CURRENT TRENDS IN MODALITY SELECTION FOR IMAGE-GUIDED MUSCULOSKELETAL PROCEDURES: FACTORS THAT INFLUENCE ULTRASOUND VERSUS NON-ULTRASOUND UTILIZATION

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DISCLOSURE OF COMMERCIAL INTEREST

None of the authors of this presentation nor any of their immediate family members have a financial relationship with a commercial organization that may have a direct or indirect interest in the content.
OBJECTIVE

- To describe current trends in clinical practice involving musculoskeletal interventions
- To determine factors that influence preference of imaging modality across United States musculoskeletal radiologists in regards to image-guided musculoskeletal interventions
Recently, there has been a paradigm shift across radiology which is predominantly focused on decreasing radiation dose throughout all imaging modalities.

This has resulted in an increased role of ultrasound (US) for both diagnostic and therapeutic musculoskeletal interventions.

Advantages of US include:
- Real-time imaging
- No use of iodinated contrast
- No ionizing radiation
Our survey attempted to describe current trends in modality selection in musculoskeletal interventions.

Variables to be studied included practice setting and years of experience as surrogates for differences in availability, workflow demands, familiarity and training.

- Practice settings were divided into private practice, academic (university) practice and hybrid.
- Years of experience were grouped based on assumed trends and observed subspecialty-training paradigm shifts.
Survey Planet online survey (surveyplanet.com) was developed

A link to survey questionnaire was electronically distributed to 1,380 active members of the Society of Skeletal Radiology (SSR)

Short 15-question survey asked respondents to identify:
- Years of practice:
  - 0-5, 6-10, 11-20, >21
- Clinical practice setting:
  - Private, academic or hybrid (academic/private)
- Fellowship training background:
  - Musculoskeletal, interventional, both or neither
- If the radiologist performs diagnostic and/or therapeutic injections, if so which modality do they have access to:
  - CT, fluoroscopy or ultrasound

Most commonly accessed joints (shoulder and hip) were isolated to compare approaches to these sites:
- Whether or not these site specific injections were performed?
- What was their preferred modality (CT, fluoroscopy and ultrasound) for the intervention and which modality was available at their clinical practice?
- How long did the procedure take excluding set-up and documentation
- Confidence in needle position: extremely confident, confident or not confident
**MATERIALS AND METHODS**

- Exclusion criteria:
  - Respondents who do not perform musculoskeletal interventions
  - Responses which did not indicate a preference in modality used during interventions

- Responses with CT as a preferred modality was combined with fluoroscopy for all analyses as this was considered a non-ultrasound technique utilized for musculoskeletal interventions

- The responses were analyzed with special attention to years of experience and practice setting as both independent variables in choice of imaging modality, as well as co-dependent variables utilizing Pearson’s chi-square and Fisher’s exact tests

- All analyses were conducted on Statistical Analysis System – SAS v9.4, Cary NC; using type 1 error set at 0.5
387 total responses received (28%):
- 190 academic practice (49%)
- 136 private practice (35%)
- 61 hybrid practice (16%)

Fellowship training – Musculoskeletal (MSK) vs. Interventional
- 341 MSK (88%)
- 41 neither (11%)
- 5 Interventional (1%)
Exclusions from the survey:
- 21 of 387 (5%) did not perform shoulder or hip
- 22 of 387 (6%) did not include a preference of imaging modality for MSK interventions

The final total of 344 responses were used for all data analyses.
RESULTS

- Ultrasound versus non-ultrasound modalities based on years of clinical practice

- Non-ultrasound modalities remains the overwhelming modality of choice for interventions

- No significant difference in use of ultrasound for joint injections across years of experience
  - Shoulder joint $p=0.56$
  - Hip joint $p=0.35$
Ultrasound versus non-ultrasound modalities based on years of practice setting

Non-ultrasound modalities remains the overwhelming modality of choice for interventions

No statistically significant difference for shoulder injections (p=0.23)

Hip injections demonstrate significant increase in ultrasound utilization in hybrid practice setting (p=0.03)
These responses were further analyzed using practice setting and years of experience as co-dependent factors.
No significant difference in frequency of ultrasound utilization across practice setting based on level of experience for shoulder injections

<table>
<thead>
<tr>
<th>Practice Setting</th>
<th>Years of Practice</th>
<th>Fluoroscopy and CT (%)</th>
<th>Ultrasound (%)</th>
<th>Total</th>
<th>Fisher Exact test p-value</th>
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No significant difference in frequency of ultrasound utilization across practice setting based on level of experience for hip injections

**TABLE 2: Tabulation of modality used by practice setting and clinical experience, hip injection only**

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“In a perfect world, all musculoskeletal injections that could be effectively done under ultrasound guidance would be done under sonography rather than fluoroscopy because of the lack of ionizing radiation. But the world we live in is not perfect.”

Additionally, the European Atomic Agency issued a directive that each medical exposure should “take into account the efficacy, benefits and risks of AVAILABLE alternative techniques having the same objective but involving no or less exposure to ionizing radiation”.

“Doing all cases under ultrasound is a nice idea in the world of utopia, but in reality this approach may lead to patients suffering on a waiting list.”

Oullete HA, Munk PL, Skeletal Radiology 2016; 45(12)1719
Our study is the first description of current practices in the clinical realm with respect to preference of imaging modality in MSK interventions.

This study attempted to determine the preference of non-ultrasound versus ultrasound imaging modality for the purposes of MSK interventions.

ALARA principles, technical advantages and increasing availability of US in clinical settings would favor an ever increasing utilization of US in MSK procedures.

We have shown that fluoroscopy remains the modality of choice in relation to shoulder and hip injections.

There is no significant difference in ultrasound utilization across practice settings or years of clinical experiences.
**DISCUSSION**

- Although our study was unable to establish statistically significant difference in the use of non-ultrasound versus ultrasound modality, there are some limitations to our study that are worth mentioning:

- **Low response rate – 387 of 1380 (28%)**
  - Do our results capture practice patterns reliably

- **Grouping of CT and fluoroscopy as “non-ultrasound”**
  - With limited sample size, unlikely to represent measureable error

- **Years of experience groupings may not reflect unique cohorts**

- Additionally, as the use of ultrasound in musculoskeletal clinical practice is a rather new concept, this study may have been conducted prematurely, without allowing clinical practice and preferences to yet evolve
DISCUSSION

- The observed discrepancy between recommendations and clinical practice highlights the opportunity for focus and emphasis on ultrasound guided interventions during residency and fellowship training.

- This renewed focus on training should also include those beyond their formal training years through meaningful hands-on workshops, CME courses and online resources.

- It is expected that a more robust musculoskeletal ultrasound curriculum during residency and fellowship training as well as training the more experienced radiologist will tip the scale towards the use of this modality in everyday clinical practice for the future.
CONCLUSION

- Our study demonstrated that fluoroscopy remains the modality of choice across clinical practices in relation to shoulder and hip joint injections.

- Low preference is given to ultrasound use across clinical practice and experience level despite proved efficacy and safety of ultrasound.


Ouellette HA, Munk PL. Reponse to letter to the editor. Skeletal Radiology 2016; 45(12)1719.


CGME program requirements for graduate medical education in diagnostic radiology. Available at: https://www.acgme.org/acgmeweb/Portals/0/PFAssets/ProgramRequirements/420_diagnostic_radiology_07012015.pdf
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THANK YOU!