
IRQN: International Radiology Quality Network
ISR: International Society of Radiology
ISRRT: International Society of Radiographers and Radiological Technologists
NEA: Nuclear Energy Agency
UN: United Nations
UNSCEAR: United Nations Scientific Committee on the Effects of Atomic Radiation
WFME: World Federation for Medical Education
WFNMB: World Federation of Nuclear Medicine and Biology
WMA: World Medical Association
International Radiology Quality Network

- Promote quality in radiology since 2002
- “Collaboration is strength”
- Promote evidenced-based and appropriate utilization
- Work with WHO, IG to develop simple guidelines
International Radiation Protection Agency

- Arose from Health Physics Society
- 1960s
- One of first to create international “umbrella” association
- Large regional and international meeting
International Society of Radiology

- Founded in 1925
- Sponsors international congress and “virtual congress”
- Open source textbooks
- Journals to underserved populations
- Hans Ringertz, Past President
Dear Doctors:

The International Society of Radiology has the pleasure of announcing the completion of our sponsored second world-wide virtual congress.

It will be available to all radiologists in your society for free via the ISR website at http://www.isradiology.org starting in early April. Please use your communications with your individual members to call this new virtual congress to their attention. The contents of the second virtual congress are all new. They include some 40 presentations from lead radiology teachers around the world. They also will include case studies and electronic posters. We still have time and space for additional posters and case studies, until 10 March. Any of your members are interested to submit them.

1. Have the parents and child been properly informed about the procedure?
2. Is the child's ID, date, position markers, etc correct? Do the markers cover any important parts of the image?
3. Is the child immobilized by device or parent?
4. Is the field size correct and centering appropriate? Not too large, not too small? Should be set by hand, not automatically. Correct centering point? Correct film-focus distance?
5. Has the necessary shielding been applied? With the edge within a centimeter of the field edge? Gonad shielding applied? Thyroid shielding applied?
7. Can you reduce the number of exposed films? If films are rejected, they should be collected and analyzed.
International Society of Radiographers and Radiologic Technologists

Corporative Sponsors: Agfa Healthcare, GE Healthcare Medical Diagnostics, Philips Healthcare, LLU Women's Health Institute, University of California

Benefits of membership of ISRRT

Click here to view the Benefits of ISRRRT membership Power Point Presentation

ISRRT Announcements

Professor Madan Rehani, IAEA, named as an Honorary Member of the Society for Pediatric Radiology. This award is given for his commitment to Pediatric Radiology. The ISRRT congratulate him on this great honor.
Brazilian College of Radiology and Diagnostic Imaging
Provide Education and Training
Diagnostic and Interventional Radiology

Training material developed in collaboration with
- World Health Organization (WHO)
- Pan American Health Organization (PAHO)
- International Labour Organization (ILO)
- International Society of Radiology (ISR)
- International Organization for Medical Physics (IOMP)
- International Society of Radiographers and Radiological Technologists (ISRRRT)

Lectures/Slides

All 23 modules (ZIP of 28 files, 89.29 Mb)

- 00. Principles of Radiation Protection and Motivation for the Course (10,548 KB)
- 01. Overview of radiation protection in diagnostic radiology (1,147 KB)
- 02. Radiation units and dose quantities (2,153 KB)
- 03. Biological effects (7,386 KB)
- 04. International system of radiation protection (871 KB)
- 05. Interaction of radiation with matter (10,586 KB)
- 06. X-ray production (6,517 KB)
- 07. X-ray beam (1,877 KB)
- 08. Factors affecting image quality (16,119 KB)
- 09. Medical exposure BSS (1,739 KB)
- 10. Patient dose assessment (1,050 KB)
- 11. Quality assurance (673 KB)
- 12. Shielding and X-ray facility design (1,047 KB)
- 14. Radiation exposure in pregnancy (1,101 KB)
- 15. Optimization of protection in radiography: Part 2 (1,207 KB)
Strengthen infrastructure

- Building workforce
What can be done to increase the number of radiologic technologists worldwide?
Creating communities of learners
Implement Policies
Regulatory actions

- European Commission
- Euratom Treaty
- FDA
- International Electrotechnical Commission
Objectives

- Review an example of large scale quality improvement
- Define the steps of the PQI cycle
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Alliance for Radiation Safety in Pediatric Imaging

- Founded in 2007
- To improve radiation protection for children worldwide
- >74 health care organizations/agencies
- >800,000 radiologists, radiology technologists, medical physicists
Social marketing is similar to an advertising campaign.

Target audience:
1. Public
2. Health professionals
3. Vendors
4. Government
5. Agencies
6. Parents/public

Media:
1. Print
2. Internet
3. Television
4. Posters
5. E-mail
6. Scientific publications
7. Social media
Let's image gently when we care for kids! The image gently Campaign is an initiative of the Alliance for Radiation Safety in Pediatric Imaging. The campaign goal is to change practice by increasing awareness of the opportunities to lower radiation dose in the imaging of children.

ONE SIZE DOES NOT FIT ALL...

There's no question:
CT helps us save kids' lives!

But, when we image, radiation matters:
- Children are more sensitive to radiation
- What we do now, affects their lifetime

So, when we image, let's image gently:
- More is not better
- When CT is the right thing to do
- Child size the kid and area
- One scan (single phase) is often enough
- It's only the indicated area

Let's image gently...

www.imagegently.org
Let's *image gently* when we care for kids! The *image gently* Campaign is an initiative of the Alliance for Radiation Safety in Pediatric Imaging. The campaign goal is to change practice by increasing awareness of the opportunities to lower radiation dose in the imaging of children.

**COURSE OUTLINE**

*Your Practice Quality Improvement Project*

1. What is practice quality improvement?
2. What are the basic steps of practice quality improvement?
3. Why is PQI good for my patients and practice?
4. What are cycles in PQI?
5. Starting my PQI project in Radiation Safety for CT scans in children (Click here for materials you will need to collect prior to performing this PQI project)
6. Materials you will need to complete this PQI project
7. Obtaining baseline data
8. Learning tools and practice interventions to improve my practice
9. Documenting improvement
# North American Consensus Guidelines for Administered Radiopharmaceutical Activities in Children and Adolescents

<table>
<thead>
<tr>
<th>Radiopharmaceutical</th>
<th>Recommended administered activity (based on weight only)</th>
<th>Minimum administered activity</th>
<th>Maximum administered activity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DTPA</strong>)</td>
<td>5.7 MBq/10 kg (0.14 mCi/kg)</td>
<td>57 MBq (1.0 mCi)</td>
<td>370 MBq (8.0 mCi)</td>
<td>BANAA Pediatric Dose Card (2007 version) may also be used.</td>
</tr>
<tr>
<td><strong>MEMAN</strong></td>
<td>9.3 MBq/10 kg (0.25 mCi/kg)</td>
<td>57 MBq (1.0 mCi)</td>
<td>370 MBq (8.0 mCi)</td>
<td>BANAA Pediatric Dose Card (2007 version) may also be used.</td>
</tr>
<tr>
<td><strong>MIBG</strong></td>
<td>Body: 3.7-5.2 MBq/10 kg (0.10-0.14 mCi/kg) Brain: 3.7 MBq/10 kg (0.10 mCi/kg)</td>
<td>57 MBq (1.0 mCi)</td>
<td>Low end of dose range should be considered for smaller patients. Administered activity may take into account patient mass and time available on PET scanner. BANAA Pediatric Dose Card (2007 version) may also be used.</td>
<td></td>
</tr>
<tr>
<td><strong>S-MIBG</strong></td>
<td>1.85 MBq/kg (0.05 mCi/kg)</td>
<td>18.5 MBq (0.5 mCi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>S-MAG3</strong></td>
<td>Without fluid study: 3.7 MBq/10 kg (0.10 mCi/kg) With fluid study: 5.5-5.5 MBq/10 kg (0.15 mCi/kg)</td>
<td>57 MBq (1.0 mCi)</td>
<td>148 MBq (4 mCi)</td>
<td>Administered activity will assume that image data are reformatted from 1 min/phase. Administered activity may be doubled if image data are reformatted at longer time per phase. BANAA Pediatric Dose Card (2007 version) may also be used.</td>
</tr>
<tr>
<td><strong>S-trans-1,2-diaminocyclohexane (nonradiolabeled) chloride (nonradioactive dopamine)</strong></td>
<td>1.85 MBq/kg (0.05 mCi/kg)</td>
<td>18.5 MBq (0.5 mCi)</td>
<td>Higher administered activity of 3.7 MBq (1 mCi) may be considered for neurochemical studies. BANAA Pediatric Dose Card (2007 version) may also be used.</td>
<td></td>
</tr>
<tr>
<td><strong>C14-benzene</strong></td>
<td>8.5 MBq/kg (0.23 mCi/kg)</td>
<td>8.5 MBq (0.23 mCi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F-18-DOPA</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>D-Sodium paratormidro (20.5 MBq/kg)</strong></td>
<td>9.25 MBq (0.26 mCi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F-18-Dexorone</strong></td>
<td>2.22 MBq/kg (0.06 mCi/kg)</td>
<td>18.5 MBq (0.5 mCi)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more information about pediatric radiation safety, visit [www.imagegentle.org](http://www.imagegentle.org)
# Digital Radiography Safety Checklist

## Safety Steps to Do and Verify for your pediatric patient

<table>
<thead>
<tr>
<th>Prior to Starting the Exam</th>
<th>Image Capture During the Exam</th>
<th>Image Critique</th>
<th>Following Completion of the Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ 1. Patient name selected from the worklist.</td>
<td>□ 1. Beam → body part → image receptor aligned, SID checked, use of grid determined.</td>
<td>□ 1. Cassette transported to and processed in reader, if applicable*.</td>
<td>□ 1. Post-processing performed only if necessary.</td>
</tr>
<tr>
<td>□ 2. Patient properly identified.</td>
<td>□ 2. Patient positioned and body part measured, cassette positioned if applicable*.</td>
<td>□ 2. Images displayed and reviewed, identification confirmed.</td>
<td>□ 2. Exam verified and images archived to PACS for reporting.</td>
</tr>
<tr>
<td>□ 3. Appropriateness of request checked.</td>
<td>□ 3. Beam collimated.</td>
<td>□ 3. Image quality reviewed</td>
<td></td>
</tr>
<tr>
<td>□ 4. Explained the exam to patient/parent.</td>
<td>□ 4. Technical factors selected.</td>
<td>□ 4. Exposure indicator/index checked, deviation index compared to target exposure index.</td>
<td></td>
</tr>
<tr>
<td>□ 5. Verified LMP/pregnancy if appropriate.</td>
<td>□ 5. Shielding and markers placed.</td>
<td>□ 5. Image reprocessed or repeated as necessary.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 6. Final adjustment of tube and settings made.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 7. Breathing instructions given.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 8. Exposure taken.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Susan John, MD Chair of CR/DR Education committee
Implementation Manual
Image Gently℠ Digital Radiography Safety Checklist
Safety Steps to Do and Verify for Your Pediatric Patient

www.imagegently.org
The following is a summary of the average values recorded for each safety checklist item and average for each of the four checklist categories.

<table>
<thead>
<tr>
<th>Prior to Exam (1)</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient name entered in the worksheet</td>
<td>3.00</td>
</tr>
<tr>
<td>Patient properly identified</td>
<td>1.30</td>
</tr>
<tr>
<td>Appropriateness of request ordered</td>
<td>1.30</td>
</tr>
<tr>
<td>Explanation of exam to patient/patient</td>
<td>1.30</td>
</tr>
<tr>
<td>Use of transport film/transport appropriate</td>
<td>0.80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image Capture During the Exam (2)</th>
<th>5.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper positioning of detectors, detectors at correct distance</td>
<td>1.00</td>
</tr>
<tr>
<td>Use of grid determined</td>
<td>1.00</td>
</tr>
<tr>
<td>Patient positioned, part measured, and cassette positioning applicable</td>
<td>1.50</td>
</tr>
<tr>
<td>Technical factors selected</td>
<td>1.00</td>
</tr>
<tr>
<td>Bottling and mashing applied</td>
<td>1.00</td>
</tr>
<tr>
<td>Final adjustment of tube and settings made</td>
<td>0.80</td>
</tr>
<tr>
<td>Re-examination given</td>
<td>0.80</td>
</tr>
<tr>
<td>Exposure taken</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Image Quality (3)</th>
<th>4.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassette transmitted and processed reader</td>
<td>1.00</td>
</tr>
<tr>
<td>Image displayed and reviewed</td>
<td>1.00</td>
</tr>
<tr>
<td>Image quality reviewed</td>
<td>1.00</td>
</tr>
<tr>
<td>Exposure indicator checked</td>
<td>1.00</td>
</tr>
<tr>
<td>Exposure index compared</td>
<td>0.80</td>
</tr>
<tr>
<td>Image represented on requested cassette</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Following Completion of the Exam (4)</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-processing performed</td>
<td>1.00</td>
</tr>
<tr>
<td>Examination results and images archived to film</td>
<td>0.80</td>
</tr>
</tbody>
</table>

We have provided a downloadable Excel spreadsheet (Digital Radiography Safety Checklist Data Report) that can be used at your institution for a practice quality improvement project (see attached Excel file). To follow is the Digital Radiography Safety Checklist Data Report. This report is an example of what a Digital Radiography Safety Checklist report would look like.

<table>
<thead>
<tr>
<th>Category</th>
<th>Benchmark</th>
<th>Average Score</th>
<th>Possible Checkmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Exam</td>
<td>4.5</td>
<td>4.6</td>
<td>5</td>
</tr>
<tr>
<td>During Exam</td>
<td>7.0</td>
<td>7.0</td>
<td>5</td>
</tr>
<tr>
<td>Image Quality</td>
<td>4.5</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>Following Exam</td>
<td>5.0</td>
<td>5.0</td>
<td>2</td>
</tr>
<tr>
<td>Overall Average</td>
<td>16.0</td>
<td>17.0</td>
<td>10</td>
</tr>
</tbody>
</table>

Online PQI project and worksheet Funded by FDA contract
Fishbone diagrams are useful to show cause-and-effect for undesired situations. In this case we want to lower pediatric dose, therefore, we have to consider all of the situations that could cause a child to have more radiation exposure than necessary. The goal is to prevent exposure creep, repeats, and errors by discovering their root cause. Once potential causes have been identified, plans and protocols should be developed to overcome deficient areas. The causes have been grouped into major categories along with corresponding subheadings to identify sources of variation.
Actions to achieve large system improvement

- Systematic transfer of knowledge
- Creation of an environment that facilitated the uptake of ideas
- Unified policy framework and infrastructure for spread
- Create an army to spread change
THANK YOU