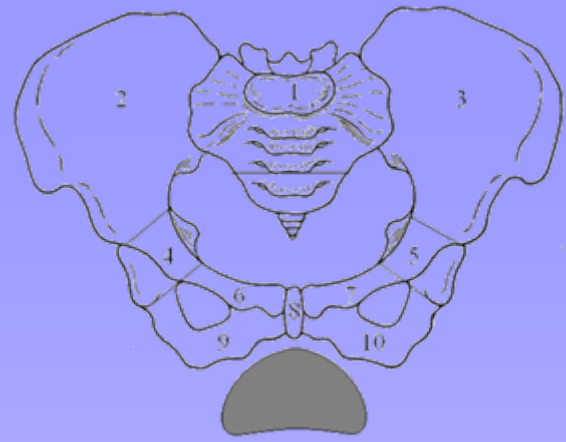




# The Gonad Shield in Pelvic X-Rays Covering a Multitude of Sins?

Aaron McManus

Naomi Davis

**Booth Hall Children's Hospital**

**Central Manchester and Manchester Children's University Hospitals NHS Trust**

**Manchester, U.K.**

# Hypotheses

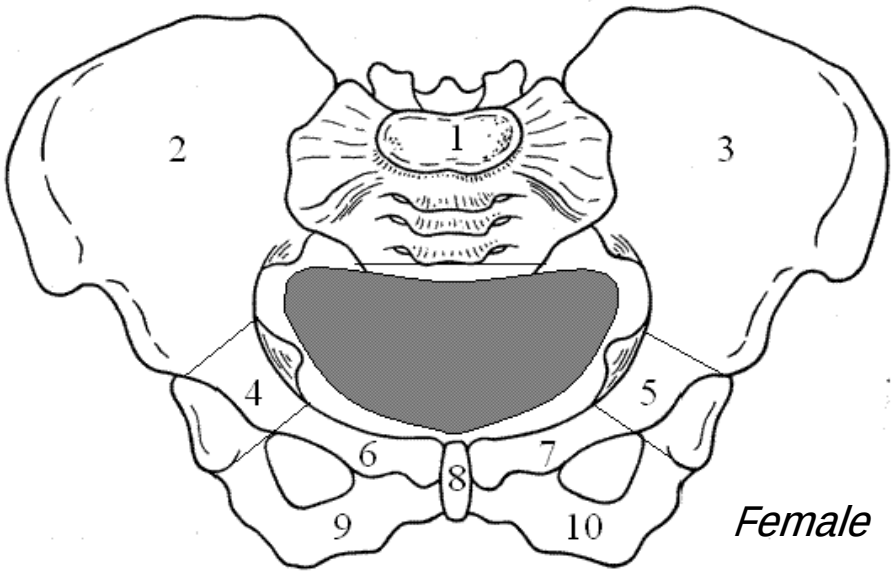
The positioning of gonad shields in children's pelvic x-rays is less than adequate, allowing for:

- Increased gonadal exposure to radiation
- Covering areas of bony interest

# Audit Scope

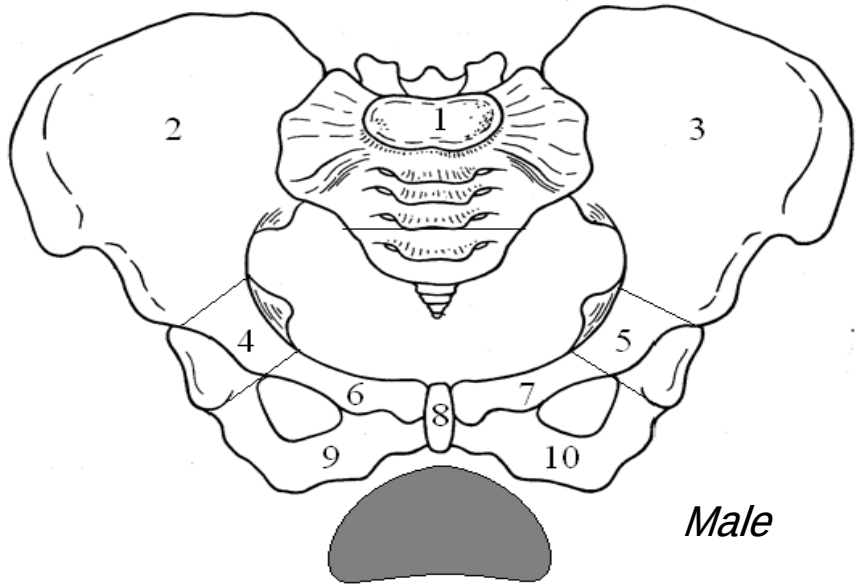
- Aim:
  - To determine the effectiveness of the process for using Gonad Shields during pelvic and hip X-Rays in children between the age of 0-16 years taken in the year 2004 at Manchester Children's Hospitals
- Sample size:
  - **1720** radiographs
- What the guidelines recommend:
  - 100% Gonad protection (excl. first trauma and emergencies)
  - 0% bone coverage
- (Industry Process Benchmark: six sigma = 3.4 defects per one million opportunities)

# What ‘Good’ Looks Like




*Female*

Female gonads are considered protected when the shield covers the middle two-thirds of the pelvic basin in the transverse plane and completely covers the pelvic basin from the symphysis pubis to the sacrum in the longitudinal plane.




*Male*

The shield must lie as close to the pubic arch as possible. The testes are protected when the shield covers all the soft tissues (scrotum) inferior to the pubic arch.

# Key Findings

*Sample size 1,720*

| | Target | Overall | Male | Female |
|---|---|---|---|---|
| **Shield Present** | **100%** | **79.0%** | **76.2%** | **81.5%** |
| **Adequately Protected** ***(when a shield was present)*** | **100%** | **43.8%** | **40.9%** | **29.0%** |
| **Bone Covered** | **0%** | **51.4%** | **28.0%** | **48.3%** |
| **Most Covered Bony Area** | | **Area 1 (10.9%)** | **Area 10 (12.8%)** | **Area 1 (24.9%)** |

# Male

Male AP pelvis showing correct gonad shield position. Gonads considered adequately protected.

Shield is protecting the testes, however is also covering bony areas of the pelvis, thus obscuring any possible bony anomalies. This radiograph may need repeating, thus increasing the child's radiation dose unnecessarily.

[image courtesy of:http://www.ispub.com/xml/journals/ijos/vol2n2/crf-fig3.jpg ]

# Female

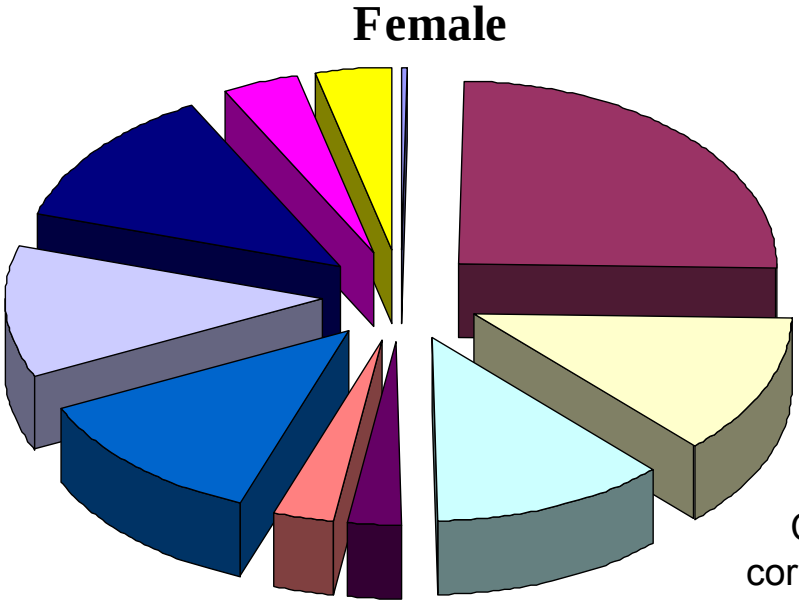
[Left] Excellent size and position of gonadal shield. Very likely to provide adequate protection without covering bony pelvic areas.

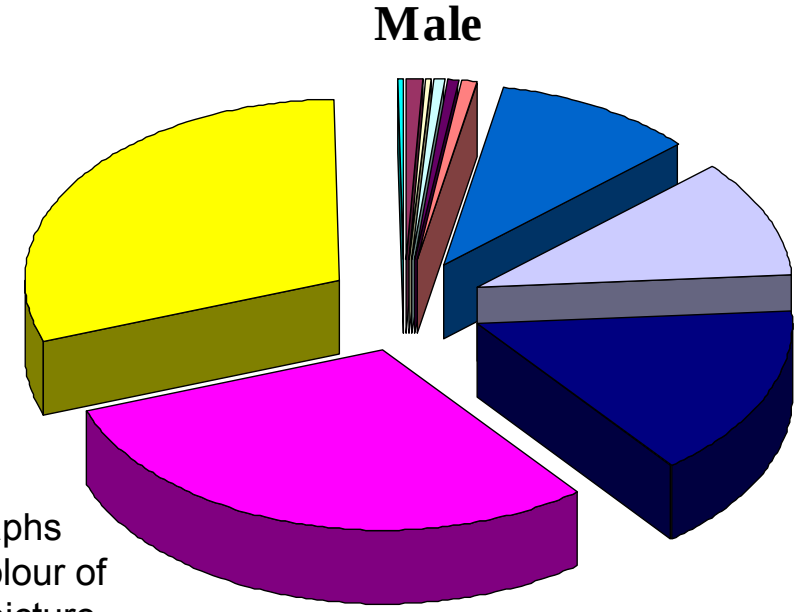
[Right] Shield present in the ***male*** location in a female patient. Gonads are totally exposed to radiation.

[Left] Shield excessively high (above ASIS), covering bony pelvis and spine. Size of shield is unlikely to satisfy protection criteria even if located correctly due to large vertical size of pelvic basin.

# Pelvic Areas Covered in Paediatric X-Rays

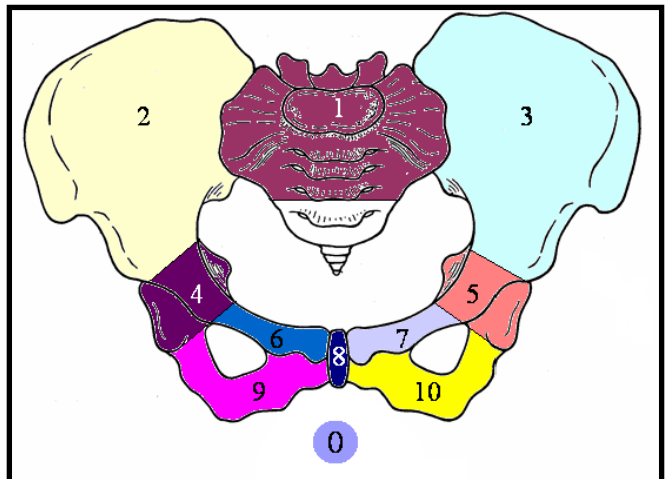
## Analysis by Gender




Colours in graphs correspond to colour of areas in pelvic picture [below]

The shields for female patients tend to obscure areas around the pelvic rim. 'Area 1' is most commonly obscured possibly due the flat shield slipping superiorly on a curved abdomen.




Bones near the pubic arch are naturally covered most often in males because the shield must lie close to this area in order to provide adequate gonadal protection.

# Significant Findings

1) More problems covering female gonads accurately:

| *% covered accurately* | ♂ | ♀ |
|---|---|---|
| | 40.9 % | **29.0 %** |

(P < 0.05)

2) More bony areas covered in females:

| *% with bony area covered* | ♂ | ♀ |
|---|---|---|
| | 28.0 % | **48.3 %** |

(P < 0.05)

3) Males more commonly without shield:

| *% with shield in place* | ♂ | ♀ |
|---|---|---|
| | **76.2 %** | 81.5 % |

(P < 0.05)

# Recommendations

1) Explore re-design of shields, especially for females

2) Increase awareness for Radiographers (urgent!)

3) Posters in relevant areas to prompt radiographers of the need for:
   a) A shield
   b) Correct application of shield

4) Re-audit following introduction of new shield design and increased awareness