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## Quality Improvement of X-Ray Imaging for Unspecified Chronic Knee pain and Suspected knee osteoarthritis in the Primary Care Setting

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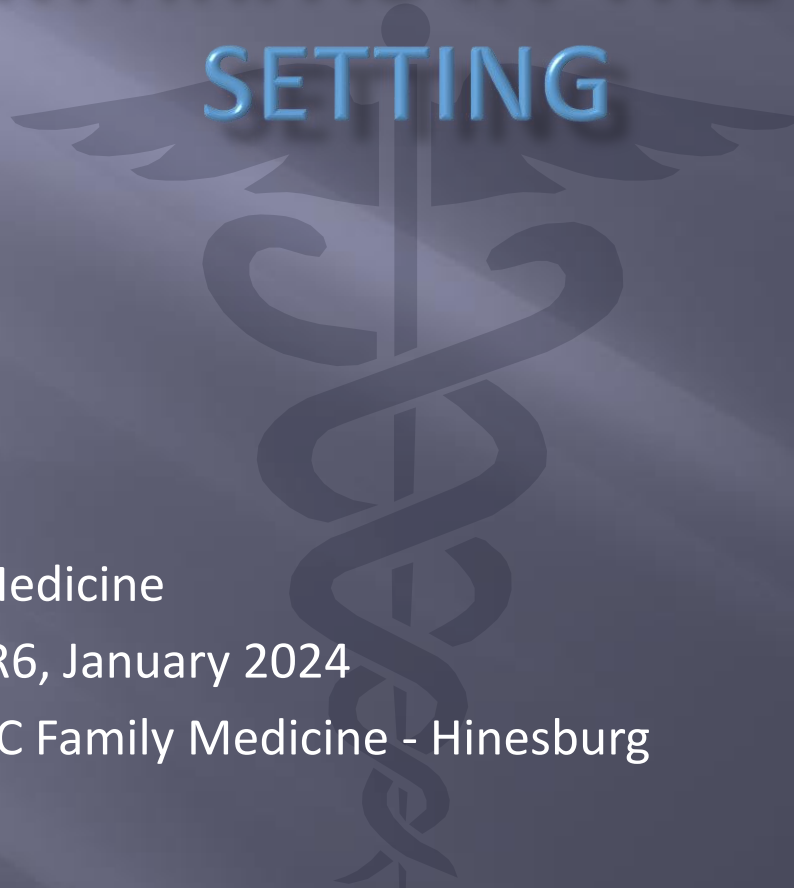
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# QUALITY IMPROVEMENT OF X-RAY IMAGING FOR UNSPECIFIED CHRONIC KNEE PAIN AND SUSPECTED KNEE OSTEOARTHRITIS IN THE PRIMARY CARE SETTING



Ty Bever, MS3, UVM Larner College of Medicine  
UVMHC Family Medicine – Hinesburg, R6, January 2024  
Mentor: Michelle Cangiano MD, UVMHC Family Medicine - Hinesburg



Knee Radiograph. Used under CC0 1.0

# Problem Identification

Knee pain affects approximately 25% of adults and has increased in prevalence by 65% over the past 20 years, accounting for nearly 4 million primary care visits annually.<sup>1</sup> Although a comprehensive history and physical exam are the mainstays of initial evaluation, plain X-rays are clinically indicated for chronic knee pain of greater than 6 weeks duration and acute traumatic pain in patients who meet specific evidence-based criteria, according to the American Academy of Family Physicians (AAFP).<sup>1</sup> However, there remains significant variation in what radiographic protocols are used in clinical practice, specifically in terms of what radiographic views are ordered and whether the imaging is performed with the patient weight-bearing (WB) or non-weight-bearing (NWB).<sup>2</sup> In fact, several studies have shown that non-weight-bearing knee radiographs are frequently ordered by general practitioners for chronic knee pain and suspected osteoarthritis, despite evidence that WB images are more sensitive and accurate in the assessment of joint space narrowing.<sup>2-6</sup> Therefore, evaluation of chronic knee pain with the use of NWB radiographs has the potential to delay diagnosis and management of early osteoarthritis (OA), lead to less accurate grading of the severity of OA and delay in specialist referral, and contribute to an increase in repeat imaging during specialist consultation.<sup>2-6</sup>

AHEC FOCUS AREA: Medical Practice Transformation

# Public Health Cost

- Direct medical cost of OA in the US is estimated at **\$72 billion**<sup>7</sup>
- Second most costly medical condition treated in US hospitals accounting for approx. 4.3% of all hospitalization costs<sup>7</sup>
- Recent study found that 40% of repeat radiographs at initial orthopedic consultation were due to prior radiographs being NWB<sup>4</sup>
  - Direct financial strain on patients requiring repeat radiographs has not been quantified but is an important consideration
  - 9-10% of the medical imaging annual national health expenditure is estimated to be “redundant” imaging = \$9 billion<sup>4</sup>
- Unfortunately, no current data are publicly available for UVMHC regarding repeat knee radiographs or potential delay in diagnosis of severe osteoarthritis





# Community Perspective

## ▣ Nathaniel Nelms MD (In-Person Interview)

- **Orthopedic Surgeon at UVMMC** Discussed the x-ray views that the UVMMC orthopedic department prefers which differ from the recommended views for chronic knee pain by the AAFP for primary care. Small tweaks that can be made to avoid x-ray studies that are not useful from the initial PCP workup include ensuring views are weight-bearing and that the contralateral knee is included in the view for reference/comparison.
- It was discussed with his Medical Assistant that non-weight-bearing x-rays are a common reason x-rays need to be repeated at the initial orthopedic consultation.
- Discussed that there would be a benefit in accurate and timely diagnosis of knee osteoarthritis by standardizing x-ray orders for UVMMC primary care.
- Reiterated that a knee MRI before proper plain film x-ray for chronic knee pain work-up is not indicated and poses an unnecessary cost to patients before orthopedic referral

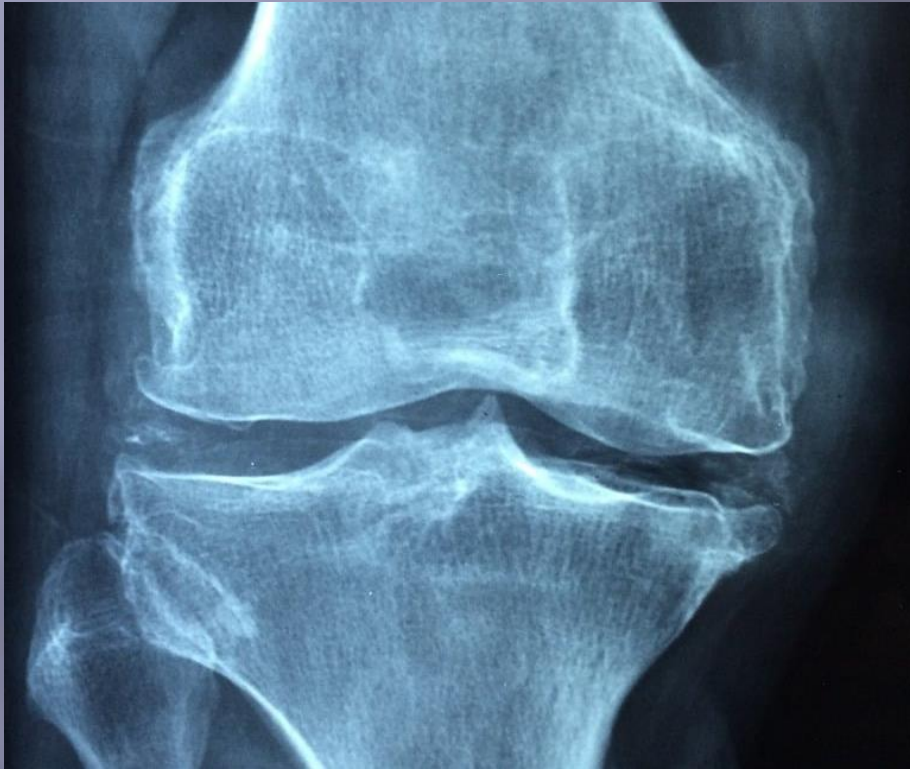
## ▣ Dori Fredette (Telephone Interview)

- **Radiology Technologist at UVVMC Family Medicine – Milton**
- Being the RT at the only UVMMC Primary Care facility with in-office access to X-Ray imaging allows for her unique perspective concerning this project.
- Dori is able to standardize the knee x-rays that are taken in Milton and she agrees that standardizing x-ray orders from other PCP offices without an on-site RT, is crucial.
  - Avoids inadequate views and the use of NWB radiography, also limits unnecessary radiation and costs for patients
- Dori also had several ideas for future projects focusing on quality improvement in this area at UVMMC, present in the future considerations portion of this presentation.

## ▣ Kathryn Grenoble MD (In-Person Interview)

- **Family Medicine Physician at UVVMC Family Medicine – Hinesburg**
- Quote: “As one of the most frequent chief complaints in primary care, a standardized radiologic workup/order set for knee pain would reduce delays in accurate diagnosis and facilitate expedient recommended treatment.”

# Intervention



Knee Osteoarthritis Radiograph. Used under CC0 1.0

- ▣ Utilized EPIC, to create a specialized x-ray order for providers at UVMHC FM-Hinesburg specifically for knee pain.
  - Order Consists of: \*Includes order for right or left knee, and bilateral option\*
    - ▣ 3 standardized views recommended by the AAFP with WB designation
      - Standing AP, Including contralateral knee for comparison, Weight-Bearing
      - Lateral, Weight-Bearing
      - Merchant, including contralateral knee for comparison
  - UVMHC FM – Hinesburg providers can add order to their preference list
    - ▣ Ensures evidence-based radiographic work-up of knee pain
- ▣ Handout explaining current evidence for WB Radiographs
  - Distributed to providers at UVMHC FM – Hinesburg
    - ▣ Includes directions for adding specialized x-ray order to preference list

# Results

- ▣ Community and provider support for this project has highlighted the importance of quality improvement and provider education regarding evidence-based radiologic imaging for knee pain in primary care.
  - Project intervention distributed to 5 Family Medicine Physicians and 2 Nurse Practitioners at UVMHC Family Medicine – Hinesburg
  - Informational page for reasoning behind this intervention reported to be clear and appropriate
  - Directions for obtaining specialized Xray orders that were provided were easy to follow and successful
- ▣ Continued interest in further quality improvement action regarding MSK imaging for PCPs is well established and this project intervention has potential to be distributed to more UVMHC Primary Care facilities.

# Proposed Evaluation of Effectiveness

- ▣ Utilization of simple surveys to evaluate UVMHC primary care provider's understanding of the evidence for and the effective use of the established order sets
- ▣ Imaging surveillance and data collection from UVMHC EPIC for evidence of decreased non-weight-bearing knee imaging ordered for chronic knee pain
- ▣ EPIC chart review to evaluate for a decrease in the number of radiologic imaging orders per patient before establishing a diagnosis of moderate-severe knee osteoarthritis



# Recommendations for Future Interventions

- ▣ Collaboration with EPIC IT support at UVMMC to ensure standardized radiologic orders are available to all UVMMC primary care providers
- ▣ Dissemination of evidence-based MSK education and appropriate order sets for the workup of other common orthopedic complaints that present to primary care
- ▣ Further collaboration between the orthopedic, primary care, and radiology departments to evaluate need/efficacy for further standardization of MSK imaging between departments
- ▣ Evaluate the potential cost-benefit of adopting PowerShare capabilities to share diagnostic imaging in real time between different states and facilities in the region, thereby avoiding unnecessary repeat imaging due to issues with accessing prior imaging

# References

1. Bunt CW, Jonas CE, Chang JG. Knee Pain in Adults and Adolescents: The Initial Evaluation. *Am Fam Physician*. 2018;98(9):576-585. ▣ 1.
2. Levin ES, Mandell JC, Smith SE. Do non-weight-bearing knee radiographs for chronic knee pain result in increased follow-up imaging? *Skeletal Radiol*. 2021;50(3):515-519. doi:[10.1007/s00256-020-03585-8](https://doi.org/10.1007/s00256-020-03585-8)
3. Spence SC, McAlister W, Reed B, et al. A Multispecialty Collaboration to Reduce Unnecessary Imaging for Knee Osteoarthritis. *J Am Coll Radiol*. 2016;13(11):1343-1346. doi:[10.1016/j.jacr.2016.05.002](https://doi.org/10.1016/j.jacr.2016.05.002)
4. Yayac M, Toci GR, Smith EB, Star AM, Parvizi J, Saxena A. The Frequency, Reasoning, and Impact of Repeated Radiographs at the Initial Orthopedic Arthroplasty Visit. *J Arthroplasty*. 2021;36(11):3641-3645. doi:[10.1016/j.arth.2021.07.007](https://doi.org/10.1016/j.arth.2021.07.007)
5. Chen A, Balogun-Lynch J, Aggarwal K, Dick E, Gupte CM. Should all elective knee radiographs requested by general practitioners be performed weight-bearing? *Springerplus*. 2014;3:707. doi:[10.1186/2193-1801-3-707](https://doi.org/10.1186/2193-1801-3-707)
6. Vespe JS, Hope D, Vizurraga DE, Joyce M. Joint Space Narrowing in the Osteoarthritic Knee. *JBJS Journal of Orthopaedics for Physician Assistants*. 2023;11(2):e22.00029. doi:[10.2106/JBJS.JOPA.22.00029](https://doi.org/10.2106/JBJS.JOPA.22.00029)
7. Leifer VP, Katz JN, Losina E. The burden of OA-health services and economics. *Osteoarthritis and Cartilage*. 2022;30(1):10-16. doi:[10.1016/j.joca.2021.05.007](https://doi.org/10.1016/j.joca.2021.05.007)

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