



# *EU JUST CT*

## **ESR iGuide Clinical Decision Support Tool for the ESR's Imaging Referral Guidelines**

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- ESR iGuide is an decision support system providing evidence-based guidance for imaging referrals using anonymous patient data, providing appropriateness recommendations, as well as displaying relative cost and expected radiation exposure
- The ESR iGuide web portal is the stand-alone version of ESR iGuide that serves as a reference tool to consult the ESR's imaging referral guidelines based on the ACR Appropriateness Criteria

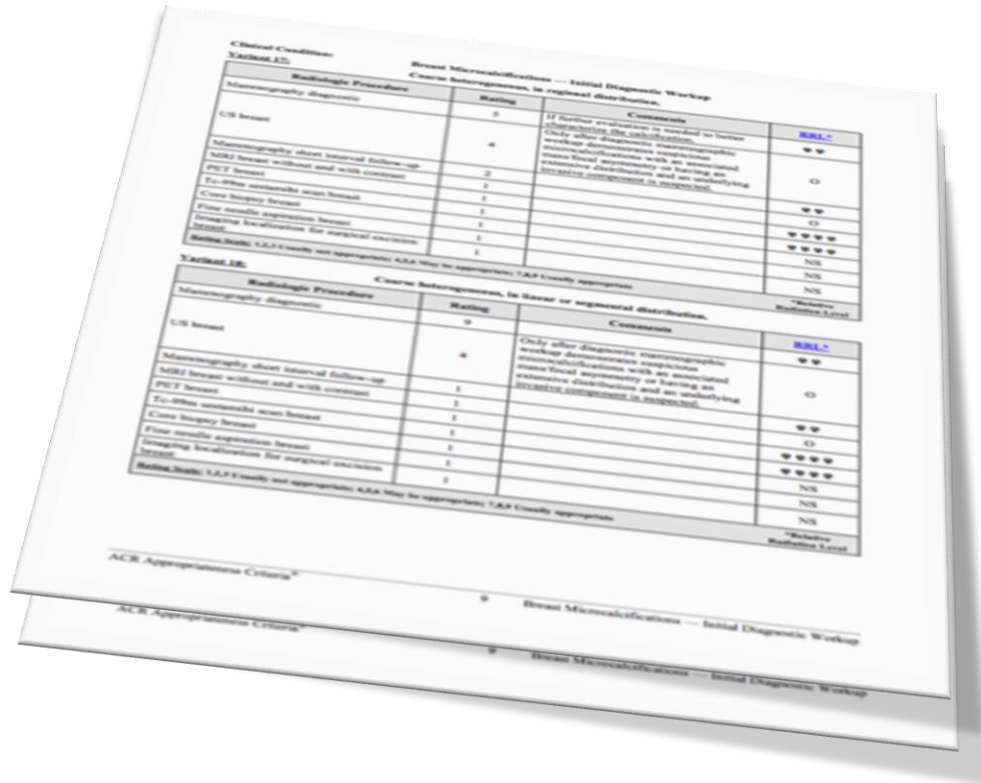
- The ESR adheres to the ACR's original methodology as far as applicable, and has established additional methodological guidance for its experts, establishing several key principles:
  - Any changes to existing recommendations, and any additional guidelines, should be based on evidence as far as possible
  - Expert opinion, judgement, European practice standards, should only function as a supplement when necessary
  - Appropriateness recommendations should give no consideration to national or institutional circumstances, costs, or availability of equipment



**DELIVERS:**

- Integration-ready clinical decision support
- Evidence-based guidelines developed by leading American and European radiologists
- Enhanced electronic referral workflows
- Consistently high quality and safety in patient care
- More efficient and effective use of clinical resources

# CDS: from paper to software



Patient Name: TEST, IGNORE      MRN: 0000006      Ordering Physician: ..

Save Exam    Print Form    Exit Exam

**9 8 7 6 5 4 3 2 1**  
Indicated 7-9      Marginal 4-6      Low Utility 1-3

**Alternate procedures to consider:**  
X-Ray    CTA    ANGIO    MR    VQ  
9    8    5    4    4

**Additional Information:**  
 Thoracic Chest Wall     Chest with contrast, 3D reconstructions

**Other Protocols (optional)**  
 Reformats (sagittal/coronal)     Stereotactic

**At least one box MUST be selected from either of the following groups**

**SIGNS / SYMPTOMS**

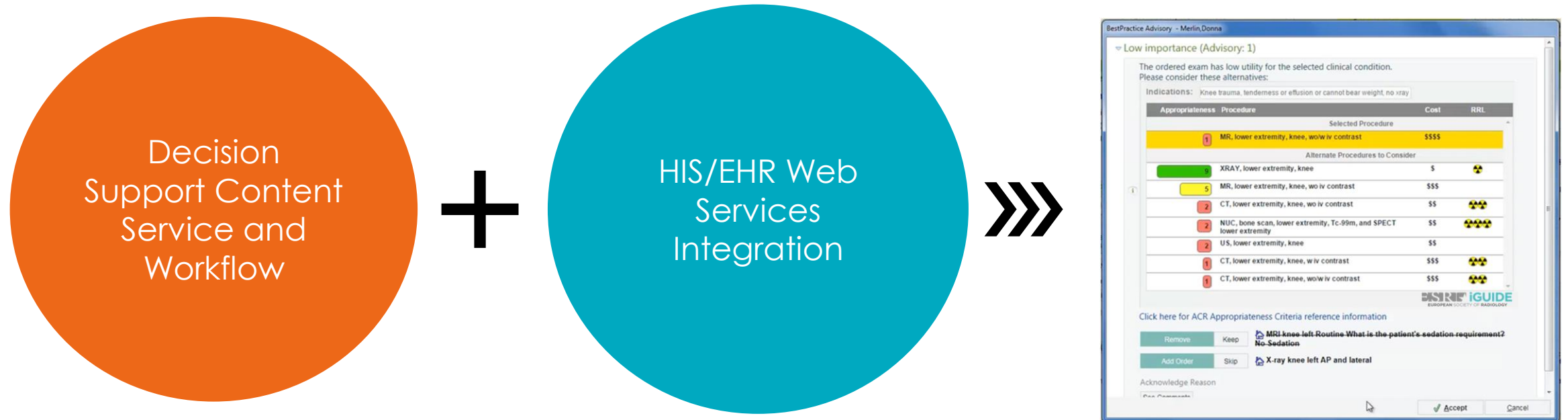
<input type="checkbox"/> Back pain	<input type="checkbox"/> Chest pain acute, cardiac origin
<input type="checkbox"/> Chest pain acute, pulmonary origin	<input type="checkbox"/> Chest pain chronic, cardiac origin
<input type="checkbox"/> Chest pain, normal EKG	<input type="checkbox"/> Chest wall pain
<input type="checkbox"/> Cough (persistent)	<input type="checkbox"/> Fatigue and malaise
<input type="checkbox"/> Fever	<input type="checkbox"/> Hemoptysis
<input type="checkbox"/> Lymphadenopathy	<input type="checkbox"/> Night sweats
<input type="checkbox"/> Rales	<input checked="" type="checkbox"/> Shortness of breath
<input type="checkbox"/> Mass or lump on chest or back	<input type="checkbox"/> Weight loss

**KNOWN DIAGNOSES (NOT Rule/out!)**

<input type="checkbox"/> Aortic dissection	<input type="checkbox"/> Brachial Plexus abnormality
<input type="checkbox"/> Bronchiectasis	<input type="checkbox"/> Bronchiectasis w/ acute exacerbation
<input type="checkbox"/> Congenital heart disease	<input type="checkbox"/> Emphysema
<input type="checkbox"/> Injury to trunk	<input type="checkbox"/> Interstitial Lung Disease (Acute)
<input type="checkbox"/> Interstitial Lung Disease (Chronic)	<input type="checkbox"/> Neoplasm - Esophageal cancer

From James Brink, MGH

# Decision Support in a nutshell




ESR iGuide delivers **imaging referral guidelines** for imaging services directly into physicians' referral workflows using a **web services integration** by scoring the referral based on **anonymous patient data** (age, sex, etc.)

# ESR iGuide workflow

2. Enter reason(s) for exam (clinical indications)  
*Example: Ataxia, slowly progressive, or long duration*

Age: 40 ▾ **Male** Female Unknown



**Body Areas**

- Abdomen
- Breast
- Cardiac
- Chest
- Head**
- Lower extremity
- Maxface
- Neck
- Pelvis
- Spine
- Unspecified
- Upper extremity

1. Select sex, age and body area  
*Example: 40 year old Male, Head*



**Clinical Scenarios**

none

**Ataxia**

- Ataxia, acute or sub-acute, infection suspected
- Ataxia, after head trauma (<24 hours)
- Ataxia, slowly progressive, or long duration
- Ataxia, stroke suspected as etiology

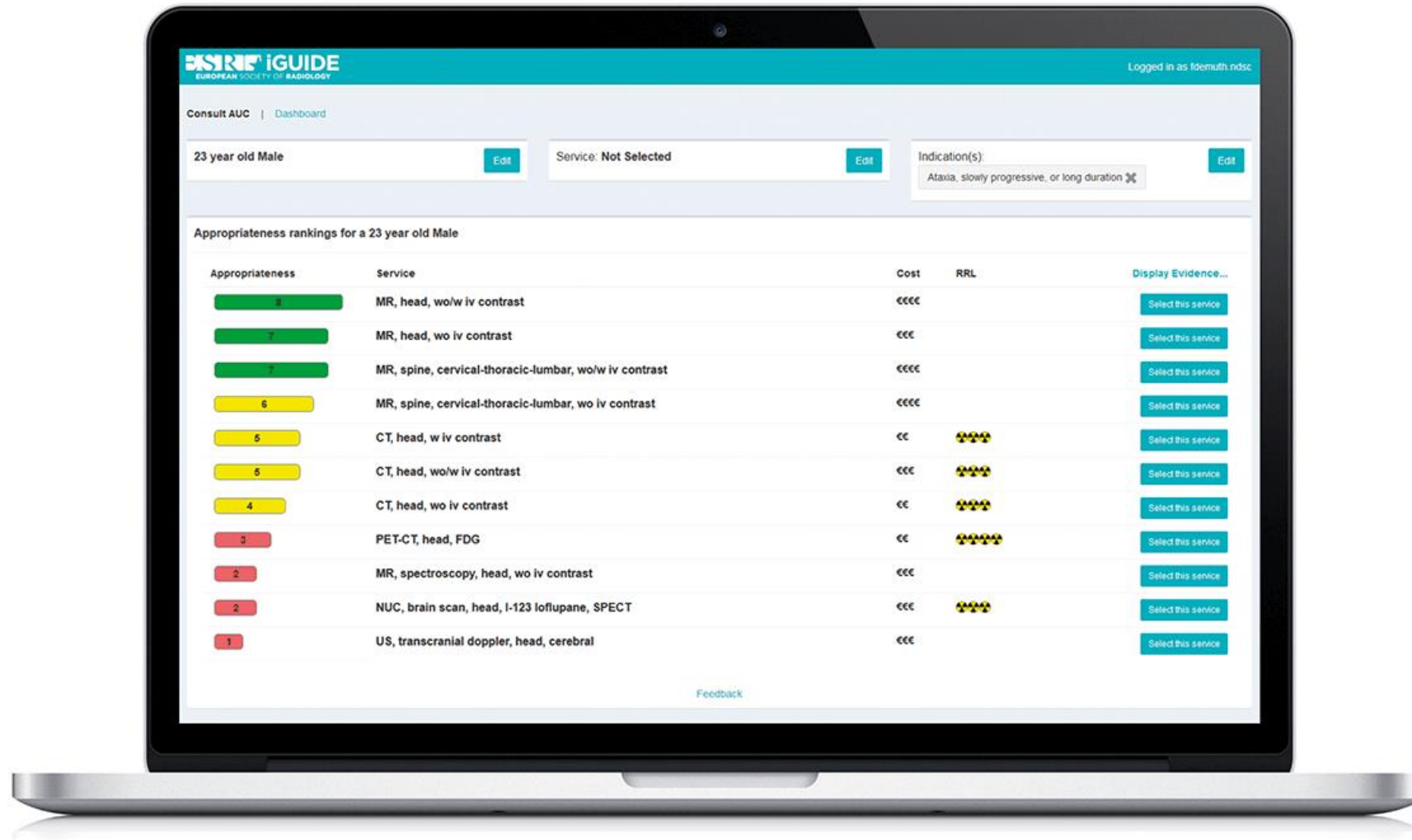


3. Receive feedback and scores (1-9)  
 for exams to consider

Appropriateness rankings for a 40 year old male [Display Evidence...](#)

Indications: Ataxia, slowly progressive, or long duration ✕

Appropriateness	Procedure	Cost	RRL
9	MR, head, wo iv contrast	€€€	<a href="#">select this exam</a>
8	MR, head, wo/w iv contrast	€€€€	<a href="#">select this exam</a>
7	MR, spine, cervical-thoracic-lumbar, wo iv contrast	€€€€	<a href="#">select this exam</a>
6	MR, spine, cervical-thoracic-lumbar, wo/w iv contrast	€€€€	<a href="#">select this exam</a>
5	CT, head, w iv contrast	€€	☠☠☠ <a href="#">select this exam</a>
4	CT, head, wo iv contrast	€€	☠☠☠ <a href="#">select this exam</a>





6 year old Female
Edit

Service: CT, abdomen-pelvis, wo/w iv contrast
Edit

Indication(s):

Pad <14y, RLQ pain, possible appendicitis, atypical ✕

Edit

Appropriateness rankings for a 6 year old Female Cancel AUC Consult

Appropriateness	Service	Cost	IRR	Display Evidence...
3	CT, abdomen pelvis, wo/w iv contrast	€€€	■■■■■■■■■■	Select this service
8	US, abdomen	€€		Select this service
7	CT, abdomen pelvis, w iv contrast	€€€	■■■■■■■■	Select this service
6	XRAY, abdomen	€	■■■■	Select this service
5	US, pelvis	€€		Select this service
4	MR, abdomen pelvis, wo iv contrast	€€€€		Select this service
2	FLUOR, contrast enema	€€	■■■■■■■■	Select this service



# Referral guidelines and justification

- Reasons for inappropriate utilisation (WHO):
  - Lack of awareness about radiation protection
  - **Insufficient access to guidelines at the point of care**
  - Over-reliance on imaging, defensive medicine
  - Excessive demand from patients and specialists
  - Lack of consultation with specialists
- Main weaknesses in justification (HERCA):
  - Lack of written procedures describing the justification process
  - **Lack of availability, awareness and use of referral guidelines**
  - Lack of national or local procedures for performing clinical audits
  - **Incomplete referrals from referring practitioners**

# ESR perspective guidelines and CDS

- Aims
  - The right test the first time
  - Consistent practice
  - Effective utilisation of imaging resources
- Guideline availability is not enough
  - Accessibility at the point of care through clinical decision support (CDS) in the workflow
- Advantages of ESR iGuide
  - The right information
  - To the right person
  - In the right intervention format
  - Through the right channel
  - At the right time in the workflow

# Elements of a good referral

- Has the test already been done?
  - CDS can check for prior exams
- Is the necessary information provided?
  - CDS requires referrers to submit a clear reason for exam
- Is imaging needed?
  - CDS provides feedback whether imaging is the best answer
- What is the right test?
  - CDS provides feedback on the appropriateness of different modalities for a clinical indication

→ **Guidelines PLUS decision support provides the best option to improve clinical practice**

# Radiology department's perspective

- Volume: radiologists justify and approve every referral
  - Often not possible at a consistently high standard in clinical practice
- Quality of the referrals
  - Unclear/missing information, avoidable delays because of consultations/changing requests/sending patients back, etc.
  - Fights with referring physicians
- Duplicate exams
  - Unnecessary exams use up valuable staff, technical, and financial resources; Increase in the unnecessary utilisation of CT and workload increasing for no clinical benefit
- Radiologists in reality do not have time to act as gatekeepers

# Benefits of utilising referral guidelines through decision support

- More appropriate, evidence-based and consistent medical imaging referrals
  - Based on a common standard for appropriateness and justification
- Reduction in unnecessary radiation exposure
  - Enhanced radiation protection of patients
- Educational benefits: feedback on appropriateness of selected exam, new insights through data collection & reporting
  - Creating awareness and 'on-the-job' training for referrers on which requests are appropriate and which are not

# ACR-ESR cooperation on guidelines

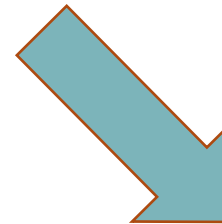


## Appropriateness Criteria

- 22 AC panels
- > 300 radiologists
- > 100 other medical specialists and associations

## Referral Guidelines Subcommittee

- 10 lead experts for topic areas
- Reviews and adapts ACR guidelines
- SC facilitates ESR cooperation with (sub)specialties and associations



## Joint Rapid Response Process

- ACR Rapid Response Committee + ESR SC
- Translating new AC into CDS rules
- Maintaining and expanding CDS content
- Periodic content releases
- Reviewing user feedback

# ESR guidelines

- 2,300 indications with associated exams incl. appropriateness ratings for defined patient groups
  - Age range: 0-150 years
  - Sex: male, female, either
- Appropriateness ratings
  - 1-3 (**red**): usually not appropriate
  - 4-6 (**yellow**): may be appropriate
  - 7-9 (**green**): usually appropriate

## DEVELOPMENT OF EUROPEAN IMAGING REFERRAL GUIDELINES

ESR experts review and adapt the content for **ESR iGuide** from the ACR Appropriateness Criteria, consisting of clinical scenarios and indications and associated imaging exams, for ten topics:



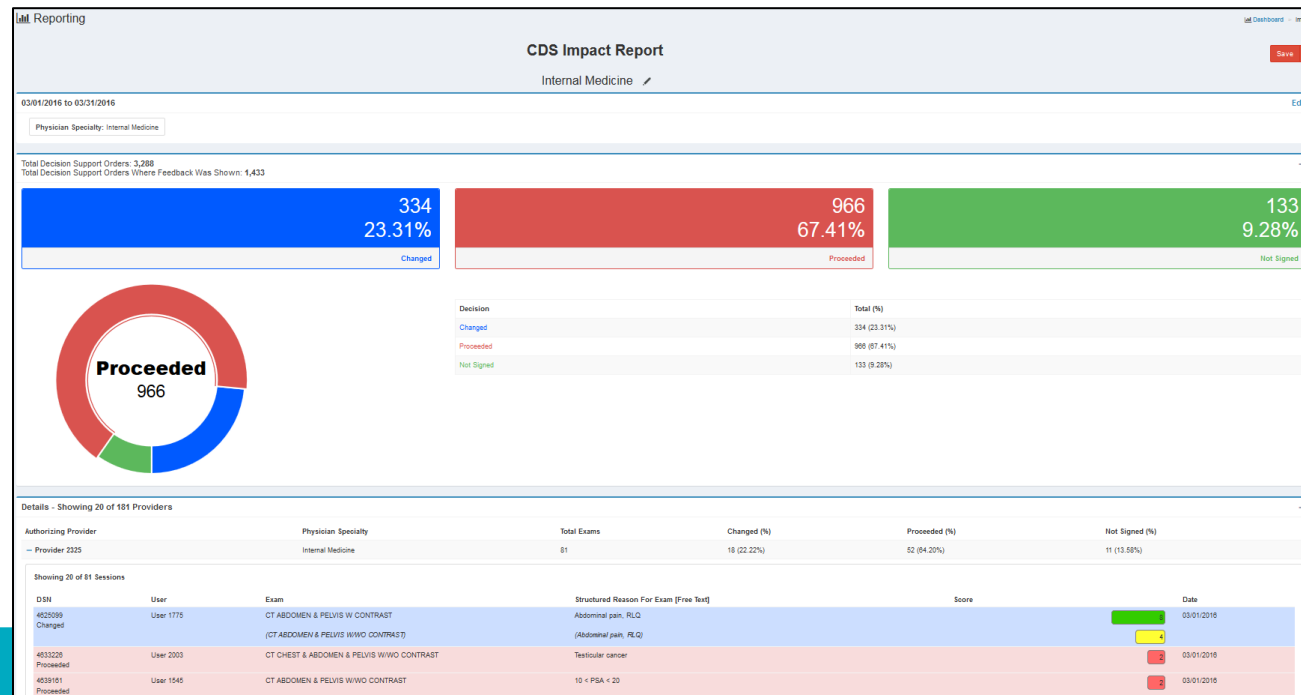
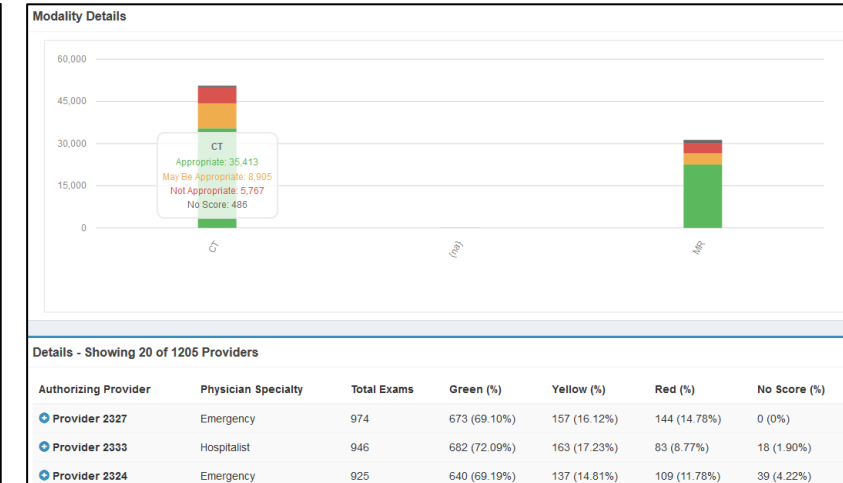
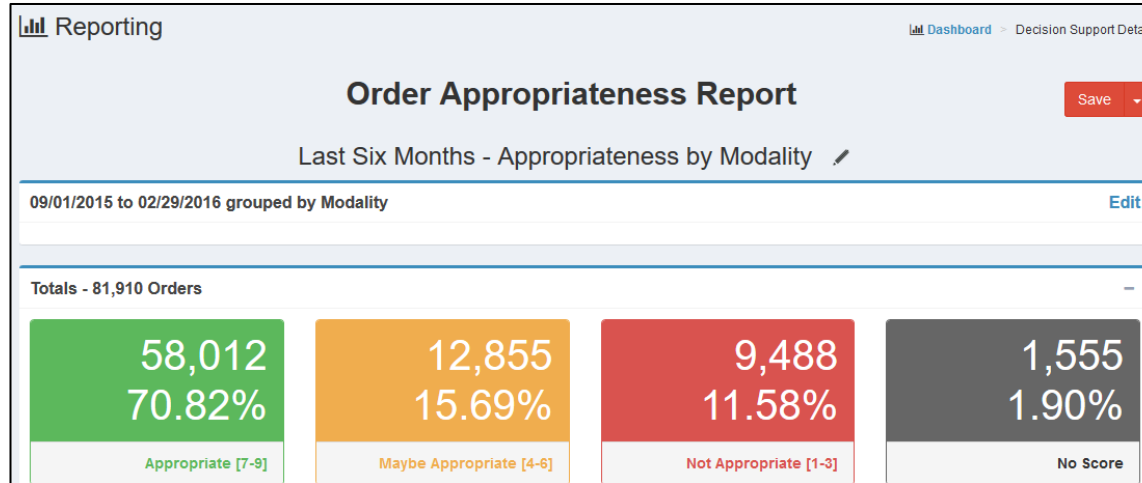
**ESR iGUIDE**  
EUROPEAN SOCIETY OF RADIOLOGY

- Breast Imaging
- Cardiac Imaging
- Gastrointestinal Imaging
- Musculoskeletal Imaging
- Neurologic Imaging
- Paediatric Imaging
- Thoracic Imaging
- Urologic Imaging
- Vascular Imaging
- Women's Imaging



## Analytics

- ESR iGuide records Decision Support Data, providing useful statistics
- The Decision Support Number (DSN) is a common link between all requests for analytics and workflow
- Neither patient nor physician information is stored in ESR iGuide

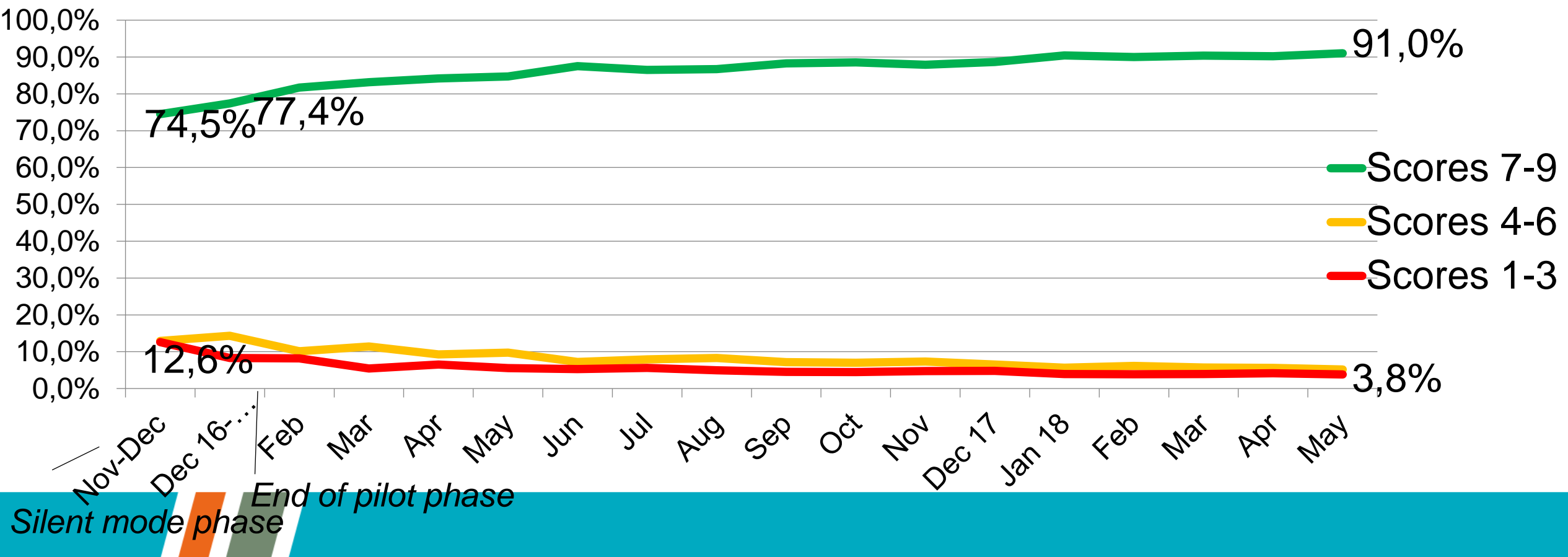


# ESR iGuide pilot project Croatia

## Sample appropriateness report

### Appropriateness of Referrals with ESR iGuide

November 2016-May 2018



# ESR iGuide pilot project Sweden

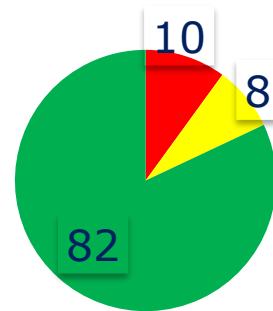
## Results

URL integration with optional CDS workflow (technically limited integration)

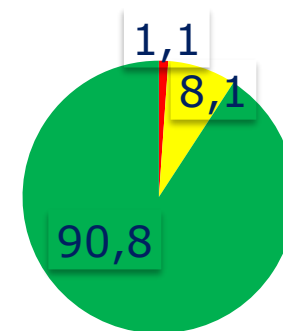
- Users were allowed to exit the CDS workflow at multiple points

→ **Based on results, a full integration of ESR iGuide was approved to improve the user experience**

Non-CDS referrals: inappropriateness rate 10%



CDS referrals: inappropriateness rate 1%

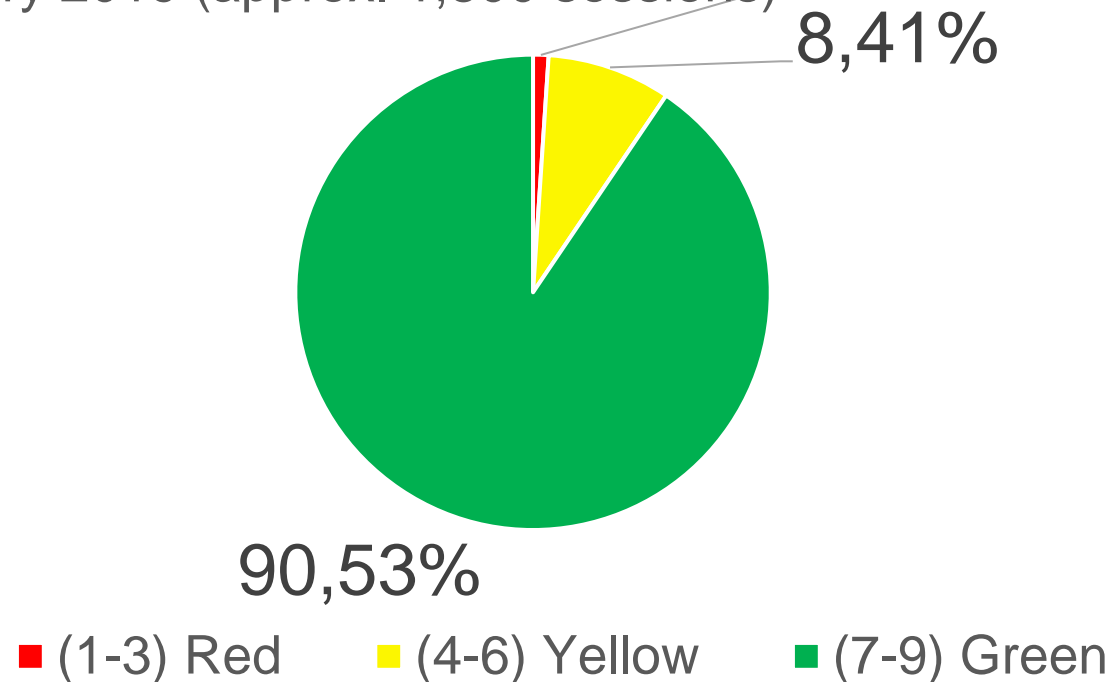


# ESR iGuide implementation Sweden – Results

Full API integration went live in November 2018

- Appropriateness rate 90.5%
- Cancelled sessions (decision not to request imaging): 11.4%

Sample appropriateness report  
January 2019 (approx. 1,800 sessions)

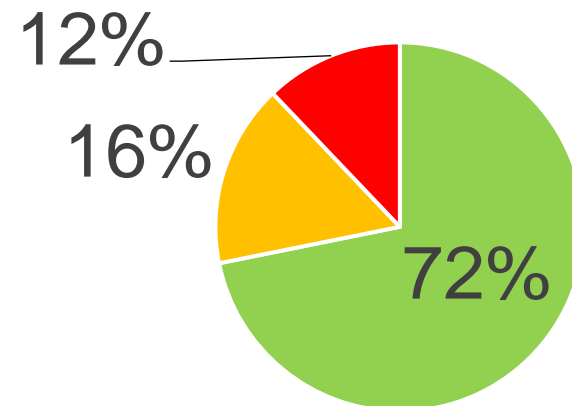


# ESR iGuide implementation (2020) Consorci Hospitalari de Vic, Spain

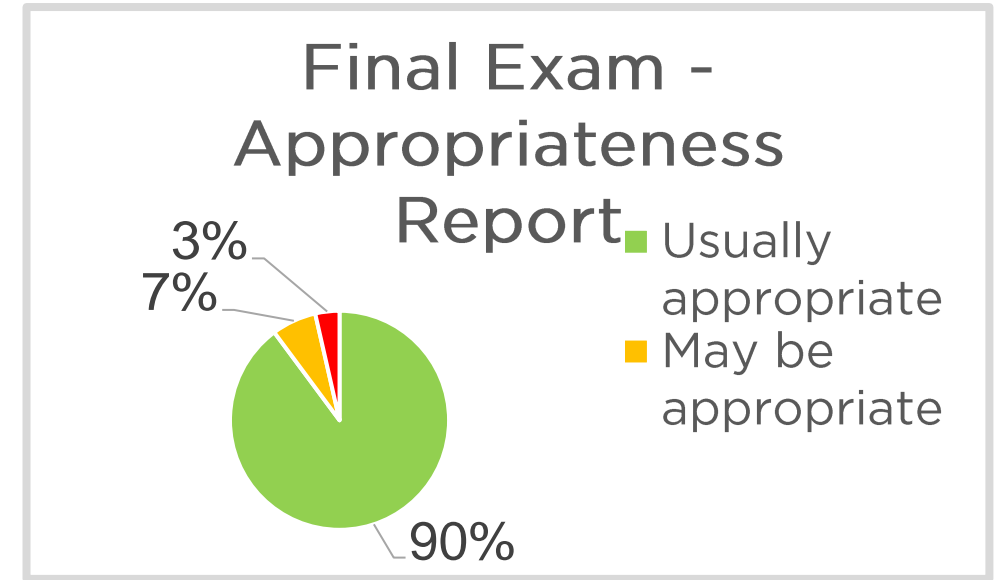
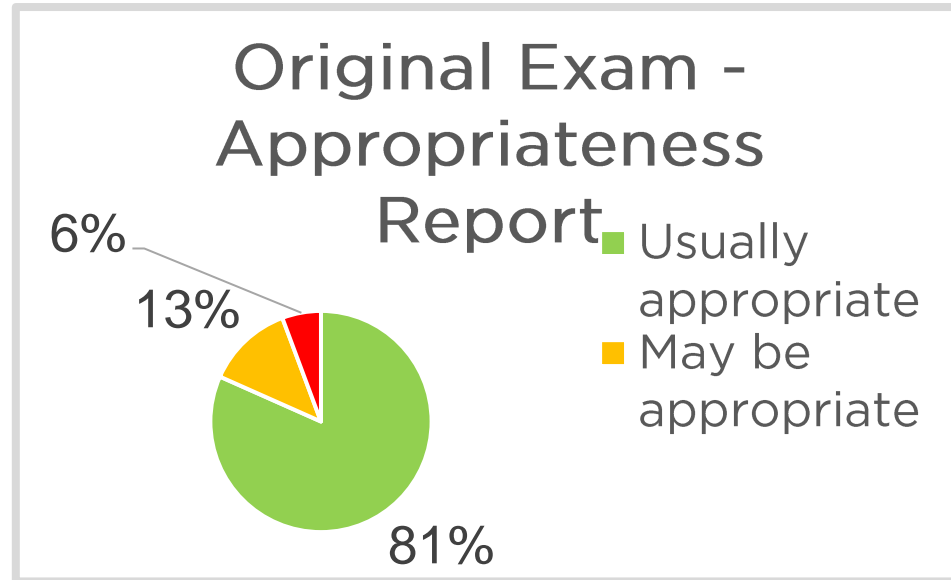


Appropriateness: retrospective data analysis of referrals

Appropriateness of referrals (approx.  
500 scored requests)

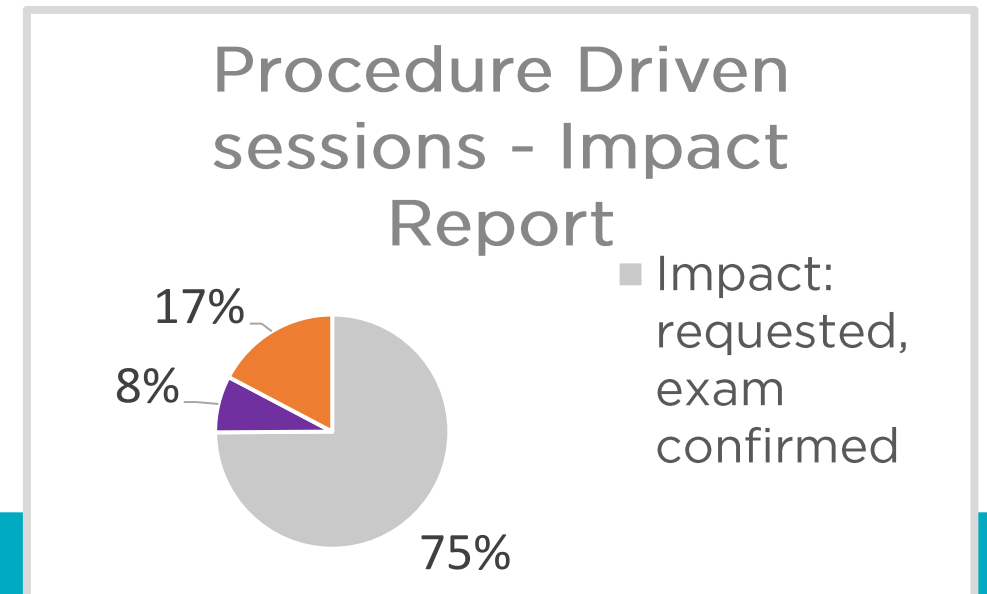


## Silent Mode



## CDS Results summary

- 8% overall improvement in appropriateness rate silent mode compared to full mode
- Impact (full mode, feedback shown):
  - 8% of exams replaced with more appropriate alternative
  - 17% of referrals cancelled after CDS feedback



# ESR iGuide implementation with xRefer Royal Victoria Hospital, St Vincent's Hospital, Dublin



- Reduction in duplicate imaging of **61%**
- Overall reduction in expected imaging volume of **8%**
- Effective radiation dose reduction of **0.27 mSv** per patient (equivalent to 13 chest x-rays)
- Time reduction in vetting referrals: **99%**

# Conclusion

- ESR's iGuide is an effective tool for selecting the most appropriate imaging study at the point of care
- It can improve patient care and decrease unnecessary radiation
- Several European and non-European countries and regions are using iGuide, and widespread implementation would increase the quality of radiological practice and of the healthcare in general





# **Does clinical decision support system promote expert consensus for appropriate imaging referrals? Chest-abdominal-pelvis CT as a case study**

Talya Markus, Saban Mor-PhD, Sosna Jacob-MD, Assaf Jacob-MD, Cohen Dotan-MD, Vaknin Sharona-MSc, Luxemburg Osnat-MD, Singer Clara-PhD<sup>2</sup>, Shaham Dorit-MD, Accepted for publication, Insights into Imaging, 2023

## The impact of ESR iGuide

- To assess the appropriateness rating of Computed Tomography (CT) examination of Chest-Abdominal-Pelvis ordered in the ED, based on expert physicians, before and after using a CDS tool, namely ESR iGuide



## The impact of ESR iGuide

- 100 consecutive cases were included of Chest-Abdominal-Pelvis CT scans ordered at the ED in a tertiary hospital
- Four experts (two radiologists and two emergency medicine physicians) rated the appropriateness of the cases on a 7-point scale, before and after using the decision support tool.

## Patients Information

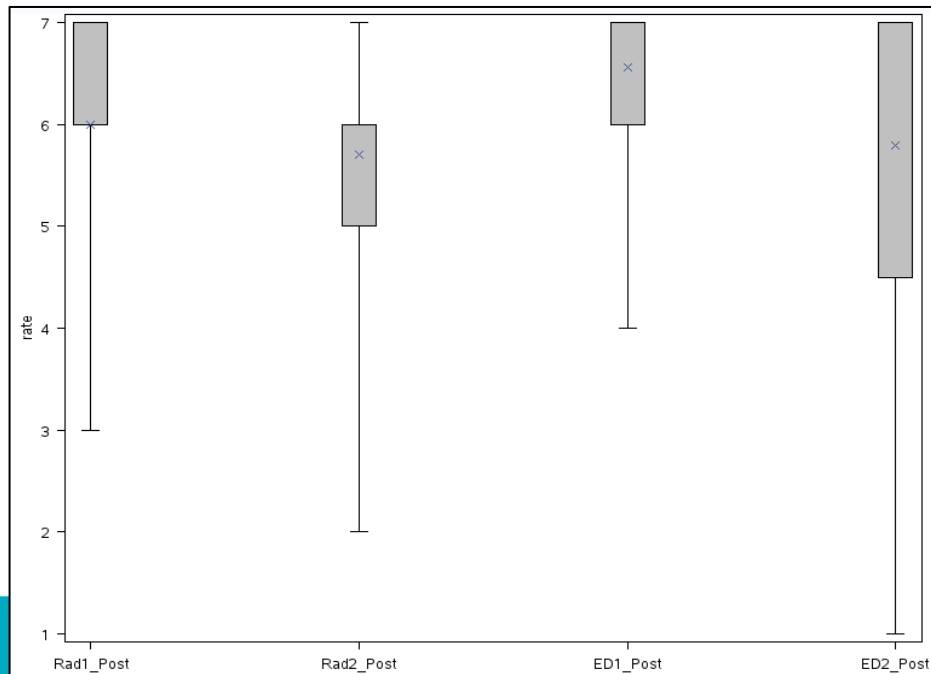
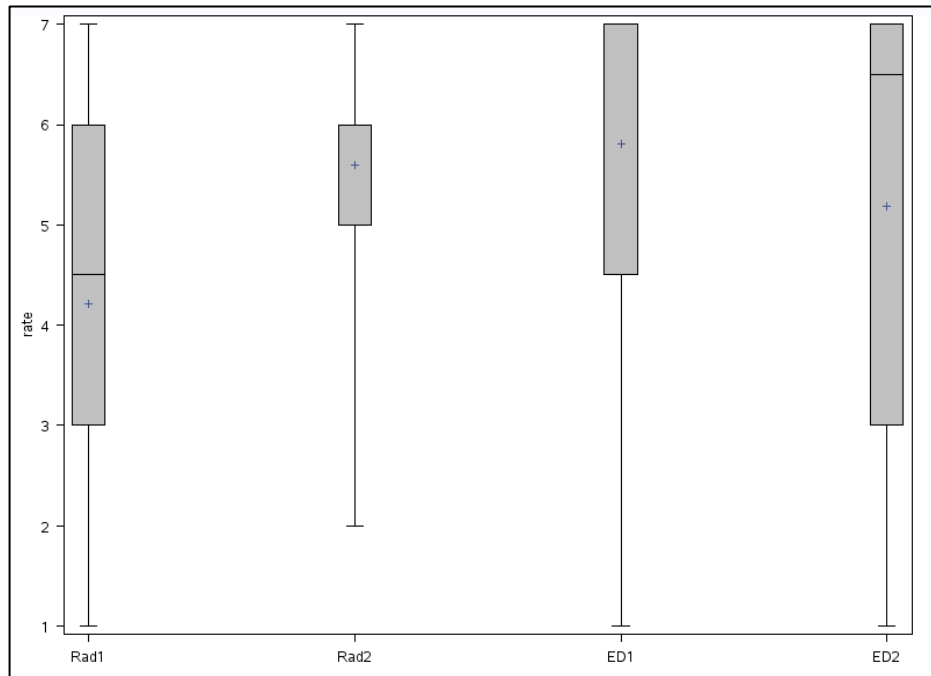
- The patients' ages ranged from 20 to 102 years and the mean age was  $64.3 \pm 19.8$  years. Out of 100 patients, 44 were female (44%)
- The most frequent indications were
  - cholecystitis/RUQ pain/abnormal liver function tests (LFTs) (21), oncological patients with acute symptoms or clinical deterioration (14), constipation (14), post-operative complications (12), and intestinal obstruction (11).

# The impact of ESR iGuide

- The overall mean rating of the four experts' physicians assessment (average rating per case) was  $5.2 \pm 1.066$ , median being 5.5 prior to ESR. After consulting the ESR iGuide, the overall mean rating of the four experts' agreement was  $5.85 \pm 0.911$ , median being 6
- The degree of overall agreement (ICC) among the experts was 0.388 before ESR consultation and 0.572 after consultation.

## The impact of ESR iGuide

- Using a threshold of 5 (on a scale of 1 to 7, where 7 is most appropriate), the experts considered only 63% of the tests appropriate before using the ESR iGuide. This number has increased to 89% after consultation with the system.
- According to the ESR iGuide system, for 85% of the cases, Chest-Abdominal-Pelvis CT was not a recommended option (score 0)
- Abdominal-Pelvis CT was "usually appropriate" for 65 out of the 85 (76%) cases (score 7-9)
- 9% of the cases did not require CT as first exam modality.



Physician	Mean	Std Dev	Min	Max	Median
Rad1_pre	4.21	1.71	1.00	7.00	4.50
Rad2_pre	5.59	1.11	2.00	7.00	6.00
ED1_pre	5.81	1.81	1.00	7.00	7.00
ED2_pre	5.19	2.21	1.00	7.00	6.50

Physician	Mean	Std Dev	Min	Max	Median
Rad1_Post	6.00	1.08	3.00	7.00	6.00
Rad2_Post	5.70	1.11	2.00	7.00	6.00
ED1_Post	6.56	0.69	4.00	7.00	7.00
ED2_Post	5.80	2.03	1.00	7.00	7.00

# The Area Covered

- According to ESR iGuide appropriateness criteria, in a high proportion of cases the addition of chest to the abdomen-pelvis protocol was unnecessary, thus increasing unnecessarily the area with radiation. Thus, another category of importance in future analysis is not only unnecessary studies but rather inadequate coverage of the scanned areas.



## Main Points

- Inappropriate testing was prevalent
- Experts agreement were increased after using the ESR iGuide
- The use of the ESR iGuide may contribute to informed decision-making
- The use of the ESR iGuide could increase uniformity among different expert physicians

# THANK YOU!



[MYESR.ORG/ESRiGUIDE](https://myesr.org/esriguide)

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