

## Background

Positioning of Musculoskeletal (MSK) X-rays, may affect diagnostic accuracy and ultimately cause misdiagnosed or missed pathology (1). In emergency radiology, fractures are the most common type of overlooked injury with improper positioning being one of the key reasons. Other reasons for misdiagnosis may be insufficient views, imperfectly exposed X-rays or perceptual error (2). Regardless of the reason, misdiagnosis may result in delayed treatment and/or unfavorable outcome for the patient (3,4).

## Statements

- MSK radiography is a specialty within the field of radiography
- MSK radiography is **not** just "the push of a button"
- BUT**
- There is always room for improvement
- FACT**
- MSK courses dedicated to radiographers are few and far between

## Purpose

The overall purpose of this quality improvement initiative is to improve quality of MSK X-rays, consequently improving the diagnostic accuracy and ultimately benefiting the patients.

## Case 1 - Misdiagnosis



Is the distal radioulnar joint dislocated?  
**Perhaps!!**  
Is it a true lateral view?  
**NO!!**  
The forearm is pronated and the pisiform is positioned too dorsally



The patient was called in for retakes and a true lateral view was taken showing no abnormalities

## Note

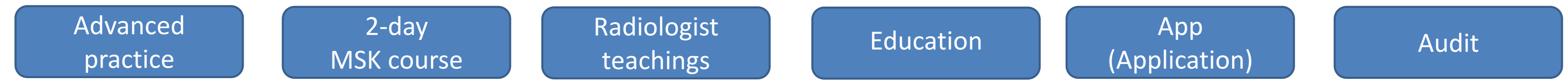
See images above – blue arrow.  
On a standard lateral view, the palmar cortex of the pisiform bone should overlie the central third of the interval between the palmar cortices of the distal scaphoid pole and the capitate head. (Department guidelines)

## Methods

Introduction of various quality improvement initiatives with a multi methodology and multidisciplinary approach focusing on continuous education of all MSK Radiologic Technologist

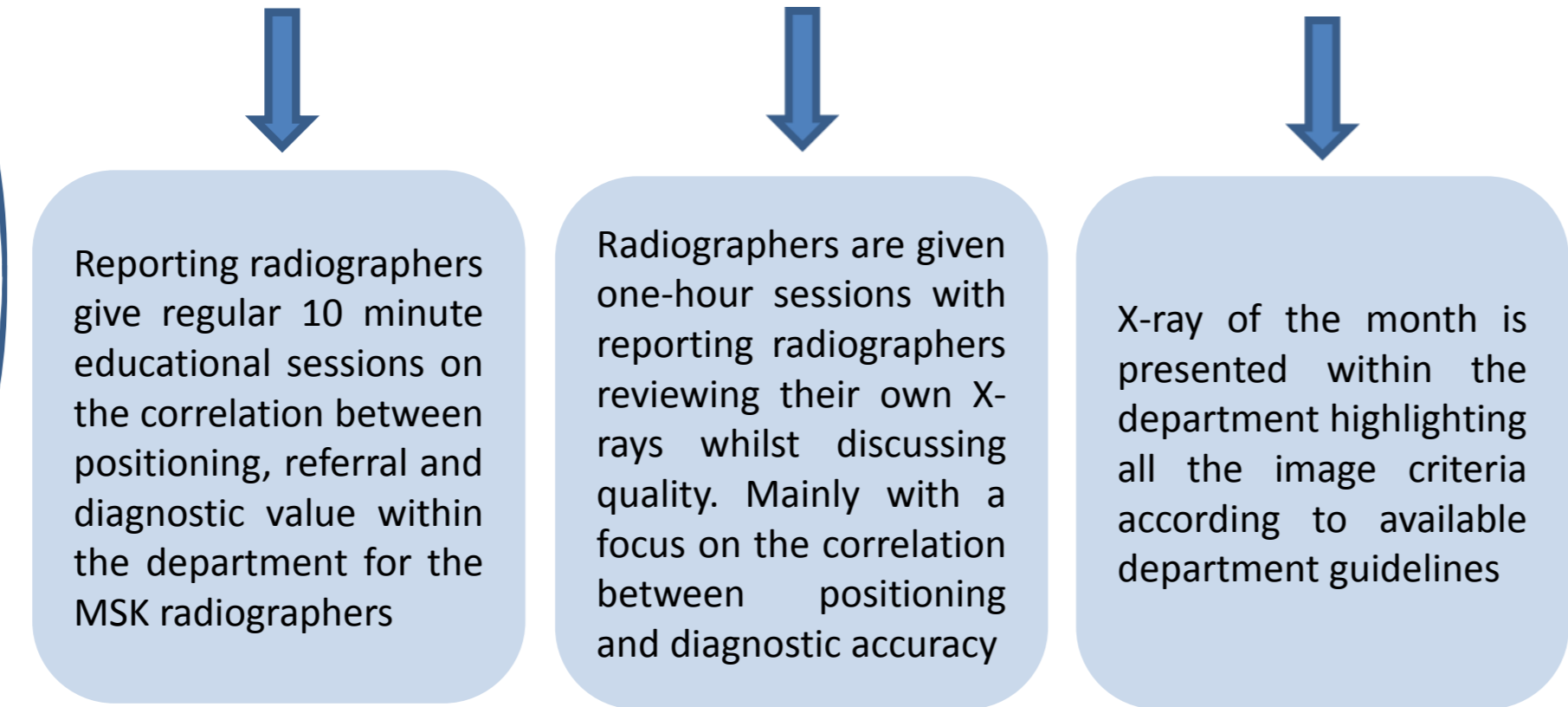
## Purpose

To introduce quality improvement initiatives ensuring that all Radiologic Technologist working with musculoskeletal X-rays are dedicated and specialized within their field



### Advanced practice

The extended role of radiographer reporting is combined with responsibilities for quality assurance and improvement. Reporting radiographers perform below mentioned quality initiatives regularly



### A 2-day intensive course on MSK radiography

- How to assess if positioning is correct according to guidelines
- How to correct positioning of MSK x-rays
- Anatomy & Pathology in relation to positioning
- Case-based show-and-tell
- What does the radiologist need from an X-ray
- What does the orthopedic surgeon need from an X-ray

## MSK Radiologist

An senior MSK radiologist give weekly case-based 20 minute sessions assessing yesterdays X-rays

- How is image quality?
  - Positioning
  - The referral
- What is good?
- What is less good?
- Pathology
- What could potentially be misdiagnosed/misread?
- How to correct positioning
- Anatomical landmarks

## Audit on positioning

Audits on positioning of MSK X-rays are performed regularly by 3 radiographers. The audits serve both an educational purpose by performing the audit and a quality assessment purpose when quantifying the results.

## App (IOS) - positioning atlas of MSK X-rays

A free app with department guidelines on positioning of musculoskeletal x-rays is developed to make it easily accessible; going from paper to interactive tool (in English and Danish)

<http://knoglebogen.dk>  
<https://lnkd.in/e3hvZfT>

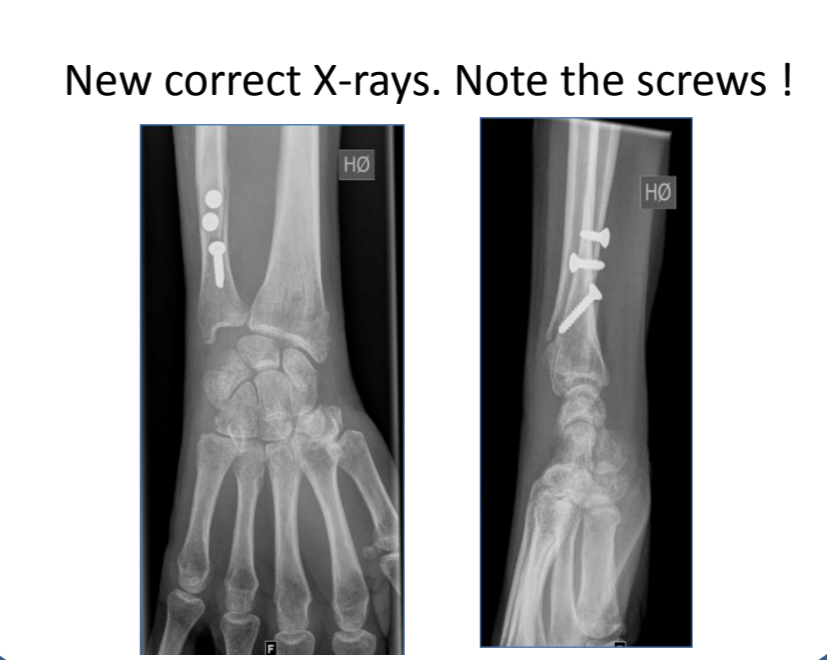
Indications positioning  
Anatomy  
Tube angulation  
Central ray  
Image criteria  
Notes  
Photos  
X-rays

## Case 2 - Positioning

Patient with increasing pain following surgery. X-rays are taken to assess positioning of screws.



Q: Is the lateral view an orthogonal view of the PA wrist?  
A: No. The distal ulna and screws are (almost) stationary.

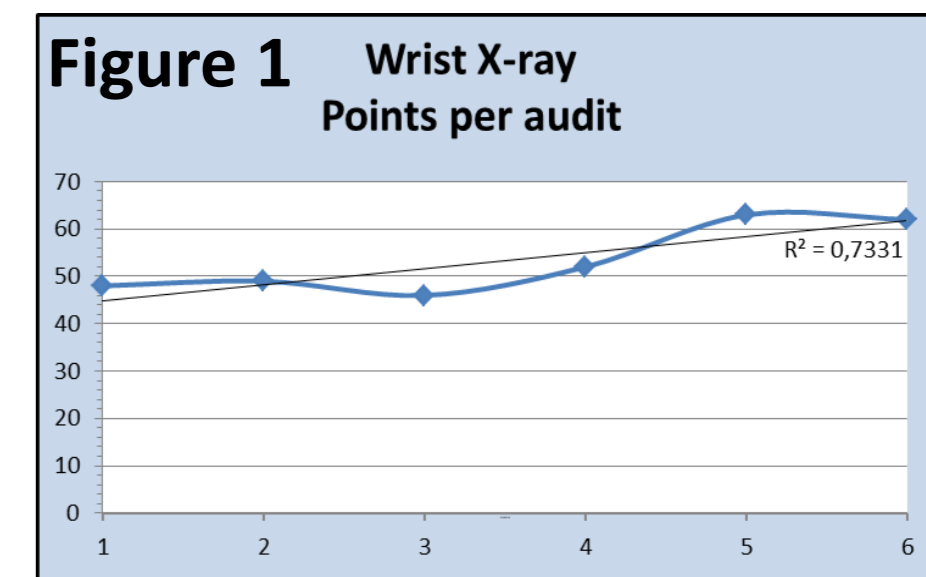


## Note

See both sets of images above.  
Isolated rotation at the wrist going from the PA position to the lateral makes the radius move around an almost stationary ulna. Resulting in a lateral view of the radius but not the ulna.

## Results

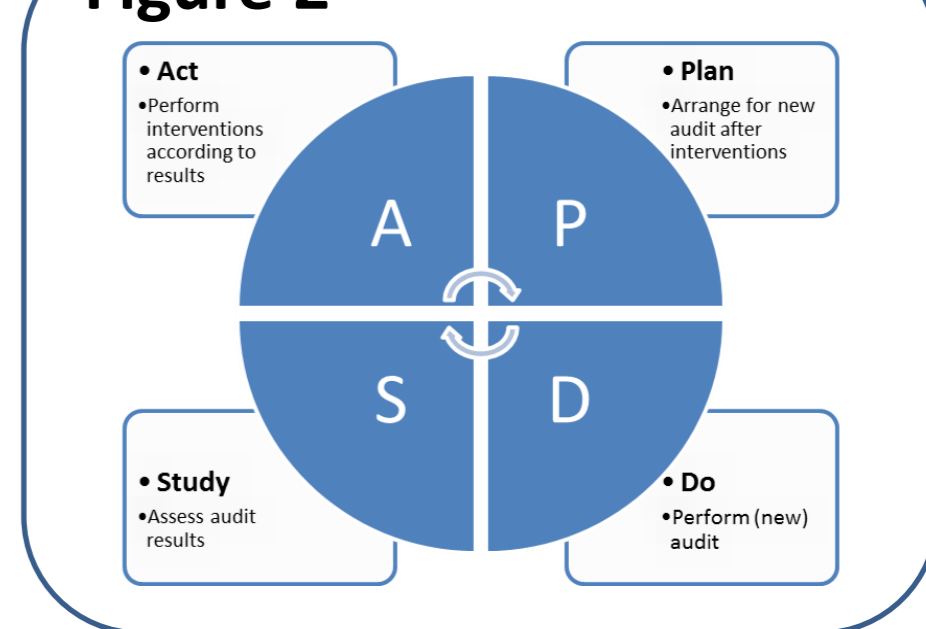
Continuous focus and education on positioning and quality of X-rays led to a marked improvement from baseline to 6th audit, (p=0.002), 47 points (baseline) to 62 points (6th audit), (Figure 1). 75 is maximum score. 15 images per audit with 5 possible points per image. The audit with quality indicators not only provides a quantitative measurement of quality but also identifies suboptimal areas which allows for a targeted systematic approach on quality improvement. This approach, using the plan-do-study-act model (Figure 2.), allows for immediate identification of areas in need of improvement, alteration of initiatives with focus on area in need of improvement followed by an assessment of the impact of the change in the very next audit.



## Audit questions

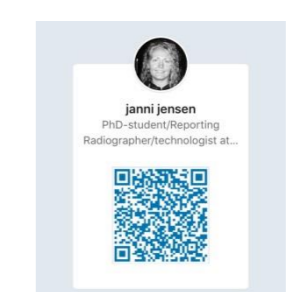
Audit questions are based on existing department guidelines on wrist X-rays. Including deviation of the wrist (radial/ulnar), supination/pronation of forearm (using the scaphopisocapitate alignment) and if wrist and elbow is at shoulder height. The guidelines are available throughout the audit process.

## Figure 2



## Conclusion

Continuous focus and education on positioning and quality of wrist x-rays showed a marked improvement from baseline to 6th audit, (p=0.002). Audits with quality indicators not only allows for quantitative measurements of quality but also identification of suboptimal areas allowing for a targeted systematic approach on quality improvement.



Janni Jensen, BS, MS  
Radiographer, Department of Radiology,  
Odense University Hospital, OUH, Denmark  
PhD student, University of Southern Denmark, SDU  
Mail: janni.jensen@rsyd.dk

References  
1. Tuncer S et al (2011)  
2. Ha AS et al (2014)  
3. Wei C-J et al (2006)  
4. Er E et al (2013)