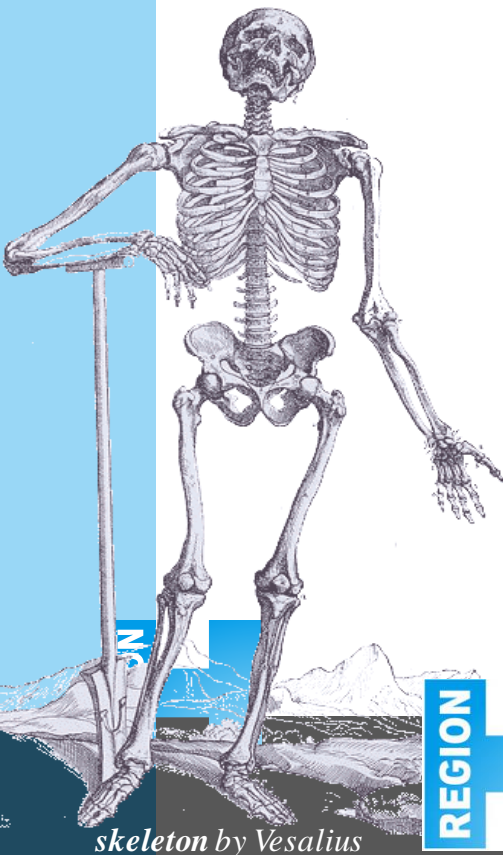


Muskuloskeletal radiologi

***Hvordan sikrer vi bedst den
muskuloskeletale radiologi i fremtiden?***

Mikael Boesen, MD, PhD
Professor

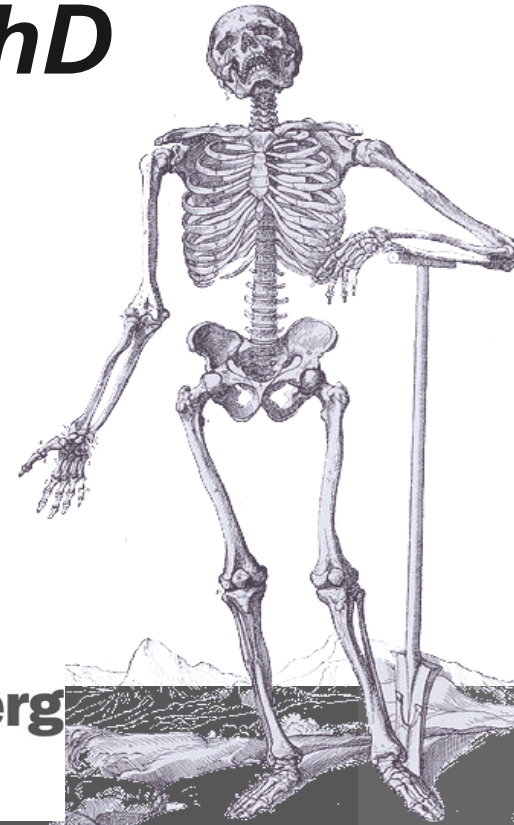
Røntgen afdelingen



**Bispebjerg
Hospital**



**Frederiksberg
Hospital**

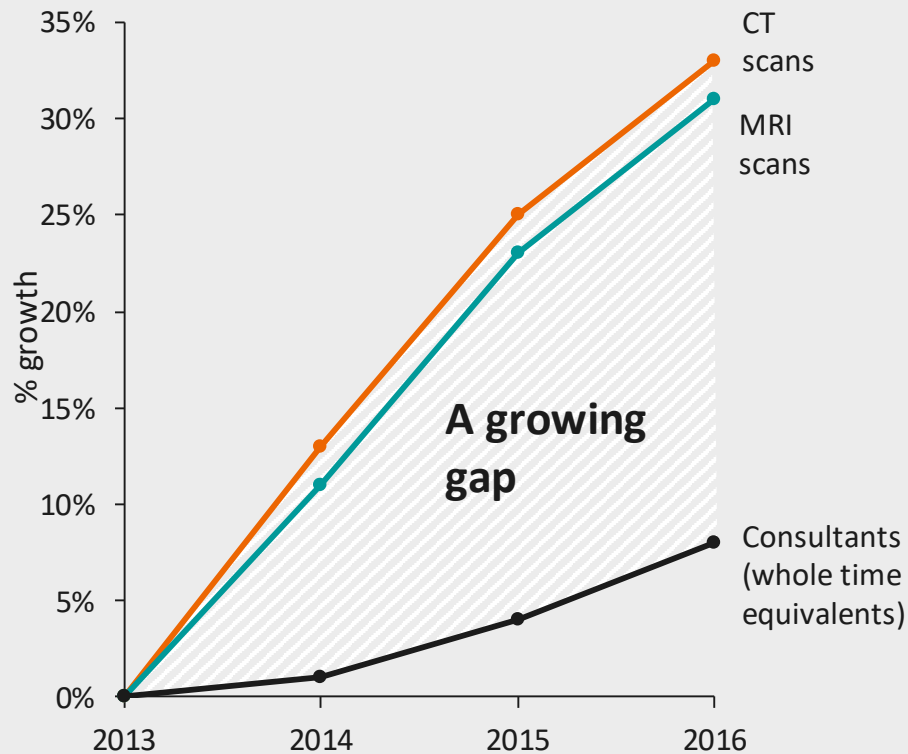


On average, a radiologist interprets one image every 3–4 seconds, 8 hours a day.



McDonald RJ, Schwartz KM, Eckel LJ, Diehn FE, Hunt CH, Bartholmai BJ, et al. (2018):
The effects of changes in utilization and technological advancements of cross-sectional
imaging on radiologist workload.

The workload of radiologists increases



Growth in the number of consultant radiologists and imaging examinations in England

The Royal College of Radiologists (2017): UK workforce census 2016 report.

More and more exams need to be evaluated.

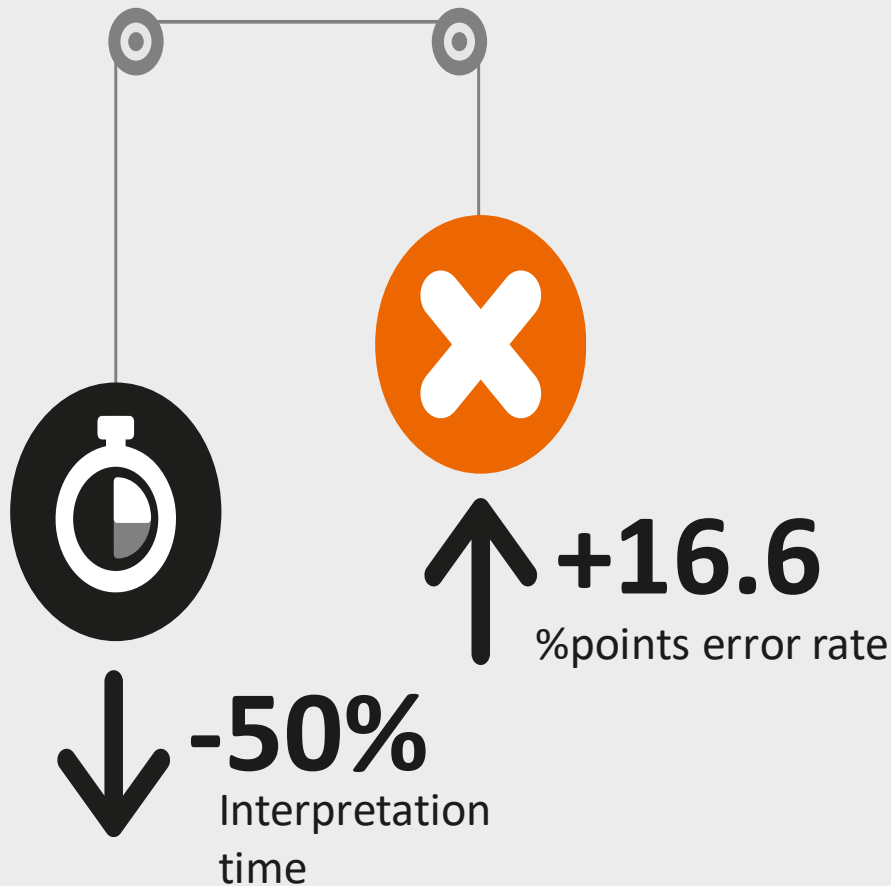
But who will do it?

In many countries, the number of CT and MRI exams explodes, but the number of experts does not grow proportionately. As a result, the workload per radiologist increases dramatically. 100 studies per day and 12+ hour workdays are not unusual.

Approximately 60% of all diagnostic examinations are MSK (including spine) at BFH hospitals

Around 2015 GPs in DK were allowed to send to MRI of spine shoulder and knee

Less interpretation time means higher error rates



With shorter turnaround time, the error rate rises.

The retrospective error rate among radiological exams is 30%.¹ Studies show that cognitive factors significantly contribute to diagnostic errors.²

Cutting in half the interpretation time of radiologists increases the interpretation error rate percentage by 16.6%.³

1) Berlin L (2007): Radiologic Errors and Malpractice: A Blurry Distinction.

2) Lee C, Nagy PG, Weaver SJ and Newman-Toker DE: Cognitive and System Factors Contributing to Diagnostic Errors in Radiology.

3) Berlin L: Faster Reporting Speed and Interpretation Errors: Conjecture, Evidence, and Malpractice Implications.

Musculo- skeletal diseases

```
graph TD; MS[Musculo-skeletal diseases] --- RA[RA]; MS --- OA[OA incl Degerative spine disease]; MS --- ISD[Inflammatory spine diseases]; MS --- SRD[Sports-related disease incl. Overuse injuries]; MS --- TD[Tendon diseases]; MS --- MD[Muscle diseases]; MS --- PA[Psoriatic arthritis]; MS --- CDD[Crystal deposition diseases]; MS --- MBD[Metabolic Bone diseases]; MS --- TD2[Traumatic diseases];
```

RA

OA incl
Degerative
spine disease

Inflammatory
spine
diseases

Sports-related
disease incl.
Overuse
injuries

Tendon
diseases

Muscle
diseases

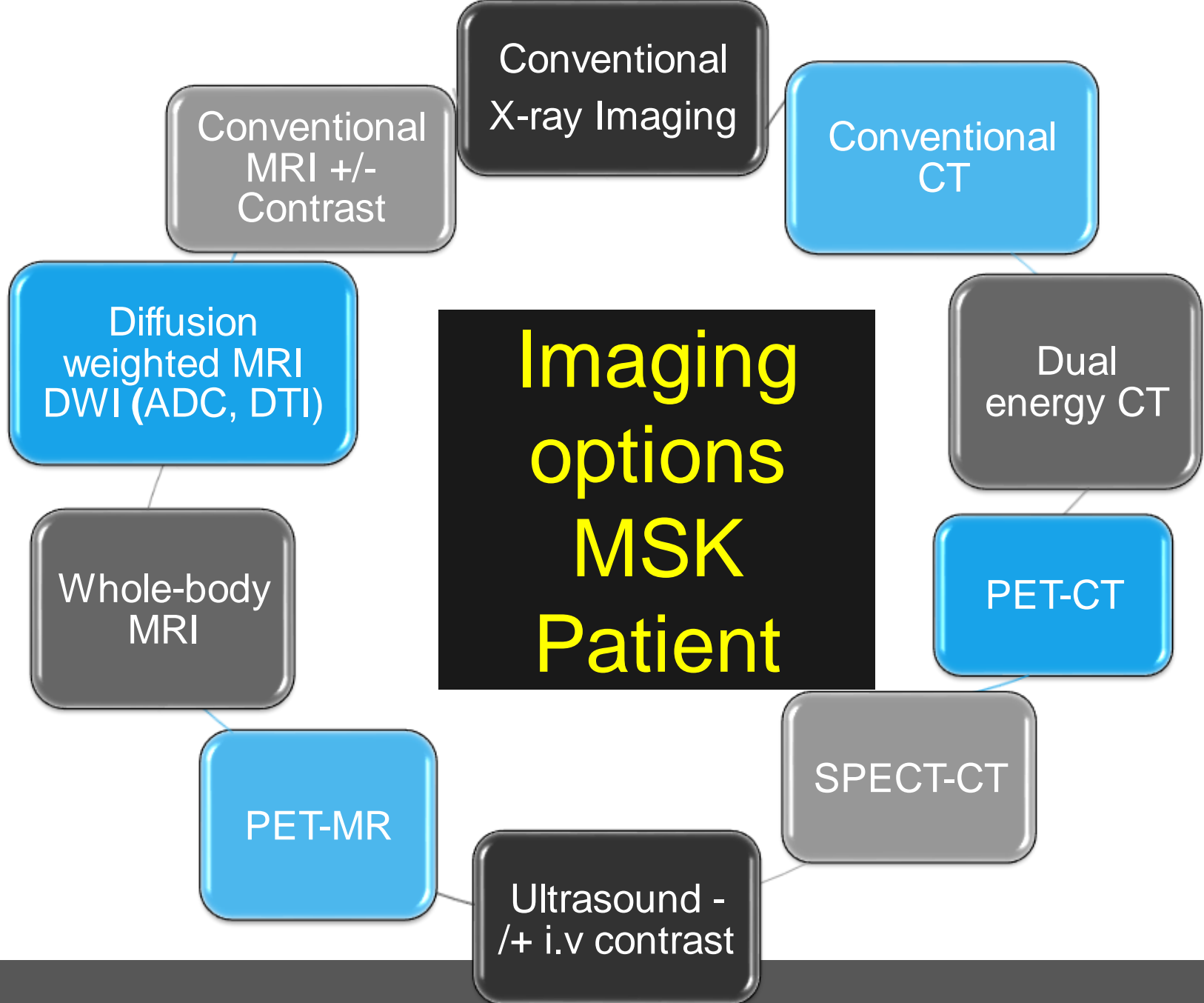
Psoriatic
arthritis

Crystal
deposition
diseases

Metabolic
Bone
diseases

Traumatic
diseases

Imaging options MSK Patient



Abnormalities found on scans in asymptomatic people



1,211 - age 20 - 70
Disk Bulging = 87%
Nakashima et al. (2015). Spine

Systematic review - 3,110
Disk Degeneration =
37% (20 y/o) to 96% (80 y/o)
Brinjikji et al. (2015) Am J Neuroradiol

51 men - age 40 - 70
Partial R.C Tear = 22%
Bursal thickening = 78%
Overall abnormalities = 96%
Girish et al. (2011). Am J Roent

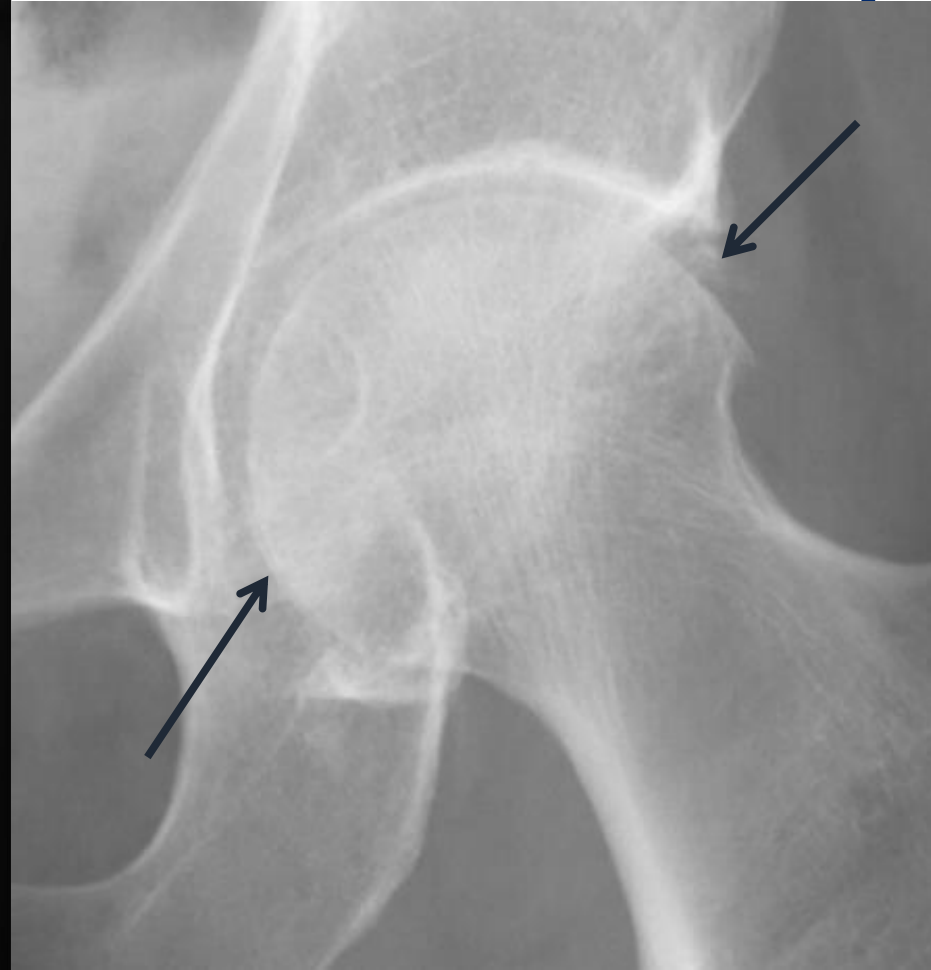
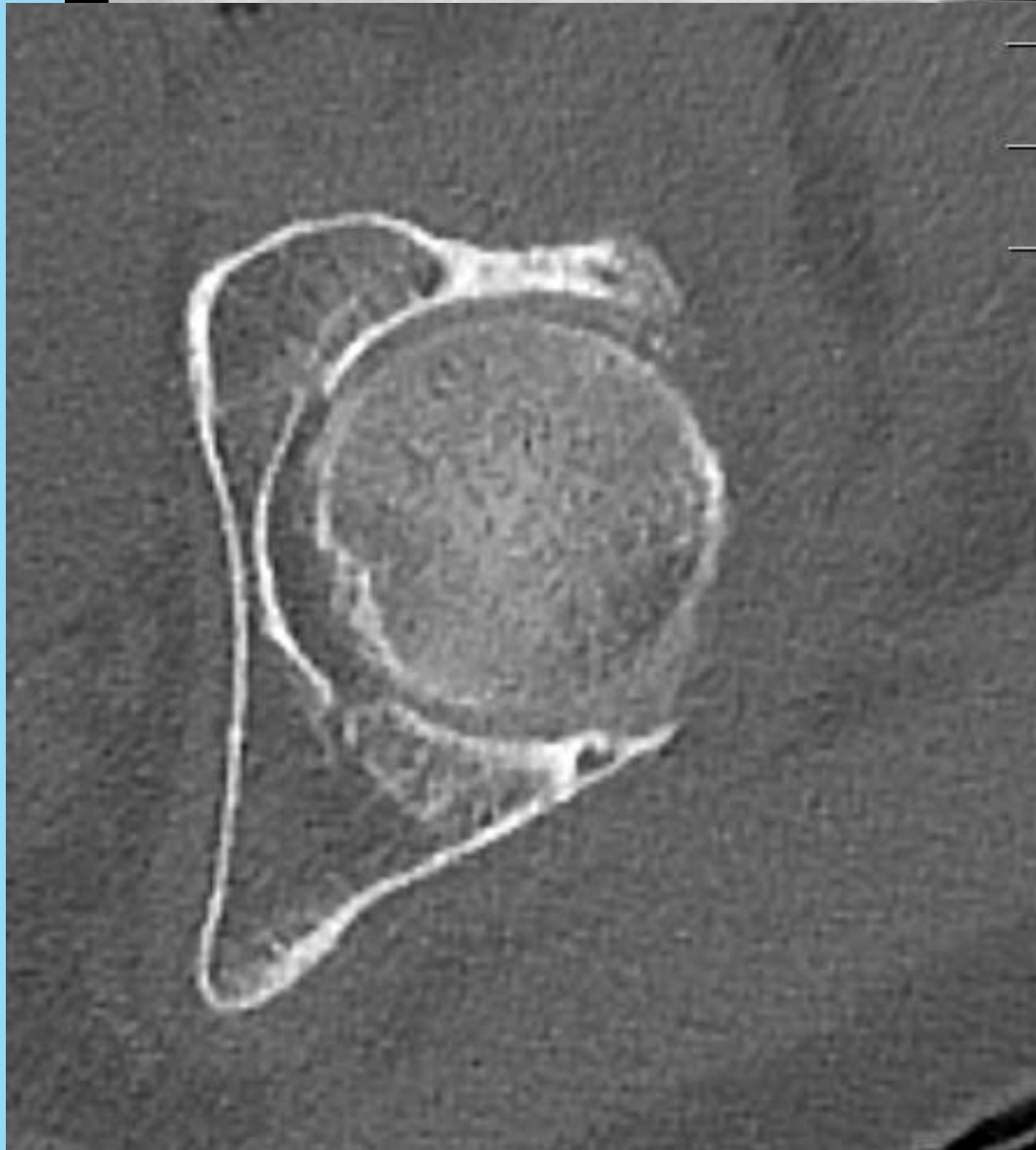
Systematic review 5,397 knees
(>40yrs / <40yrs)
OA = 19 - 43% / 4 - 14%
Cartilage Defect = 43% / 11%
Meniscal Tear = 19% / 4%
Culvenor et al. (2018). BJSM

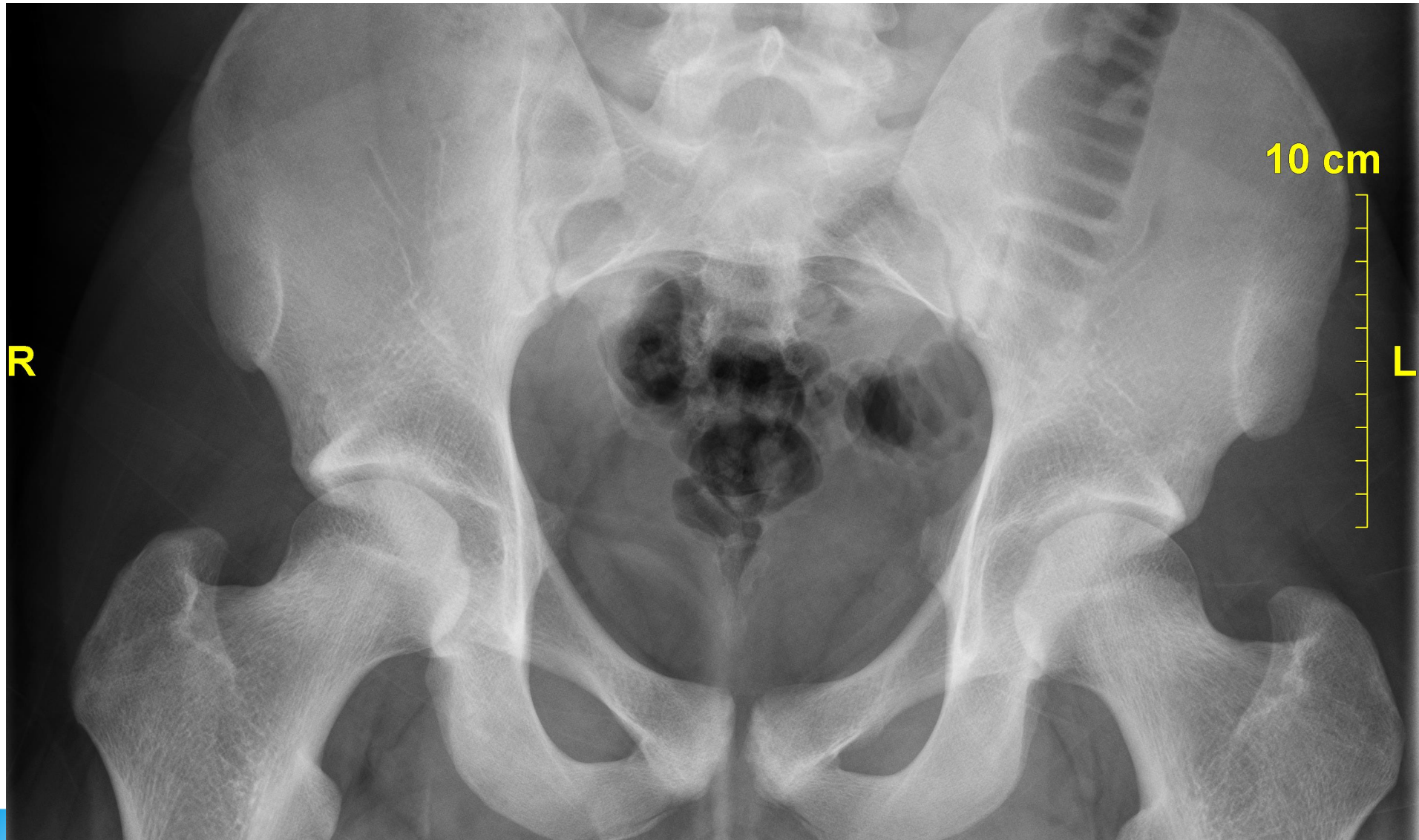
Systematic review - 2,114
asymptomatic hips
CAM Deformity = 37%
Pincer deformity = 67%
Labral Injury = 68%
Frank et al. (2015). Arthroscopy

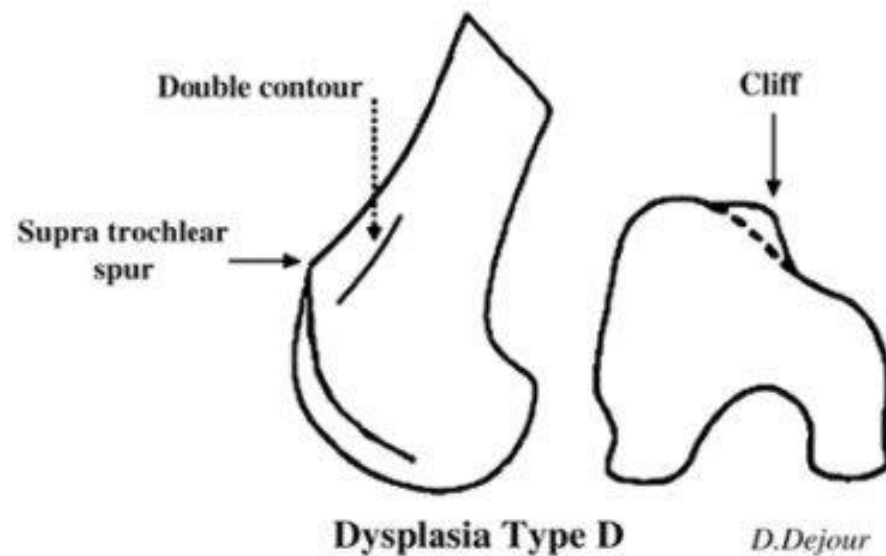
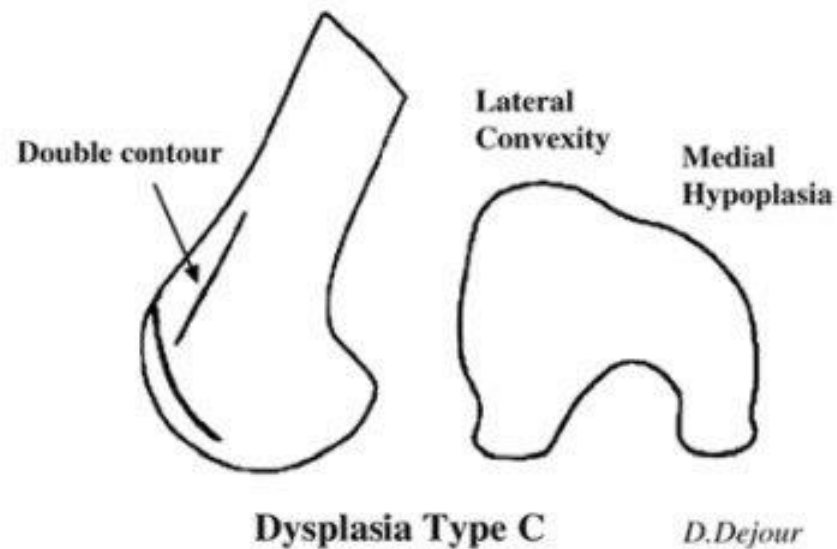
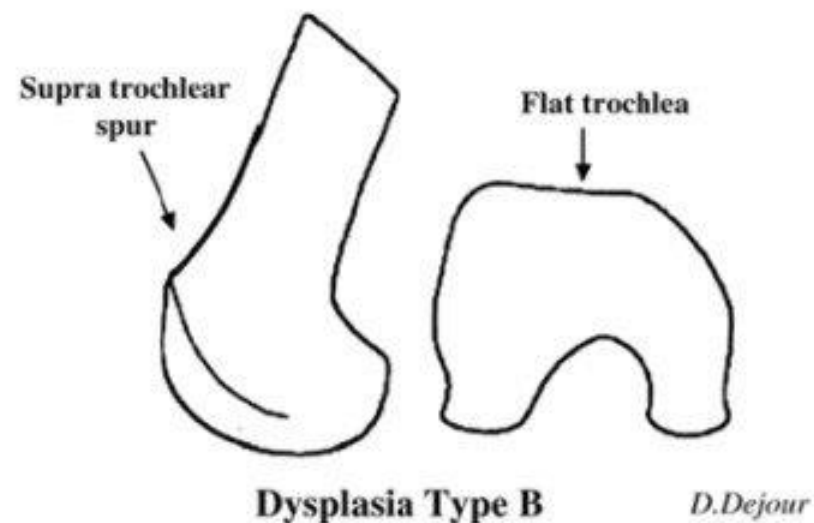
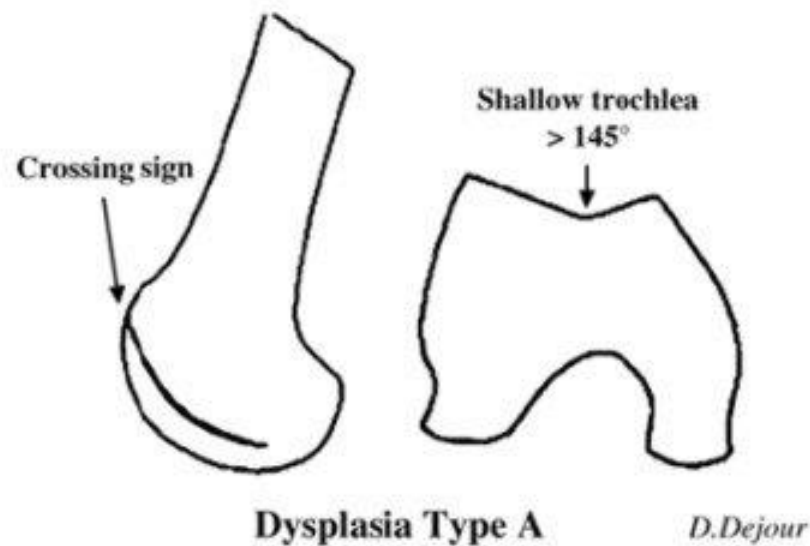
48 - mean age 47
Mortons Neuroma = 54%
Symeonidis et al. (2012). Foot Ankle Int

320 MRIs - Median age 51
ATFL pathology = 37%
O'Neil et al. (2017). Foot Ankle Ortho

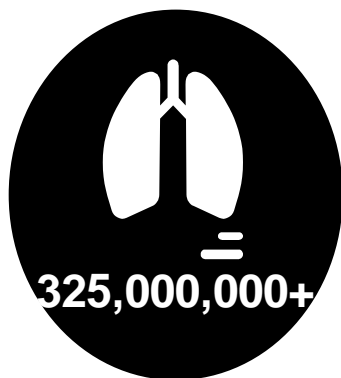




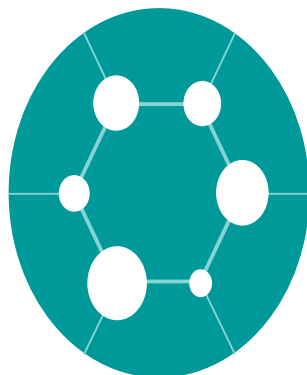




Can AI can help radiologists tackle these challenges?



- **Over 325 million images**, reports and clinical reports together with clinical collaborations
- **600,000** imaging, laboratory and point-of-care systems
- Touching **240,000** patients every hour
- Dedicated **Structured Reading team**



- **Regional supercomputing data centers**
- **AI competence center** with awarded data scientists
- Close clinical **collaborations**

EUROSTARS-2
Application Funding Result



Aim Higher

Mikael Boesen

Bispebjerg and Frederiksberg Hospital
Bispebjerg Bakke 23
Copenhagen 2400
DENMARK

Wednesday, January 16, 2019

Subject: E! 12835 X-AID is approved
Reference: 12835/20/32866/Ae

Dear Mikael Boesen,

Following our previous letter, E! 12835/20/Q, we are pleased to inform you that project application E! 12835 X-AID has been approved, and your organisation has been earmarked for funding.

Funding is allocated and paid according to the rules and procedures of the relevant National Funding

Viewpoint

ONLINE FIRST

FREE

January 7, 2019

Curbing Unnecessary and Wasted Diagnostic Imaging

Ohad Oren, MD¹; Electron Kebebew, MD²; John P. A. Ioannidis, MD, DSc^{3,4}[» Author Affiliations](#) | [Article Information](#)*JAMA*. Published online January 7, 2019. doi:10.1001/jama.2018.20295

Despite modest effects from initiatives such as the Choosing Wisely campaign, unnecessary diagnostic imaging remains a substantial problem in the United States. Significant between-country differences probably reflect largely wasted overuse. The United States occupies top usage ranks, with population rates of annual computed tomography (CT) scans (245 per 1000 people) and magnetic resonance imaging (MRI) scans (118 per 1000 people) that are 5 and 3 times higher than those of Finland, respectively. With aggressive testing, the yield of useful information increases only slightly. Further, some diagnostic tests generate the detection of mostly incidental findings (“incidentalomas”) with the frequency proportional to the excess of testing performed....!!!

January 7, 2019

Curbing Unnecessary and Wasted Diagnostic Imaging

One set of strategies may involve education of physicians most likely to order tests. Medical school, residency, and continuing medical education can sensitize physicians about diagnostic waste. Clinicians can be educated to routinely answer the following questions before ordering any radiographic test:

- **Is it necessary?**
- **What are the consequences of performing the test?**
- **What are the alternative options (and their associated benefits and risks)?**
- **What is the likely outcome with no further workup?**

CERTIFICERING

**Dansk Selskab for
Muskuloskeletal
Radiologi**

v. Christa Bluhme

CERTIFICERING

2015/16 :

- idé om at højne faglighed af faget og øge respekten for faget
- idé om systematisk efteruddannelse

CERTIFICERING

- Vi er her for patienternes skyld
- Dokumentation af kvalifikationer
- Fastholdelse og højnelse af vores faglighed
- Rekruttering
- Bredere konsensus om faglighed og kompetencer

CERTIFICATE

Kick-off arbejdsgruppe bestående af
Zoreh Rastiemadabadi (region H)
Inger Fog (region Syd, Sønderjylland)
Christa Bluhme (region Syd, Esbjerg)

- Nye speciallæger i radiologi
- Kvalificerende til specialeansvar
- Lægefagkyndig i klages

VISION

CERTIFICERING

- **Den europæiske model:**

- **Curriculum (Målbeskrivelse)**

- Viden
 - Færdigheder
 - Kompetencer

- **Certificeringsproces level III**

- ESSR medlemskab
 - Log
 - Kursusaktivitet, årsmøder, forskning mv.
 - Eksamen (mundtlig + skriftlig)

Level I : I-læge + 1. og 2. kursist-år

Level II : 3.+4. kursusår / speciallæge

Level III : Certificeret speciallæge

CERTIFICERING

Den danske model:

- HVORDAN opnår og måler vi det ?
 - Metodeafsøgning :
 - Log / portefølge ?
 - Case – database, evt. perifert afh. af kvalifikationer
 - Fokuserede ophold ? Dels MSK–rad dels klinisk afd.
 - CME
 - Subspecialiseringsstilling
 - Eksamination – mundtlig + skriftlig

Strukturering af og organisering for efteruddannelse

Hvordan kan kompetencerne (**Curriculum**) opnås – og valideres?

- Fellowships – er det en vej ?
- Tests ?
- RIS dokumentation ?
- Hvordan kvalitetssikrer vi efteruddannelsen af MSK radiologer?
- Inddragelse af hele landet
- De organisatoriske rammer skal sikres
- Vedligeholdelse af kompetencer
- Samarbejde med Videreuddannelsen og Sundhedsstyrelsen
- Økonomi



Det europæiske initiativ ESSR og EULAR:

News letter from Chairman of the ESSR arthritis subcommittee

Development of Consensus/ recommendation papers

-The papers we decided on in Amsterdam are now well on the way. We will give an update on the progress that has been made at the ECR meeting.

We will collaborate with the EULAR standing committee on msk imaging. Two ideas for collaboration have been proposed:

- 'Recommendation statement on communication between the rheumatologist and the radiologist'.
- 'Recommendation paper on interventional musculoskeletal procedures in arthritis'.



Det europæiske initiativ ESSR og EULAR:

Project grant application

Project proposal

Project title	Development of EULAR Protocols on Bidirectional Interaction between Rheumatology and Radiology Departments (i.e. Referral and Report Requirements) for RMDs in Clinical Practice
Project leader	Esperanza Naredo (Spain), Mikael Boesen (Denmark), Peter Mandl (Austria)

Recent project Involvements of the MSK group BFH:

- **Clinical academic group (CAG):**
 - Associate member "Physical Activity and Sports in Clinical Medicine – Disease Prevention, Treatment and Rehabilitation" 2017 (M. Kjær, F. Dela)
 - Board member ROAD - Artrose 2018 (A.Troelsen, S. Jacobsen)
- **Radiobotics A/S (OPI)** computer algorithms for automatic detection of MSK diseases on X-rays (X-AID - EURO-star application Sept 2018 , Rated number 1 af all projects in EU)
- **FTI Horizon 2020 application** board member:
Standardization of DCE-MRI in MSK diseases across platforms
- **JOINT venture between DIMS and ESSR** for organisation of the 2020 ESSR congress in Stockholm (Sports Medicine imaging)

Dept. of Radiology: MSK Imaging research group 2016-18



Mikael Boesen



Philip Hansen



JanusDamm Nybing



Bettina Thestrup

Senior
Staff
2018

Post Doc's



Monica Bayer
2016-17



Elisabeth Bandak
2018

Imaging Ph.D's



Ph.D defended 2018

Bjarke Hansen



Ph.D defended 2017

Robert GC Riis



Ph.D defended 2017

Signe R Madsen



Ph.D defended 2018

Stine Hangaard



Felix Müller



Cecilie L. Daugaard



Nikolaj Mølkjær
M.-Clausen



Anne-Sofie
Agergaard

Medical students
2018

Christopher

Cecilie

Signe

Ingrid

Regional research collaborations 2016-2018



Monica Talibi



Miki Hadzic



Urszula Ciochon



Zoreh Rasti



Jacob Grindsted



Engin Kurt



Mette L Harving

To be continued...☺

