Washington State Hospital Association

100K Children Campaign

Safe Imaging

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100K Children Campaign – Safe Imaging

January 28, 2015

Presented at Washington State Hospital Association Safe Table Webcast 1/28/2015

Speakers

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Medical Director for Radiology, Providence Health Care Emergency Radiology Section Chief, Inland Imaging

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Washington State Hospital Association

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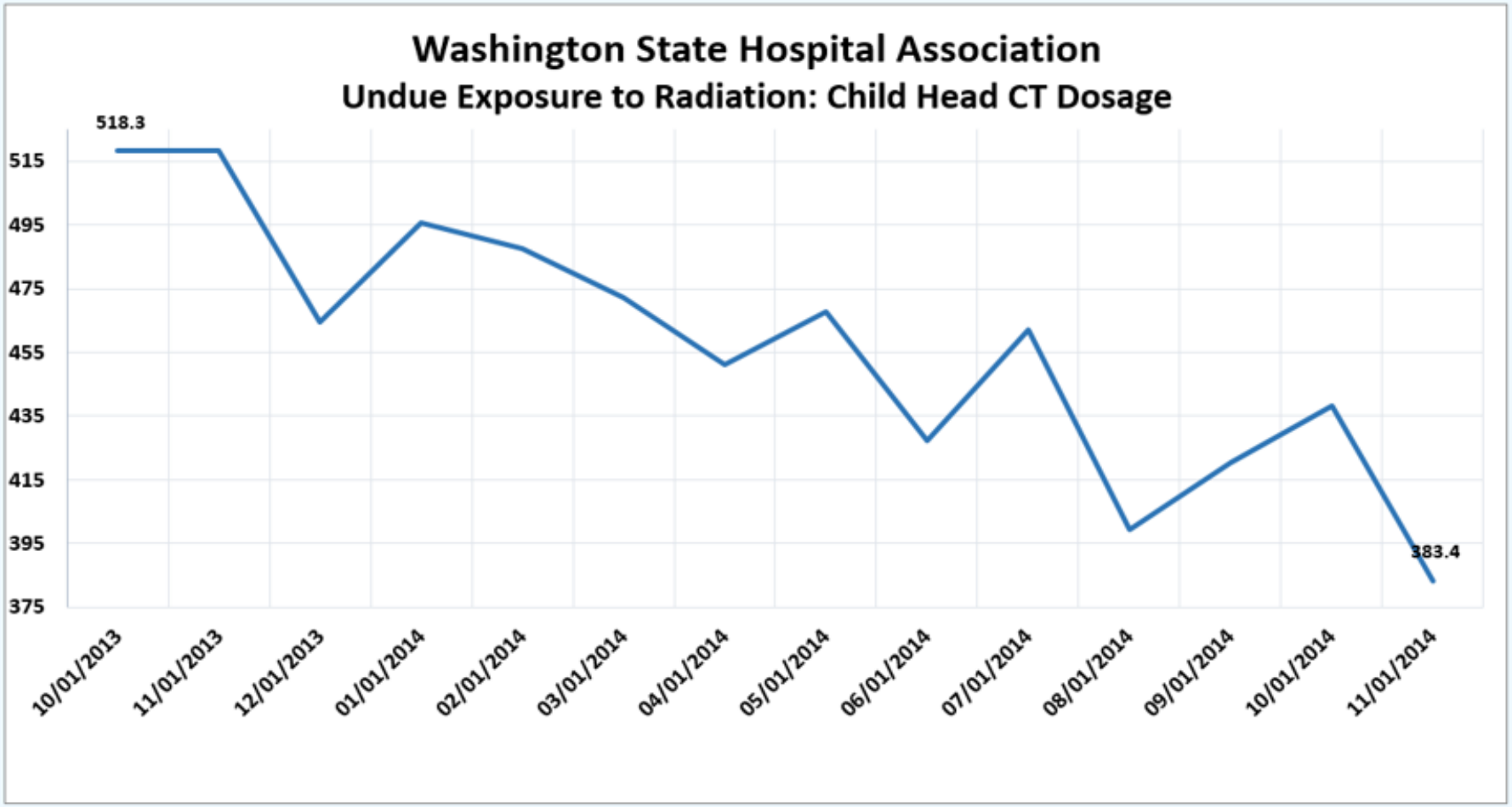


Definition

Numerator: Total dose length product (DLP) for all head CTs (child)

Denominator: Total number of CTs with recorded DLP (child)

Data Source: Facility direct report to WSHA.

Washington reduced the radiation dose in **2840** children – this translates into 6 elementary schools full of children.

Strategy Implementation

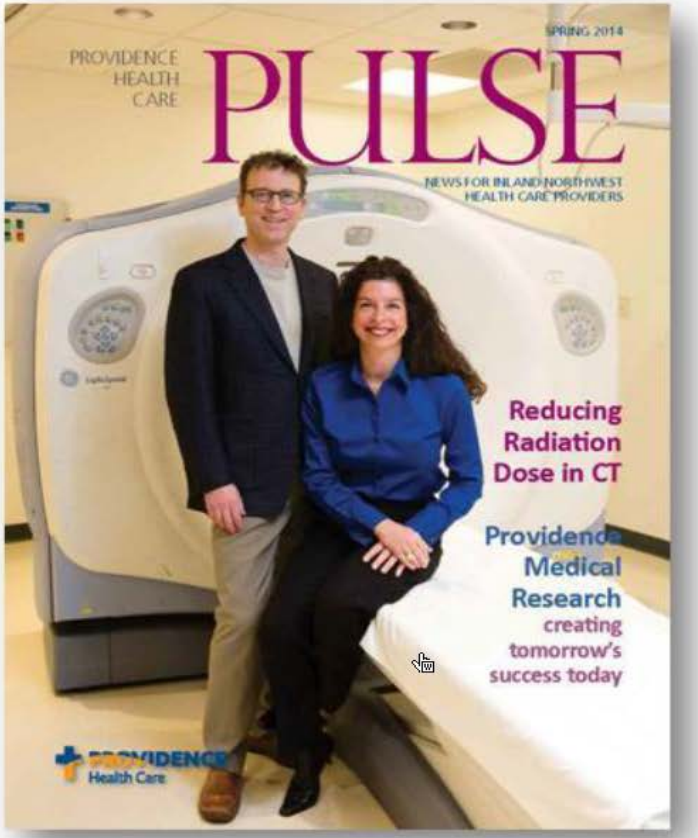
- Reduce inappropriate studies
- Reduce inappropriate orders
- Reduce inappropriate techniques
- Build a framework for ongoing work

Keys to Success

- **Right Study**
  - Percent of pediatric patients receiving observation for minor head trauma
  - Percent of pediatric patients receiving ultrasound for suspected appendicitis
- **Right Order**
  - Percent pediatric single phase head computed tomography (CT)
  - Percent of single phase chest computed tomography (CT)
- **Right Way**
  - Pediatric CT protocols developed, labeled and consistently used
- **Right Report**
  - Optimize radiation dose for pediatric head computed tomography (CT)
- **Right Action**
  - Quality data and performance improvement reported to organizations' Quality Committee and shared with Emergency Department leadership

Next Steps

- Define a champion and main contact from your organization
- Join us for bi-monthly calls on best practice and review of statewide data
- Access measure definitions at http://www.wsha.org/0694.cfm and submit data to QBS at http://www.wsha.org/0202.cfm
- For more information and to get started submitting data, contact Karen Lautermilch: karenl@wsha.org 206.216.2509



The Spring 2014 issue of PHC Pulse has arrived.

Inside, you'll find:

The groundbreaking work of radiologists like **Gordon Teel, MD,** and **Robin Hines, MD,** who are spearheading efforts to reduce radiation dose to patients undergoing CT exams.

PR work in support of physician education. Similar article published in *Heart Beat*, our consumer focused community news magazine.

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Understanding Medical Radiation Exposure: What We Know and What We Don't

Robin Hines, MD
Medical Director for Radiology, Providence Health Care
Emergency Radiology Section Chief, Inland Imaging

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Overview

Appropriate use of Radiology Resources:

- in the Emergency Department
- CT in the Emergency Department
- CT in children in the Emergency Department
- CT of the head & neck in children in the ED

Background in:

- Radiation Exposure
- Radiation in Medical Imaging
- Radiation Dose
- Radiation in Children

What are some Key Questions to Answer?

- Why worry about radiation exposure?
- What is the scope of the problem?
- What is concerning about imaging with ionizing radiation in children?
- What are the risks? Who are we worried about and why?
- What can be done to minimize risk? Whose role is it?
- When should we scan kids in the ED?
- What do we tell patients and families?
- Where do we get additional/updated information?

Radiation Exposure

- **Background radiation** - from naturally occurring sources in the environment (radon, terrestrial rock, natural radionuclides) and cosmic rays from outer space
- **Medical radiation** – has increased 6-fold over the past 25 years - most significant source in this category is CT
- **Nuclear Explosion -** Atom Bomb Detonation at Hiroshima and Nagasaki
- **Nuclear Accidents** - Chernobyl, Ukraine and Fukushima, Japan

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Radiation Exposure

Ionizing radiation – high energy radiation capable of ionizing the tissues through which it passes.

High-level : radiation sickness/poisoning

Low-level: increased risk of cancer

Ionizing radiation classified as a **carcinogen** by:

- WHO International Agency for Research on Cancer
- Agency for Toxic Substances and Disease Registry of the Centers for Disease Control
- National Institute of Environmental Health Sciences

Low-Level Radiation Exposure

- Background radiation in U.S. estimated to be an average of 3 mSv/year
- High altitude residents (Denver, CO) are exposed to higher level of cosmic radiation – an additional 1.5 mSv/year average background radiation compared to residents at sea level
- High radon levels increases radiation exposure
- In 1987, it was estimated that medical imaging contributed less than 15% of the total radiation exposure to the U.S. population/year. 25 years later exposure from medical imaging increased six-fold from an average of 0.5 mSv to 3 mSv/year

Radiation Exposure and Cancer Risk

- Background rate of cancer is high – 4 of out 10 will be diagnosed with cancer in their lifetime
- Low-level radiation is “weakly carcinogenic” – how do we measure the impact on cancer rates when the background rate is so high?
- How do we estimate impact when cancer presentation can be delayed 1-2 decades or more?
- Survivors of Chernobyl have shown a significantly increased incidence of thyroid cancers only in the 25 years since the accident

Radiation Exposure and Cancer Risk

- Background radiation – 3 mSv
- Low level radiation – 100-150 mSv
- Based on data from atomic bomb survivors in Japan, there is a statistically significant increased chance of cancer at doses in excess of 50 mSv
- There is no specific data linking medical imaging with cancer – no study of radiation-induced cancers from CT or other imaging modalities – but it follows that as we add to the population's radiation exposure, the risk of imaging-induced cancers will increase

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The Benefits of CT

- Extraordinary detail yields high sensitivity and specificity
- Early, definitive, accurate diagnosis
- Quick and generally painless
- Decreased need for hospitalization for observation – reduces expense
- Decreased need for exploratory surgery/unnecessary treatments – reduces potential risk
- All these benefits make CT almost IRRESISTIBLE in the emergency setting

Common and Appropriate Indications for CT

- Major trauma – evaluation head, spine, chest and abdominal/pelvic injuries
- Inflammatory conditions – appendicitis, abscess (paratonsillar, lung, perinephric)
- Cancer evaluation – primary tumor and metastatic disease, detection and surveillance

Effective Dose in mSv

- Synthesis or summary of data which expresses a complex dose pattern, a quantity roughly proportional to the risk of harmful radiation effects

- Absorbed radiation is tissue-specific, influenced by age, size, gender, and is <u>not</u> easily measured

- Radiation dose is a complex business!

Typical Radiation Doses from Medical Imaging of Children

Exam	Dose (mSv)	CXR Equivalents
Ankle X-ray (3V)	.0015	1/14th
CXR (2V)	.02	1
Nuclear Cystogram	.18	9
Fluoro Cystogram		16
Brain CT	.33	100
Chest CT	3	150
Abdomen CT	5	250
Bone Scan	4-6	Up to 310
PET Scan	15	765

ALARA PRINCIPLE

Radiation dose should be

As Low As Reasonably Achievable

ALARA

- Evaluate Benefit: Risk ratio of medical imaging
- Know that for most patients, the benefit of imaging in the appropriate setting will far outweigh the risk
- Be cognizant of issues of radiation exposure
- Know your patient's imaging history
- Consider alternative imaging (ultrasound, MRI) that don't use ionizing radiation
- Limit region being examined
- Consult with the radiologist – yes, you can!

ALARA

- For individual patients, generally, the benefits of medical imaging substantially outweigh the risks
- For a population, the increasing use of medical imaging which employs ionizing radiation presents a public health risk
- Estimated increased cancer risk is: 1 fatal cancer/1000 patients imaged/lifetime
- We have no data which includes cancer incidence (fatal and nonfatal cancers and its associated morbidity/expense) vs. cancer mortality.

Modifying Radiation Exposure

- Generally, more radiation yields better quality diagnostic images
- Since 2001, concern for radiation exposure, especially in young patients, has driven changes in scanner design/flexibility
- New scanners are equipped with Automatic Exposure Control or Tube Current Modulation
- Allows technologist to more easily reduce total radiation exposure – the scanner automatically decrease radiation to thinner, less dense body parts

Regulation of CT – or Not

- No CT usage regulation by the FDA today, FDA only regulates equipment. Expect regulations by 2016.
- No standard dose requirements
- No requirements to display or record dose
- No mandate for ACR CT accreditation
- No warning for excessively high dose
- No warning for high cumulative dose from prior studies

Limiting Radiation Exposure

- Increase awareness of the entire health care team for the need to reduce radiation exposure in children whenever possible, follow the ALARA Principle – includes physicians, PA's, nurses, physicists, and technologists
- Use single phase imaging whenever possible
- Limit anatomic coverage whenever possible

Why worry about radiation exposure more in children?

- Risk from radiation exposure - increased risk of developing cancer from being exposed to radiation - is cumulative over a lifetime
- If you have your whole life ahead of you, you have more time to express that risk – to develop cancer
- Radiation is more damaging to actively dividing cells and kids have more dividing cells than mature adults
- “Non-essential” tissue (fat, muscle) attenuates ionizing radiation
- Little people have less “non-essential” tissue so “essential” tissue (glandular) absorbs more radiation

Radiation-Sensitive Tissues

- Fetus *
- Eyes
- Thyroid *
- Breasts *
- Bone Marrow
- GI tract
- Gonads *

TALKING POINTS

- There is always some radiation exposure associated with CT scanning
- Exposure from CT scans is generally considered low-level radiation
- There is some small risk of developing cancer from exposure to low-level radiation and this increases with dose
- There is no specific or well-defined measurable risk – risks from CT scans is estimated
- The amount of radiation from CT is variable and depends largely on equipment and protocols used

TALKING POINTS

- Properly performed CT scans on newer equipment exposes children to much lower radiation dose than adults
- The potential benefit from an indicated CT scan generally far out-weighs the risks of subsequent cancer
- We use the ALARA principle!

Where to get additional/updated information

- The Alliance for Radiation Safety in Pediatric Imaging: www.imagegently.org
- American College of Radiology(ACR): www.RadiologyInfo.org
- American Academy of Pediatrics: www.aap.org

Washington State Hospital Association
In Person Safe Table

Date: Wednesday February 25, 2015

Time: 9:00 a.m. – 2:30 p.m.

Location: DoubleTree Hotel, 18740 International Blvd, SeaTac, WA

Topic: 100K Children Campaign – Safe Imaging

To register for this event: Michelle Graham michelleg@wsha.org
206.216.2557