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CAMRT Position Statement

Discontinuing the Use of Gonadal and Fetal Shielding for Patients

Gonadal and fetal shielding are longstanding practices within medical imaging facilities and for Medical Radiation Technologists (MRTs), historically endorsed by the International Commission on Radiological Protection and International Atomic Energy Agency.[1,2] This shielding practice has been considered important for reducing radiation exposure to non-targeted areas of the body, with the practice upheld by the "As Low As Reasonably Achievable (ALARA)" principle.[3]

As technology has advanced over the years, patient exposure to radiation in medical imaging examinations has steadily declined. When compared to 1951, diagnostic x-ray examinations today produce 20-25 times less radiation dose.[4–6] With these advances, a corresponding decrease in risk to the patient has also been observed.[7]

In recent years, an overwhelming body of peer-reviewed literature has emerged that must reshape our understanding of this traditional practice. The current consensus based on research is that gonadal and fetal shielding is clinically ineffective for reducing:

- cumulative effects of radiation[7]
- internal radiation scatter[7]

Furthermore, over decades of study, radiation exposure to human reproductive organs at levels associated with x-ray-based diagnostic imaging has not been linked to heredity changes.[1,5,8]

Research also shows that shielding can significantly compromise diagnostic efficacy and, ultimately, may increase the need for additional imaging[9–12] as caused by:

- technology errors (e.g., shielding interfering with automatic exposure controls),[13] and
- technical errors (e.g., differences in anatomical positioning and the inability to identify this prior to an x-ray leading to suboptimal shielding placement).[10,14–18]

The overarching conclusion drawn by experts who have reviewed the research is that there is negligible, or no, benefit to patients' health when gonadal and fetal shielding is used with current technology.[9–12] Many publications now recommend the discontinuation of the use of gonadal and fetal shielding for patients.

In April 2019, the American Association of Physicists in Medicine released a position statement recommending the discontinuation of gonadal and fetal shielding during x-ray procedures.[19] The announcement led to scientific and policy discussions around the world, highlighting much support for changing the shielding practice. Endorsement from organizations such as the Canadian Organization for Medical Physics, Canadian Association of Radiologists, and Image Gently highlighted the need for the CAMRT to investigate this issue in a fulsome manner and derive a national recommendation for Canadian MRTs.

Recommendation

CAMRT recommends that MRTs advocate for their facilities to make the necessary adjustment to their respective policy and procedures to discontinue the use of gonadal and fetal shielding on patients undergoing x-ray-based diagnostic imaging. CAMRT recommends that these policies be reflective of current best practice and be compliant with all relevant provincial and federal legislation.

Mandatory considerations for the implementation of this recommendation:

It is important to note that although the recommendations are simple and straightforward, the discontinuation of shielding practices must be carefully considered, both from a patient and policy perspective.[20–23]

1. MRTs must be compliant with their facility's policies and procedures.
    a. It is the responsibility of the medical imaging leadership team within your facility to ensure that the recommended change to practice is permissible within their facility prior to implementation.
    b. This position statement and the references cited within it can be used in conjunction with other current evidence to have informed discussions related to a facility' policies and procedures related to gonadal and fetal shielding.

2. MRTs must be compliant with all provincial regulations related to MRT practice.
    a. It is the responsibility of the medical imaging leadership team within your facility to ensure that the recommended change to practice is permissible within their jurisdiction prior to implementation.
    b. MRTs may identify facility policies and procedures that already address this area of practice. This position statement can be used in conjunction with current evidence to advocate for this change.

3. Once the policy change has been made and implemented, MRTs must answer patient and caregiver questions concerning practice changes to gonadal and fetal shielding.
    a. It is the responsibility of MRTs to obtain the education and training required to implement the changes in policy and within their professional practice, including practice changes associated with gonadal and fetal shielding.
    b. This position statement should be used in conjunction with current evidence to inform oneself, patients, and their families of the rationale for the practice change.
    c. It is the responsibility of an MRT to recognize that implementing the recommendation may cause confusion or fear for some patients and their families who are accustomed to the historical shielding practice.

More Information for MRTs

CAMRT has created a number of resources for MRTs relating to this topic, including a frequently asked questions (FAQ) page and some resources to help guide discussions with patients.

References

1. International Commission on Radiological Protection. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP publication 103. *Ann ICRP*. 2007;37(2-4):1-332. doi:10.1016/j.icrp.2007.10.003
2. International Atomic Energy Agency. Radiation protection and safety in medical uses of ionizing radiation, specific safety guide no. SSG-46. Accessed May 13, 2020. https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1775_web.pdf
3. Strauss KJ, Kaste SC. The ALARA (as low as reasonably achievable) concept in pediatric interventional and fluoroscopic imaging: Striving to keep radiation doses as low as possible during fluoroscopy of pediatric patients. *Pediatr Radiol*. 2006;36(Suppl 2):110-112. doi:10.1007/s00247-006-0184-4
4. Handloser JS, Love RA. Radiation doses from diagnostic x-ray studies. *Radiology*. 1951;57(2):252-254. doi:10.1148/57.2.252
5. Jeukens CRLPN, Kütterer G, Kicken PJ, et al. Gonad shielding in pelvic radiography: Modern optimised x-ray systems might allow its discontinuation. *Insights Imaging*. 2020;11. doi:10.1186/s13244-019-0828-1
6. Billings MS, Norman A, Greenfield MA. Gonad dose during routine roentgenography. *Radiology*. 1957;69(1):37-41. doi:10.1148/69.1.37
7. Marsh RM, Silosky M. Patient shielding in diagnostic imaging: Discontinuing a legacy practice. *Am J Roentgenol*. 2019;212(4):755-757. doi:10.2214/AJR.18.20508
8. National Research Council. Health risks from exposure to low levels of ionizing radiation: BEIR VII phase 2. Published 2006. Accessed May 13, 2020. https://scholar.google.com/scholar_lookup?hl=en&publication_year=2006&author=National+Research+Council&title=Health+risks+from+exposure+to+low+levels+of+ionizing+radiation%3A+BEIR+VII+phase+2.
9. Frantzen MJ, Robben S, Postma AA, Zoetelief J, Wildberger JE, Kemerink GJ. Gonad shielding in paediatric pelvic radiography: Disadvantages prevail over benefit. *Insights Imaging*. 2011;3(1):23-32. doi:10.1007/s13244-011-0130-3
10. Fawcett SL, Barter SJ. The use of gonad shielding in paediatric hip and pelvis radiographs. *Br J Radiol*. 2009;82(977):363-370. doi:10.1259/bjr/86609718
11. Lee MC, Lloyd J, Solomito MJ. Poor utility of gonadal shielding for pediatric pelvic radiographs. *Orthopedics*. 2017;40(4):e623-e627. doi:10.3928/01477447-20170418-03
12. Warlow T, Walker-Birch P, Cosson P. Gonad shielding in paediatric pelvic radiography: Effectiveness and practice. *Radiography*. 2014;20(3):178-182. doi:10.1016/j.radi.2014.01.002
13. American College of Radiology (ACR). ACR-AAPM-SIIM-SPR Practice parameter for digital radiography. Resolution 40. Published 2018. Accessed May 13, 2020. https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Rad-Digital.pdf
14. Karami V, Zabihzadeh M, Shams N, Saki Malehi A. Gonad shielding during pelvic radiography: A systematic review and meta-analysis. *Arch Iran Med*. 2017;20(2):113-123. doi:0172002/AIM.0011

15. Kenny N, Hill J. Gonad protection in young orthopaedic patients. *BMJ*. 1992;304(6839):1411-1413.
16. Wainwright AM. Shielding reproductive organs of orthopaedic patients during pelvic radiography. *Ann R Coll Surg Engl*. 2000;82(5):318-321.
17. Liakos P, Schoenecker PL, Lyons D, Gordon JE. Evaluation of the efficacy of pelvic shielding in preadolescent girls. *J Pediatr Orthop*. 2001;21(4):433-435.
18. Fawcett SL, Gomez AC, Barter SJ, Ditchfield M, Set P. More harm than good? The anatomy of misguided shielding of the ovaries. *Br J Radiol*. 2012;85(1016):e442-447. doi:10.1259/bjr/25742247
19. American Association of Physicists in Medicine (AAPM). AAPM position statements, policies and procedures - Details. Accessed May 13, 2020. https://www.aapm.org/org/policies/details.asp?id=468&type=PP
20. Bjarnason TA, Rees R, Kainz J, et al. COMP report: A survey of radiation safety regulations for medical imaging x-ray equipment in Canada. *J Appl Clin Med Phys*. 2020;21(3):10-19. doi:10.1002/acm2.12708
21. American College of Radiology (ACR). ACR-SPR. Practice parameter for imaging pregnant or potentially pregnant adolescents and women with ionizing radiation. Resolution 39. Published 2018. Accessed May 13, 2020. https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Pregnant-Pts.pdf
22. Oikarinen HT, Perttu AM, Mahajan HM, et al. Parents' received and expected information about their child's radiation exposure during radiographic examinations. *Pediatr Radiol*. 2019;49(2):155-161. doi:10.1007/s00247-018-4300-z
23. Dauer LT, Thornton RH, Hay JL, Balter R, Williamson MJ, St. Germain J. Fears, feelings, and facts: Interactively communicating benefits and risks of medical radiation with patients. *AJR Am J Roentgenol*. 2011;196(4). doi:10.2214/AJR.10.5956