

Patient contact shielding: regulations and current practice

REGULATIONS



Current
Practice

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CONFLICTS OF INTEREST

1. None to declare
2. Member of EURADOS WG12
3. GAPS committee member

OBJECTIVES

1. To learn about the guidelines, recommendations, and national and international legislation about the use of patient contact shielding.
2. To understand about the current practice of patient shielding in European hospitals



Current
Practice

In field shielding



Source : M. J. Frantzen et al., Gonad shielding in paediatric pelvic radiography: Disadvantages prevail over benefit, Insights Imaging, 2012



Reduction of Radiation Dose to the Eye, Wang et al. Radiology Volume 262: Number 1—January 2012

- ❖ To protect specific organs **inside the field of view**
- ❖ Generally made of latex impregnated with bismuth offering a modest level of X-ray attenuation - still allowing X-ray penetration for image formation

Out of field shielding



<https://www.radiologyinfo.org>



<https://controlthedose.com/course>

- ❖ To protect specific organs **outside the field of view**
- ❖ Typically made of highly attenuating (high-Z) materials, such as lead



Work performed within EURADOS WG 12-Dosimetry for medical imaging

SG2 – Patient dosimetry

Review of recommendations/legislative documents on use of out-of-field shielding in X-ray imaging

Marta Sans Merce, Cristian Candela-Juan, Jérémie Dabin, Dario Faj, Aoife Gallagher, Hugo de las Heras Gala, Željka Knežević, Françoise Malchair, Francesca De Monte, George Simantirakis, Chrysoula Theodorakou

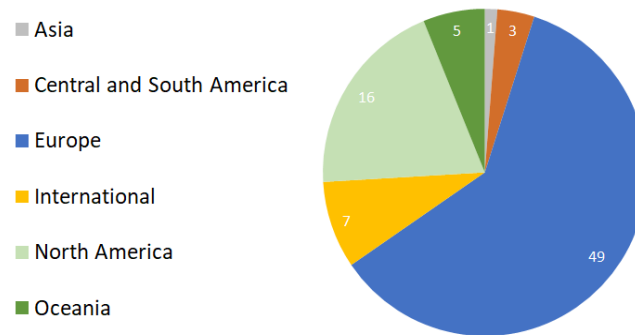
Objective: review current recommendations and legislative documents on the use of **out-of-field shielding** in X-ray imaging, including those from national authorities and from international and national organizations and professional bodies

The collage features several logos and document covers:

- Strålsäkerhetsmyndigheten** (Swedish Radiation Safety Authority)
- DANISH HEALTH AUTHORITY** (Radiation Protection)
- DSA** (Norwegian Radiation and Nuclear Safety Authority)
- GEISLAVARNIR RÍKISINS** (Icelandic Radiation Safety Authority)
- stuk** (RADIATION AND NUCLEAR SAFETY AUTHORITY)
- Schweizerische Eidgenossenschaft** (Confédération suisse / Confederazione Svizzera / Confederaziun svizra)
- Département fédéral de l'intérieur DFI** (Office fédéral de la santé publique OFSP / Unité de direction Protection des consommateurs)
- Division Radioprotection** (www.slr-rad.ch)
- Directive R-09-02** (Moyens de protection pour les patients en radiodiagnostic)
- AEA Safety Standards** (for protecting people and the environment)
- Radiation Protection and Safety in Medical Uses of Ionizing Radiation** (jointly sponsored by AEA, IAEA, PAHO, WHO)
- Strahlenschutzkommission** (Geschäftsstelle der Strahlenschutzkommission, Postfach 12 06 29, D-53048 Bonn, http://www.ssk.de)
- Verwendung von Patienten-Strahlenschutzmitteln bei der diagnostischen Anwendung von Röntgenstrahlung am Menschen** (Empfehlung der Strahlenschutzkommission und wissenschaftliche Begründung)
- Radiological Protection Institute of Ireland** (An Institiúit Cosainteach um Cosaint Radiaíochais)
- The Use of Lead Aprons in Dental Radiology**
- Salusmannschaft an Seirbhíse Síne** (Health Service Executive)

Methodology

- Work was carried out mainly in 2020
- Extensive review of available guidelines from national legislations, recommendations and guidelines from national authorities and international organizations and professional bodies → **81 documents**



- All X-ray imaging modalities (radiography, fluoroscopy, mammography, computed tomography and dental radiography)
- All patients (adults, pediatrics and pregnant women)

The review and classification

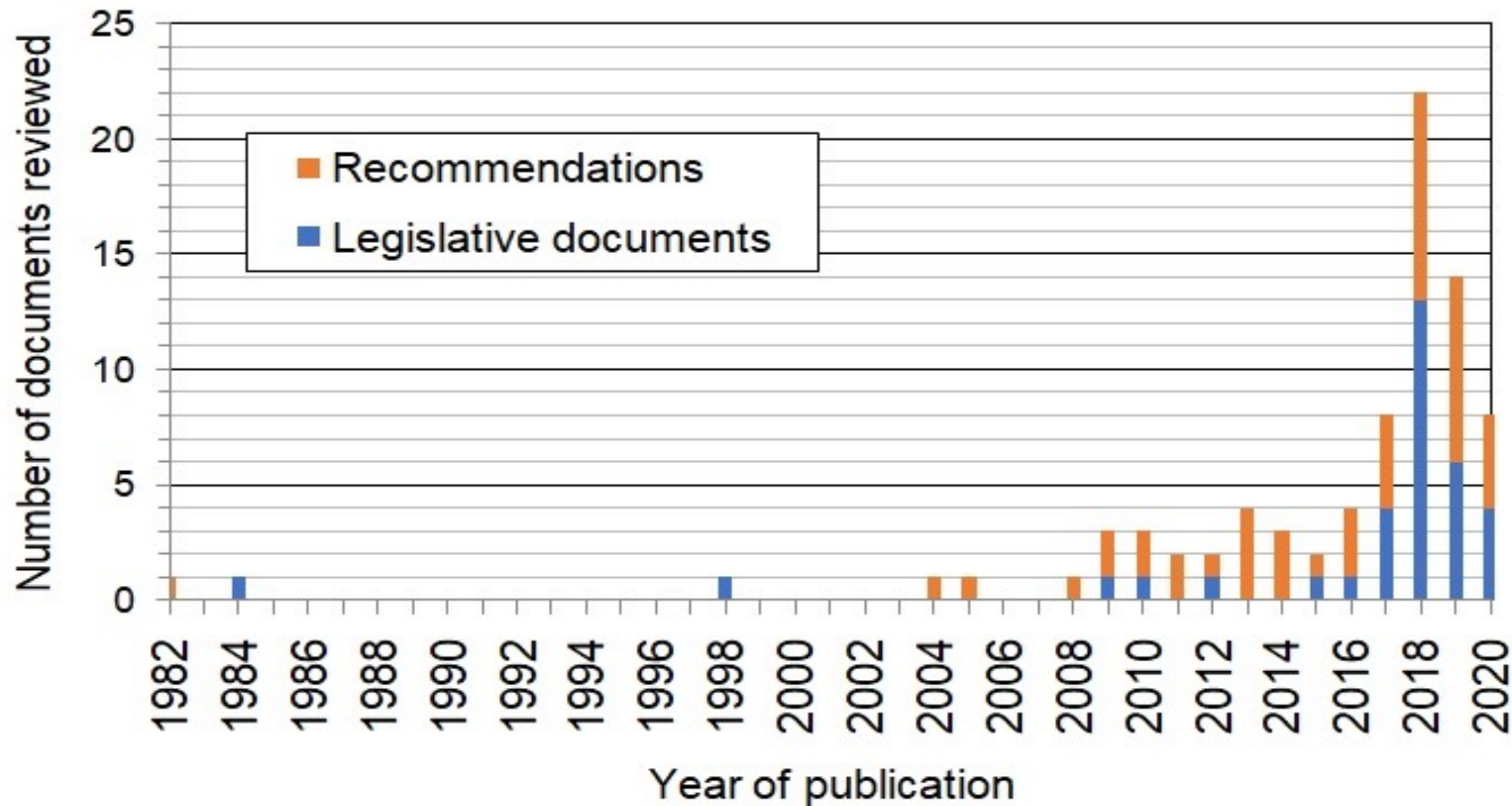
- All documents classified using a standardized approach;
- Scientific papers were excluded from the analysis;
- The synthesis of the results was descriptive.

Classification of documents:

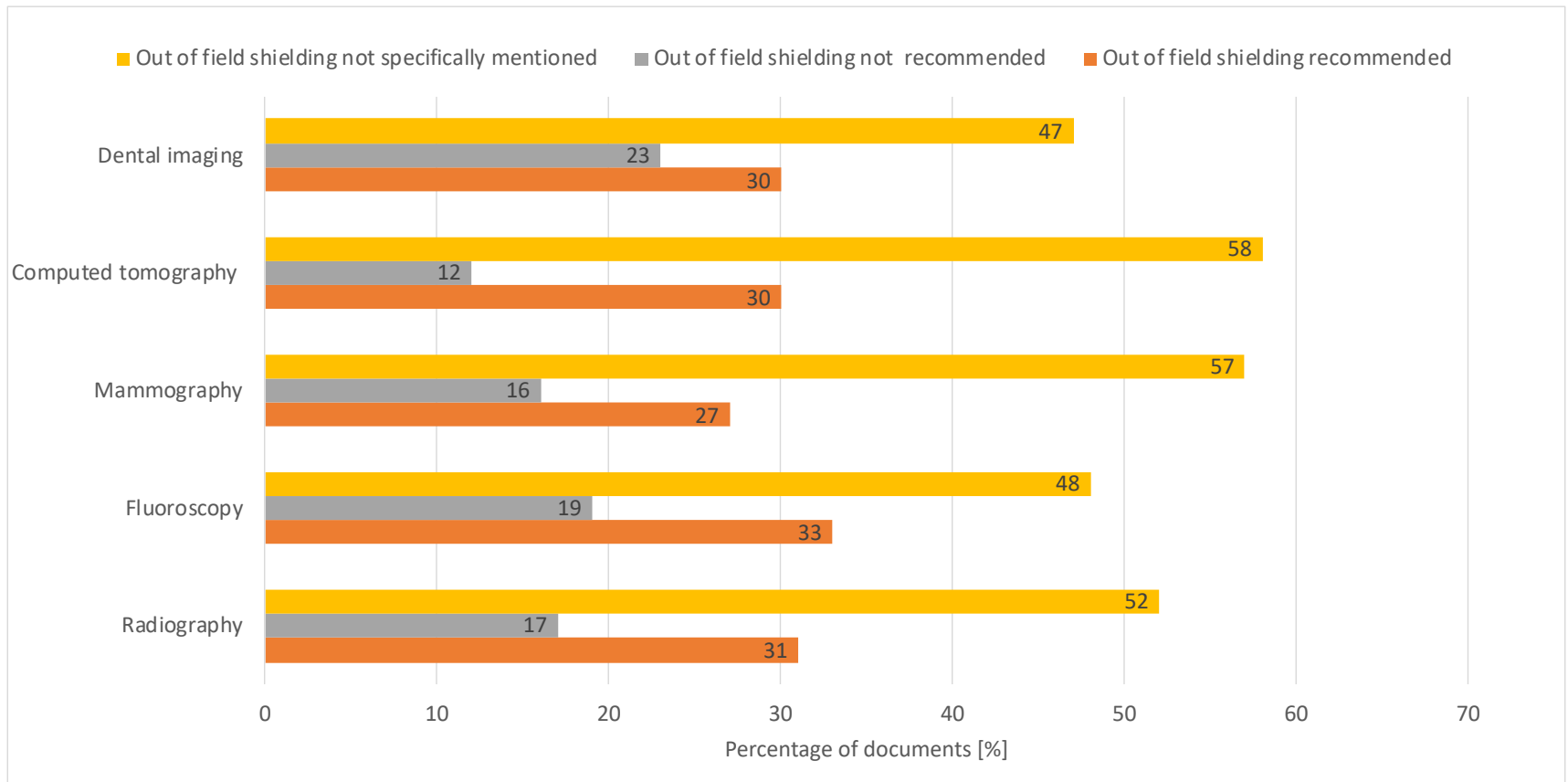
1. *Document recommends the use of out-of-field shielding;*
2. *Document recommends not to use out-of-field shielding;*
3. *Out-of-field shielding is not specifically mentioned or mention without further specification in the document.*

The review

- ❖ The documents analyzed were published in the period 1982-2020.

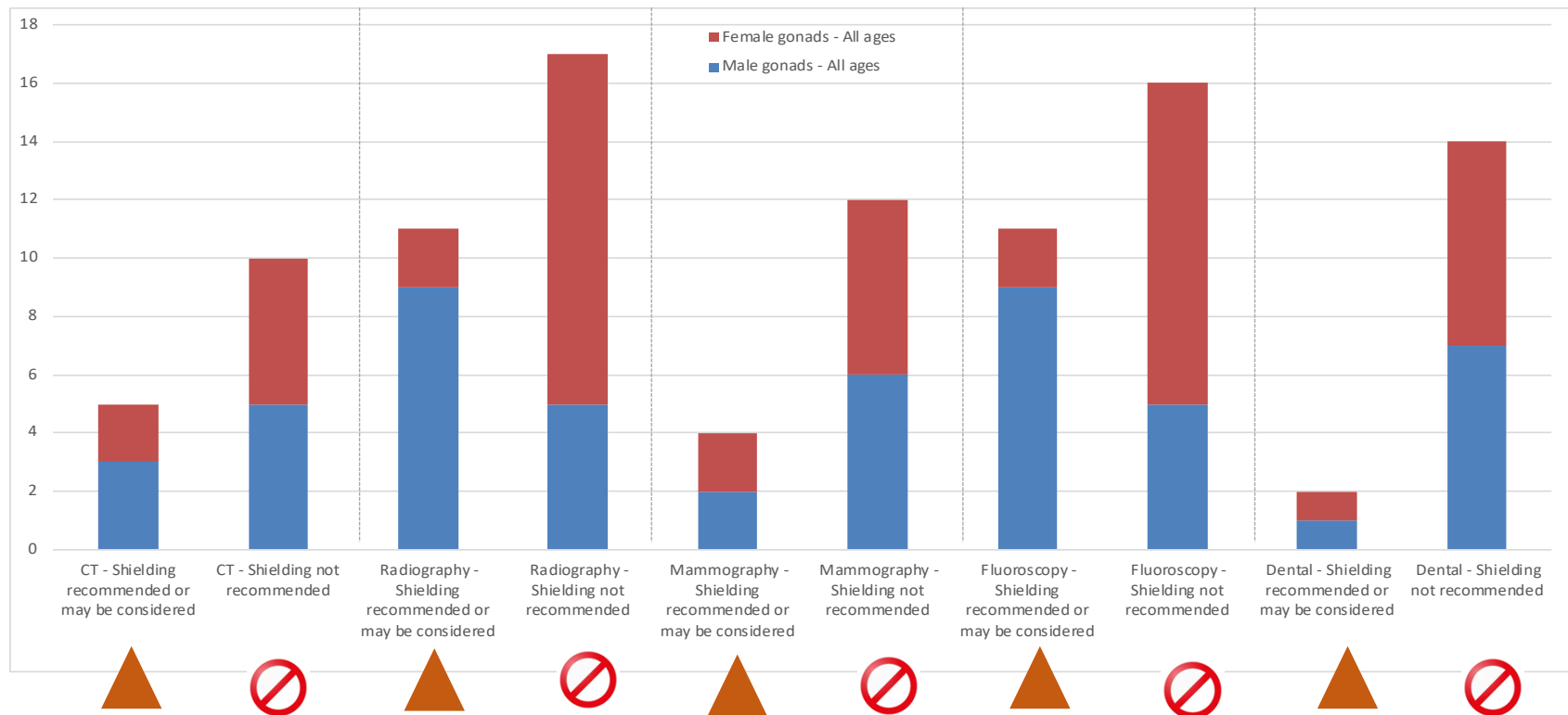


Position of countries and organizations



Findings

Number of documents considering **gonad shielding** for patients all ages.



- *When shielding of gonads is recommended -> this very often refers to **male gonads**.*
- ***Shielding of the female gonads is more widely not recommended** (variability in position of female gonads).*

General findings

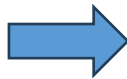
In most countries, both legislative documents and recommendations are not specific enough

facilities must have adequate protective clothing in order to protect the patient if necessary

appropriate apron must be available where X-ray machines are in use

hospitals should have the necessary radiation protection means available, but it is the responsibility of the radiation protection expert to regulate its judicious use

All findings can be found



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Physica Medica 86 (2021) 44–56

Contents lists available at [ScienceDirect](#)

Physica Medica

journal homepage: www.elsevier.com/locate/ejmp



Review paper

Use of out-of-field contact shielding on patients in medical imaging: A review of current guidelines, recommendations and legislative documents

Cristian Candela-Juan ^{a,*}, Olivera Ciraj-Bjelac ^b, Marta Sans Merce ^{c,d}, Jérémie Dabin ^e, Dario Faj ^{f,g}, Aoife Gallagher ^h, Hugo de las Heras Gala ⁱ, Željka Knežević ^j, Françoise Malchair ^{k,l}, Francesca De Monte ^m, George Simantirakis ⁿ, Chrysoula Theodorakou ^o



Conclusions

In most countries, both legislative documents and recommendations are not specific enough;

There is a wide variation in countries/organizations between those that recommend out-of-field shielding, those that do not recommend it, and those that do not state anything about it;

The documents analyzed were published over three decades, some of them might not be in line with recent scientific evidence;



Diversity of recommendations → **more research is needed** to derive clear and unambiguous conclusions:
review of existing literature and/or discussion among experts to identify **GAPS** in the knowledge and trace future research studies

→ **Common recommendation is needed.**

Further work

GAPS

- EFRS
- EURADOS
- EFOMP
- ESR
- ESPR
- EADMFR
- Eurosafe Imaging



Objectives:

- To gain consensus on the subject of patient shielding;
- To write recommendations to the stakeholders;
- To produce information for patient and staff in different languages.

Physica medica xxx (xxxx) xxx



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Physica Medica

journal homepage: www.elsevier.com/locate/ejmp



European consensus on patient contact shielding

Peter Hiles^{a,*}, Patrick Gilligan^{b,c}, John Damilakis^{d,e}, Eric Briers^f, Cristian Candela-Juan^{b,g}, Dario Faj^{h,i}, Shane Foley^{j,k}, Guy Frija^{d,l}, Claudio Granata^{m,n}, Hugo de las Heras Gala^{b,o}, Ruben Pauwels^p, Marta Sans Merce^{h,q}, Georgios Simantirakis^{h,r}, Eliseo Vano^{d,s}

Example of new legislations/recommendations since 2020...



Strahlenschutzkommission

Geschäftsstelle der
Strahlenschutzkommission
Postfach 12 06 29
D-53048 Bonn
<http://www.ssk.de>

Verwendung von Patienten-Strahlenschutzmitteln bei der diagnostischen Anwendung von Röntgenstrahlung am Menschen

Empfehlung der Strahlenschutzkommission

Verabschiedet in der 321. Sitzung der Strahlenschutzkommission am 22./23. September 2022

Recommandations de la CPR : Abandon de l'utilisation des moyens de protec- tion pour le patient en imagerie médicale

1 Introduction et base légale

En imagerie médicale par rayons X, la présence de moyens de protection pour le patient ainsi que leur utilisation judicieuse sont réglementées dans l'ordonnance sur les rayons X (OrX, art 24, annexe 2). De plus, une directive de l'OFSP créée en 2003 et révisée en 2018 recommande d'utiliser autant que possible des moyens de protection lors des examens radiologiques diagnostiques en médecine humaine. En Suisse, les moyens de protection sont employés de manière très hétérogène selon les régions.

2 Rapport scientifique de la Société suisse de radiobiologie et de physique médicale (SSRPM)

En raison de l'obligation d'optimiser en permanence l'exposition médicale fixée dans l'ORaP (art 4), un groupe de travail de la Société suisse de radiobiologie et de physique médicale (SSRPM) a revu une grande partie des publications nationales et internationales évaluées par des pairs (peer-reviewed) parues ces dix dernières années sur le thème des « moyens de protection externe en imagerie médicale » (n=59). Ces travaux concernent la radiographie conventionnelle, la mammographie, la fluoroscopie (imagerie interventionnelle) et le scanner (CT). Les auteurs ont étudié l'application des protections à l'intérieur (in-plane) et à l'extérieur (out-of-plane) du champ primaire pour diverses régions du corps.

Le groupe de travail de la SSRPM conclut dans l'ensemble que l'utilisation de moyens de protection aboutit à une réduction de dose négligeable en radiologie conventionnelle et que le rayonnement au patient peut être réduit autant, voire de manière plus efficace, en optimisant l'application des rayons X (positionner le patient exactement, diaphragmer le champ de rayonnement, appliquer le contrôle automatique de l'exposition, moduler le courant du tube, utiliser la reconstruction itérative des images etc.). En revanche, l'utilisation de moyens de protection lors des examens CT risque de dégrader la qualité diagnostique de l'image en raison du contrôle automatique de l'exposition (1), d'augmenter l'exposition au patient (2), d'affecter le confort du patient et, en plus, d'engendrer d'éventuels problèmes d'hygiène. Dans un document consensuel (3), la SSRPM recommande ainsi de renoncer dorénavant à utiliser des moyens de protection en imagerie médicale sans exception,

GAPS SURVEY



Current
Practice

Objective :

- to assess the current practice of patient contact shielding among radiology departments
- to assess their attitude towards a non-shielding policy.

Methods:

From May to September 2021 → radiology departments were invited by the ESR EuroSafe Imaging office to respond to an anonymised web-based questionnaire with 59 multiple-choice questions

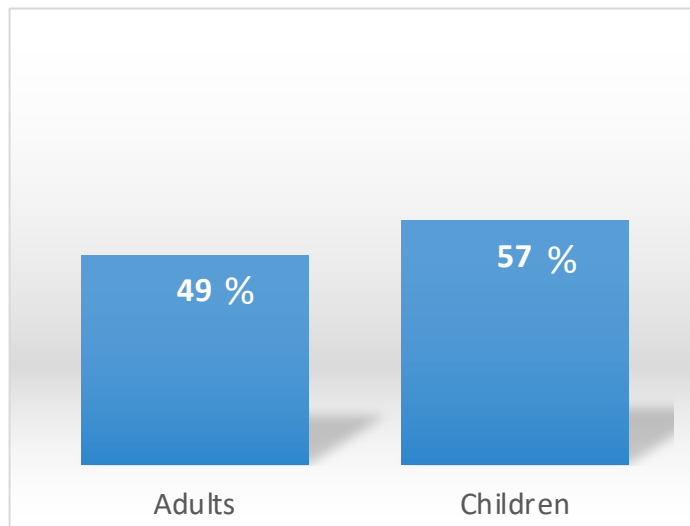
The survey was designed by consensus view of all members of the GAPS group and endorsed by the ESR and ESPR boards.

Results of the GAPS survey

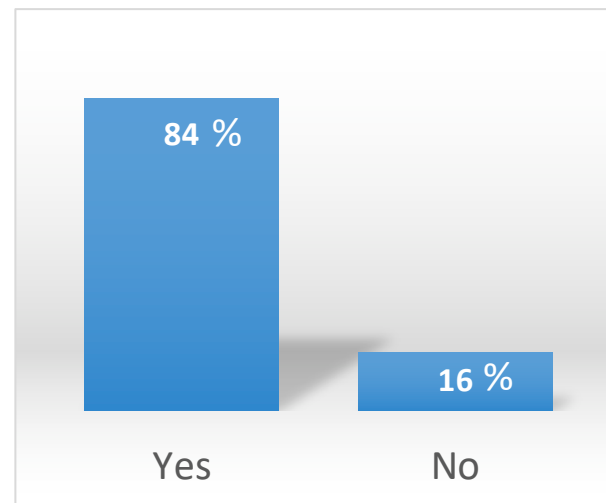
Results from 225 radiology services from 35 countries responded to the survey:

- 193 centers perform examinations on adults
- 160 (71%) performed studies in children:
 - of these, 32 (14.3%) were dedicated paediatric radiology departments

Use of shielding in a least one radiological modality

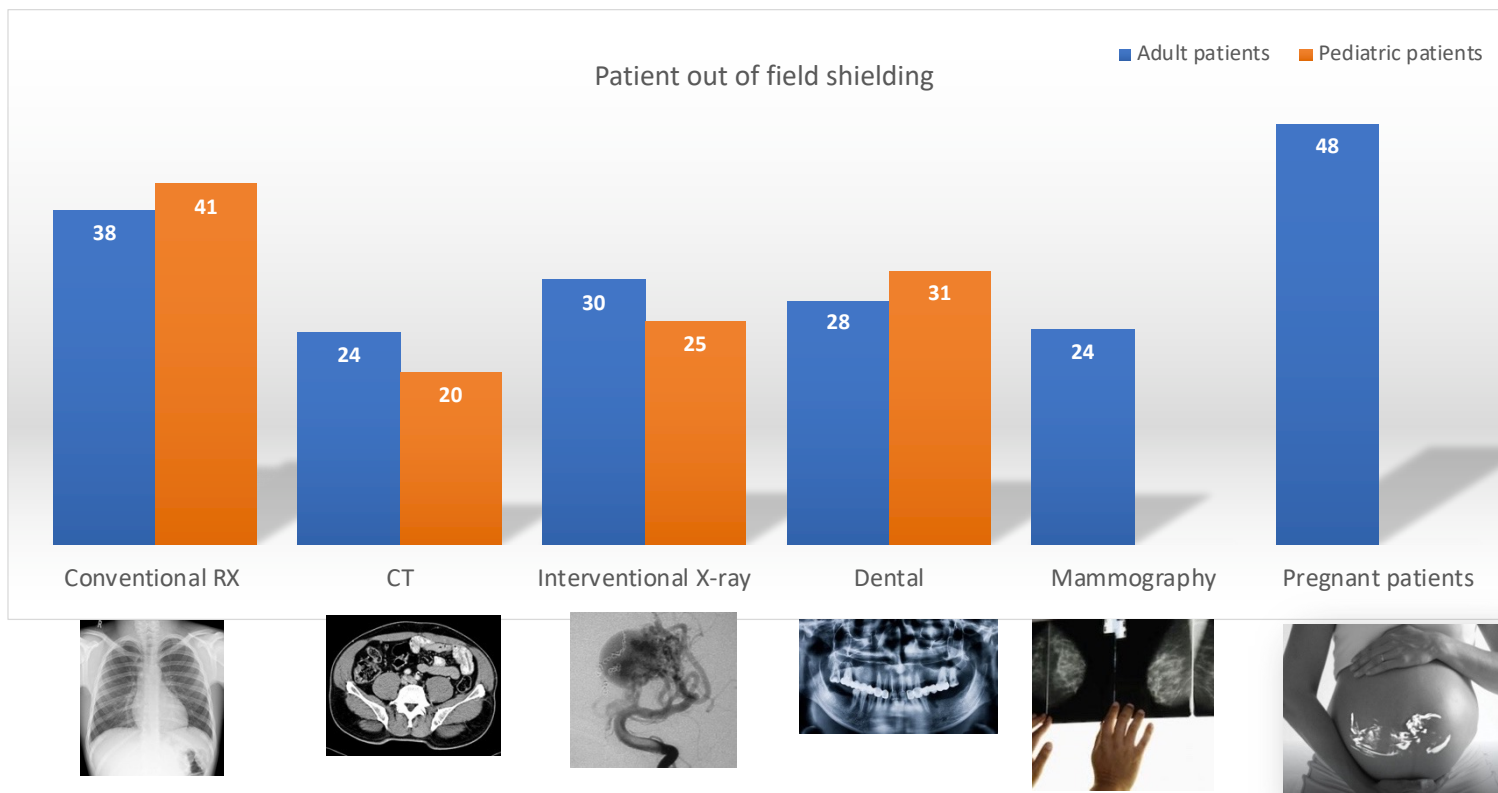


Would you follow European recommendations, if provided by main European bodies?



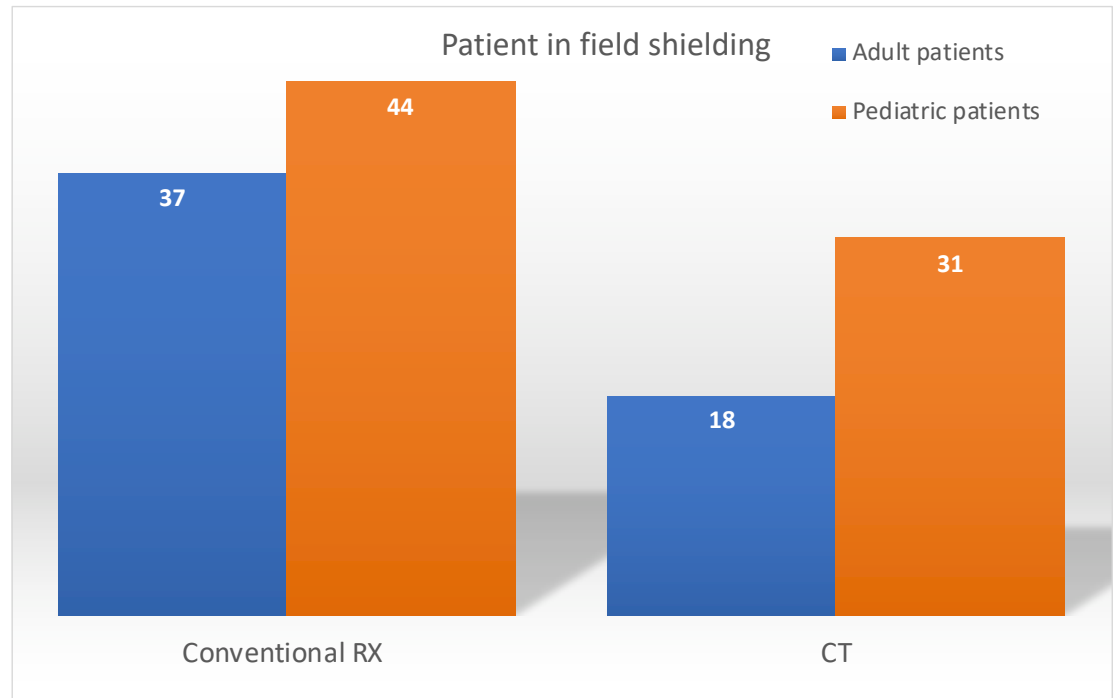
Results of the GAPS survey

Percentage of radiology departments using out of field shielding [%]



Results of the GAPS survey

Percentage of radiology departments using in field shielding [%]



Results of the GAPS survey

Centres using contact shielding	146	64.9%
Reasons why		
I believe shielding is effective to reduce unnecessary dose exposure to sensitive organs	97	66.4%
Shielding helps patients, carers, parents feel confident about the care received	81	55.5%
Regulations require us to do so	76	52.1%
Regulations require us to do so, but I do not believe shielding is effective or needed to reduce unnecessary dose exposure to sensitive organs	17	36.7%
Consequences of its use		
Need to repeat the study due to superimposition of the shield	107	73.3%
Artefacts	74	50.7%
Increased dose due to automatic exposure control activation	65	44.5%
Missed pathology	51	34.9%
None	39	26.7%
Infection control issues	8	5.5%

Results of the GAPS survey

Centres not using contact shielding	79	35.1%
Reasons why		
It is because contact shielding is not effective or needed to reduce unnecessary dose exposure to sensitive organs	47	59.5%
It is because contact shielding may impair image quality and diagnostic capability of the examination – and therefore require retakes	46	58.2%
It is because the automatic exposure control (AEC) may increase the dose	41	51.9%
I don't know	12	15.2%
It is because of concerns for hygiene / infections	4	5.1%
It is because of the physical discomfort it brings to the patient	4	5.1%
Centres not using contact shielding	79	35.1%
How do you feel about this policy?		
I am OK with this policy	56	70.9%
I feel uneasy about this policy, as contact shielding may reduce unnecessary exposure to sensitive organs	10	12.7%
I feel uneasy with patients, as they may think we do not take care of them	8	10.1%
With children, I feel uneasy with their parents/carers, as they think we do not take care of them	5	6.3%
I don't know	4	5.1%
I feel uneasy with patients, as I am not able to explain effectively to them why they are not shielded	3	3.8%

Summary of the GAPS survey



- Shielding especially in children is still largely used, despite concerns about its usefulness and effectiveness
- Conventional radiology and dental imaging, both low dose procedures, are the modalities in which shielding in children is most frequently used
 - this could be explained by the long-standing habit of using shielding in these modalities
- Gonads are the most frequently shielded organs, even though:
 - There is no evidence of genetics effects + radiosensitivity of gonads has been scaled back
 - It is well known that is very difficult to cover the female gonads with shielding
- In-field shielding is commonly used in conventional radiology and less frequently used in CT:
 - In both cases the practice is very questionable, because of potential interference with AEC (RX-CT) + issues with image quality (CT)

ORIGINAL ARTICLE

Open Access



European survey on the use of patient contact shielding during radiological examinations

Claudio Granata^{1*} , Erik Briers², Cristian Candela-Juan^{4,5}, John Damilakis^{3,6}, Timo De Bondt^{3,7,8}, Dario Faj^{9,10}, Shane Foley^{3,11,12}, Guy Frija^{3,13}, Hugo de las Heras Gala⁴, Peter Hiles¹⁴, Ruben Pauwels^{15,16} , Marta Sans Merce^{9,17}, Georgios Simantirakis^{9,18}, Eliseo Vano^{3,19} and Patrick Gilligan^{4,20} on behalf of the ESR, ESPR, EFOMP, EFRS, and EURADOS

THANK YOU FOR
YOUR ATTENTION

