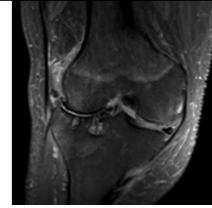


HARRISHEALTH SYSTEM



Leading Quality Improvement via Interinstitutional and Interdepartmental Collaboration in the Management of Knee Osteoarthritis: From X-ray to Arthroplasty



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Background:

HARRISHEALTH SYSTEM



Harris Health System is:

- A large county healthcare system
- Has approximately 1.9 million patient visits per year
- Shared by two different (and sometimes competing) medical schools

Each major department within the health system is divided in two, with its own medical directors and faculty, according to the medical school that staffs it.

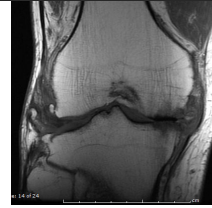
4 of those divided departments were involved in this project.

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The Problem (according to Radiology)

This project was started by radiology, as daily read outs showed a large numbers of patients getting MRIs for their **advanced arthritic knees**.



This practice:

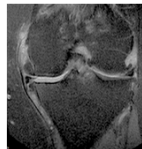
- Has an ACR appropriateness of 1 (lowest appropriateness rating)
- Involved over a quarter (27.0%) of the knee MRIs performed
- Resulted in ~485 inappropriate exams /year
- Was the equivalent of running **all six** Harris Health MR magnets simultaneously for 1.75 weeks per year, performing entirely unnecessary knee MR studies
- All this, while the wait time for an outpatient MR was ~ 3 weeks
- While direct cost is always difficult to calculate, at CMS rate of payment on knee MR, this was equivalent to \$125,528/year, wasted
- In an attempt to determine the reason for the inappropriate MRs, we engaged with our ordering primary care physicians (PCPs)



Radiology



Primary Care



Radiology



Primary Care



The Problem (according to Primary Care)

ORTHOPAEDICS:

- Rejection rate for orthopaedics referral for adult chronic knee pain/OA/DJD was 55%, resulting in frustration from the referring PCPs

- A prior version prior, actually

- High rejection of MR Knee or

**So we decided to expand
our discussions outside
of primary care**

n corrected 1-2 years

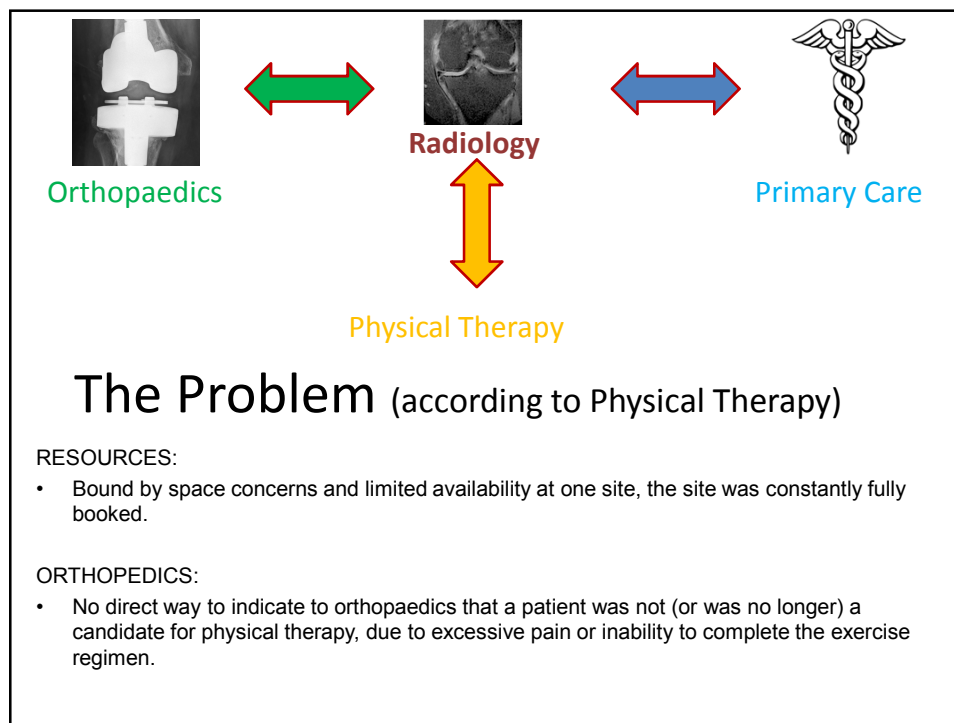
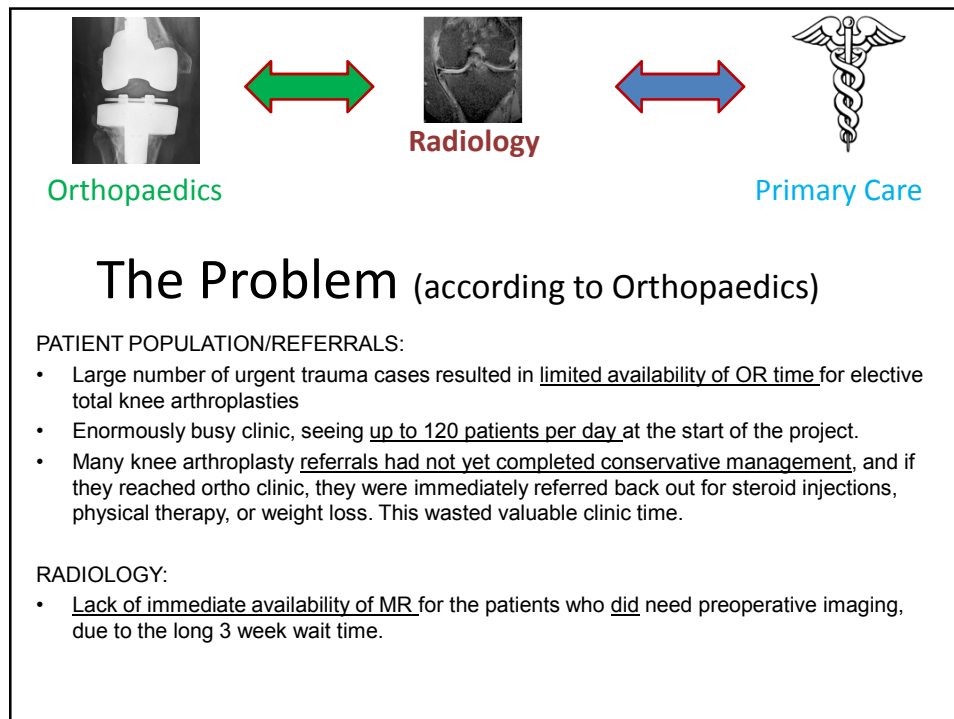
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RADIOLOGY:

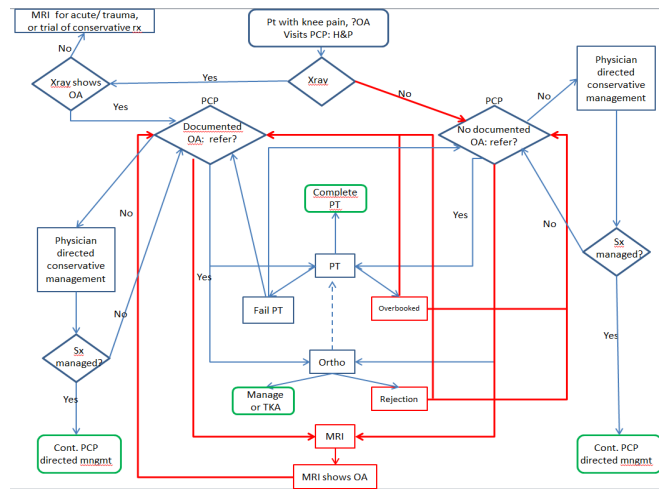
- Complete lack of guidance by radiology on which patients had severe OA and which didn't, with report Impressions such as this: "Degenerative changes. No acute abnormality."

PHYSICAL THERAPY:

- Limited availability at one of the physical therapy sites (which patients living in that area preferred), resulting in frustration with PT referrals.



Analysis and Intervention

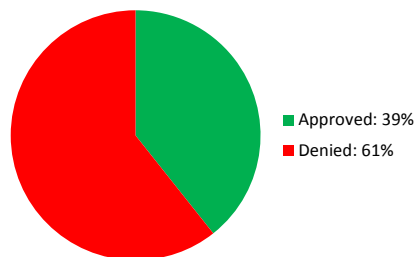


The current process map shows a complex and wasteful workflow, with the patient returning to the PCP multiple times, both after the MRI (if ordered), but also if the orthopaedics referral was rejected, or if physical therapy could not fit them in.

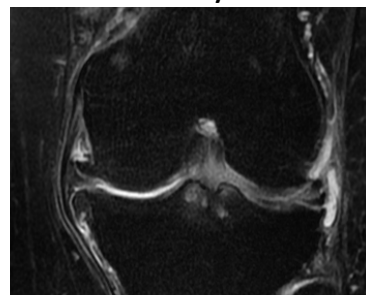
At least 38% of knee OA patients referred to orthopaedics had already had an MRI.

Patients who had had a knee MRI were actually more likely to have their referral denied than approved.

Why?



Knee OA pts referred to ortho, who already had MR



This 72 year old woman with full thickness chondromalacia and areas of sclerosis in the medial compartment was referred to orthopaedics...for the medial meniscal tear.

The medial meniscal tear was secondary in this case, but it was Impression point #1 on the MR. Using the MR result as the reason for referral meant that this referral was denied. The real issue was OA, and it should have been managed as such.

INTERVENTION: Radiology

How can radiology provide better guidance on whether or not a patient's knee osteoarthritis is already moderate to severe, therefore not even needing MR?



An x-ray like this would have the following report:

"Degenerative changes. No acute abnormality."

This provides *no guidance* to the clinician as to the degree of osteoarthritis, and an MRI might be ordered because the patient is in significant pain.

ACR appropriateness criteria state that no MRI is needed if joint space narrowing, osteophytes, subchondral cysts etc are already present.

How can we issue an *evidence-based*, standardized report that let's the clinician know when the arthritis is already moderate or severe?

The project *cannot work without it*

INTERVENTION: Radiology

How can radiology provide better guidance on whether or not a patient's knee osteoarthritis is already moderate to severe, therefore not even needing MR?



Kellgren-Lawrence scale:

Grade 1, Minimal: Doubtful or minimal osteophyte formation, joint spaces preserved
Grade 2, Mild: Definite osteophyte formation, joint spaces preserved
Grade 3, Moderate: Definite osteophytes with definite joint space narrowing (<3mm medial compartment is a rough guide if you're unsure)
Grade 4, Severe: Definite osteophytes with severe joint space narrowing, subchondral sclerosis and/or remodeling

1. Adopt the Kellgren-Lawrence classification system

EXAM: XR BILATERAL KNEE 2 VIEWS

DATE: <<ORDER TIME>>

INDICATION: <<Order Reason for Study>>

COMPARISON: [None available]

TECHNIQUE: Weight-bearing AP and lateral views of the bilateral knees

DISCUSSION: No acute fracture or malalignment is identified.

Right knee: [Describe joint spaces: narrowed or preserved?]. [Describe osteophytes: none, minimal, definite]. There is no knee joint effusion. No soft tissue abnormality is identified.

Left knee: [Describe joint spaces: narrowed or preserved?]. [Describe osteophytes: none, minimal, definite]. There is no knee joint effusion. No soft tissue abnormality is identified.

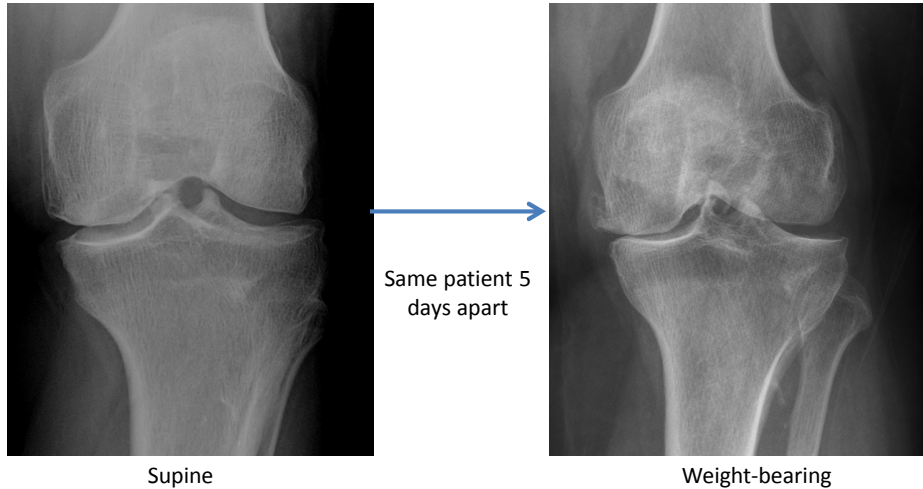
IMPRESSION:

1. Kellgren-Lawrence grade [3, moderate] osteoarthritis of the right knee [medial] compartment.
2. Kellgren-Lawrence grade [3, moderate] osteoarthritis of the left knee [medial] compartment.

2. Standardized reports were adopted by both radiology departments, to clearly describe the level of osteoarthritis according to accepted criteria.

INTERVENTION: Radiology

Promote the use **weight-bearing knee X-rays** to allow for an accurate Kellgren-Lawrence classification



INTERVENTION: Radiology

Intervention: Purchase stools for clinics that currently lacked capability for performing weight-bearing views (so that the chest bucky could be used to perform them).

Purpose: Exchange an expensive test (MRI) for a cheap test (weight-bearing x-ray) whenever possible.

Primary Care Clinics Within the System	Weight-bearing capable?
Acres	Yes
Aldine	Yes (on stool)
BT hospital	Yes
Baytown	Yes (on stool) * 9/9/15
Casa	Yes
El Franco	Yes (on stool)
Gulfgate	Yes
LBJ hospital	Yes
MLK	Yes (on stool)
NW	Yes (on stool) *9/12/15
Settegast	Yes
Strawberry	Yes (on stool) *9/9/15
Thomas St	Yes
QM	Yes (on stool)
Vallbona	Yes
Cypress, Geriatric, Homeless and Squatty: no x-ray	

CMS payment at the time of intervention(technical and professional) for:

- Knee MR w/o contrast: \$258.82
- Knee X-ray, 3 View: \$38.46

INTERVENTION: Orthopaedics

How can we make the orthopaedic referral guidelines for knee OA clearer?

- Review the evidence and guidelines of the major societies (see references)
- Created a new, evidence-based referral guideline
- Both medical school orthopaedic departments agreed on the new guidelines (below)

Weight bearing radiographs show **moderate or severe knee OA (Kellgren-Lawrence grade 3 or 4)**:
No MRI is needed.

Prior to referral, document that pt has undergone AT LEAST 12 WEEKS of attempted conservative management (or document contraindication if one or more is contraindicated):

1. Physical therapy and/or physician directed self management program, strengthening and physical activity
2. Weight loss (for BMI >25)*
3. Pharmacologics: NSAIDS (oral or topical) preferred, or tramadol
4. External supports: knee brace, cane, walker etc.
5. Intra-articular steroid injections (can be performed in clinic, by radiology or by PM&R)

ALSO, for total knee arthroplasty candidates:

1. BMI: <35
2. HgA1c <7.5

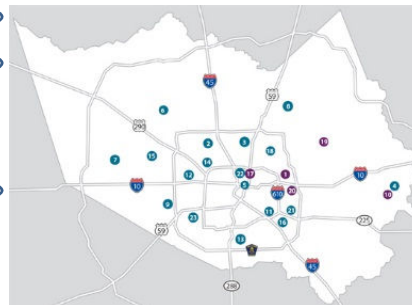
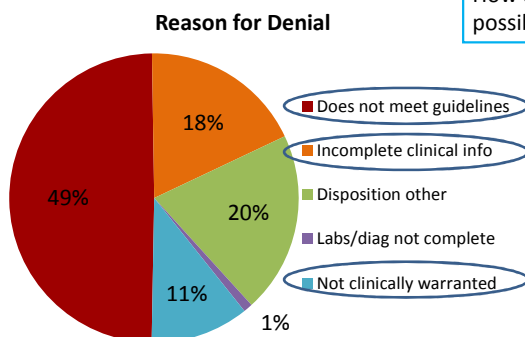
Smoking cessation encouraged but not mandatory.

*BMI of <25 is not required, but conservative management guidelines support attempted weight loss in this group

INTERVENTION: Primary Care

Reasons for orthopaedic referral denial mostly centered around incomplete documentation of the medical necessity for referral.

How do you educate as many people as possible on what the guidelines are?



Visit all the clinics with a presentation on the conservative management guidelines for knee arthritis, and reinforce that MRI is not necessary (September – November 2014).

INTERVENTION: **Physical Therapy**

How can physical therapy improve availability for knee arthritis patients at the center with limited availability?

- Added a dedicated option for referral for knee OA
- Instituted group sessions for knee OA patients at the site with limited availability (up to 4 patients, performing the same exercises)
- Created a home exercise program for those unable/unwilling to travel to PT
- Added an additional site at a remote clinic (2 days/week), in an area from which patients were having trouble traveling for PT

INTERVENTIONS: **What was going on outside this project**

- A new hire and opening of new OR suites increased orthopaedics availability to perform total knee arthroplasty, decreasing wait times
- Physical therapy and orthopaedics sat down and agreed upon how patients could be referred to physical therapy if an orthopaedics referral for arthroplasty was placed before PT had been completed. PT would then indicate to orthopaedics when physical therapy was completed or failed.

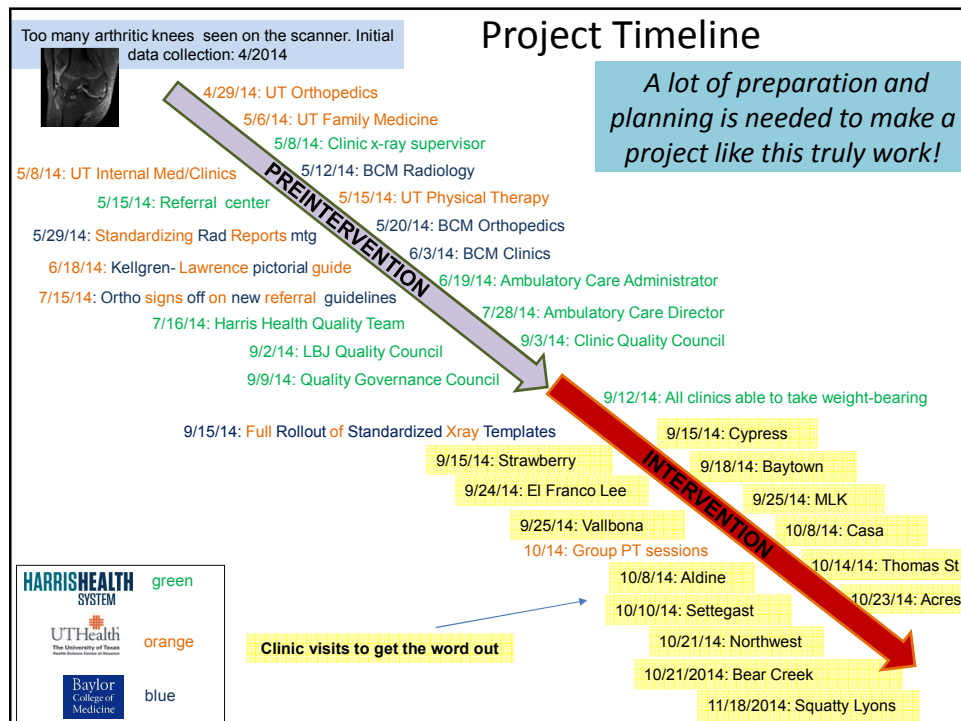


Major Intervention Summary

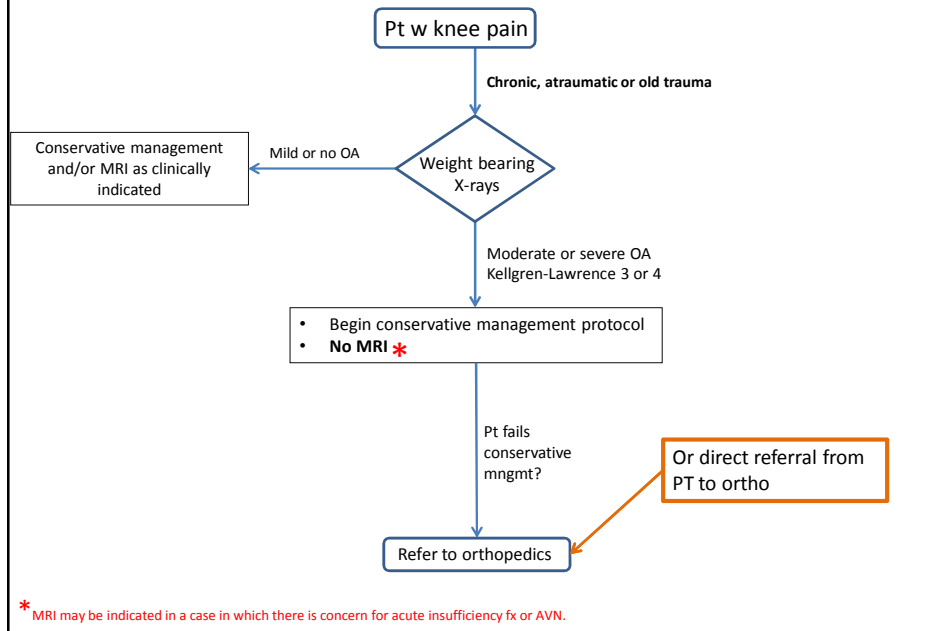
- New orthopedics guidelines were agreed upon and updated with the referral center
- Radiology reports all began using the standardized format and Kellgren-Lawrence classification system
- All clinics capable of weight-bearing xrays
- New knee OA category for PT
- Rollout of group knee OA sessions by PT
- Educational presentations in the clinics Sept-Nov 2014. Additional follow up on-site educational presentations were given by orthopedic surgery

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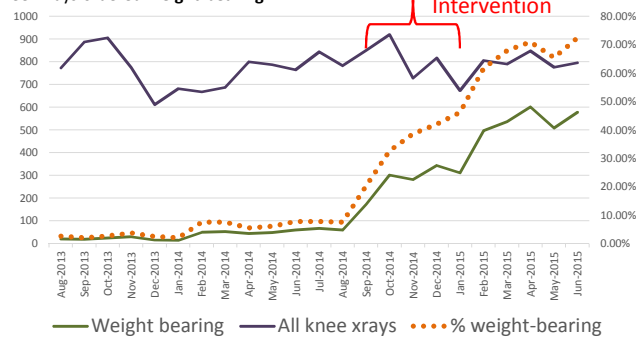


Overview of the proposed new workflow for chronic knee pain patients:



Results: Primary Care ↔ Radiology

Number of knee x-rays ordered **weight-bearing**

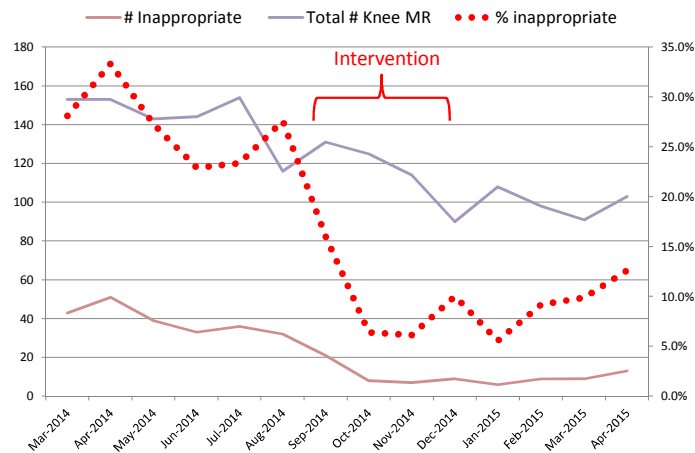


- An average of 781 knee x-rays/month are performed in the outpatient clinics
- Percentage of knee x-rays ordered **weight-bearing** increased from **5.02% to 69.22%**
- This means an accurate Kellgren-Lawrence score can be given on the chronic pain patients (with trauma patients still performed supine)
- Total number of x-rays taken is similar over time, therefore weight-bearing views are replacing the previous supine views, without adding additional imaging.

Results: Primary Care ↔ Radiology

Number of inappropriate knee MRs decreased from **27.0% → 8.5%** (~71% decrease)

Average total number of knee MRs therefore also decreased: **149.4 → 104.1/month**



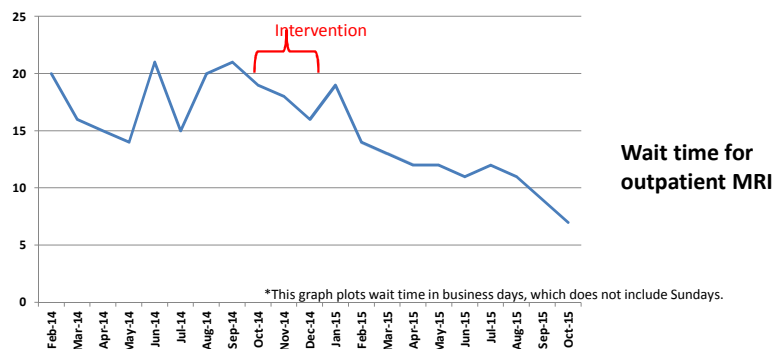
Results: Primary Care ↔ Radiology

Therefore, on average, with 45.3 fewer MRs per month =

~1.1 outpatient scan days were saved on the MR scanners/month

~\$11,725/month in CMS equivalent dollars saved

These (& other) interventions have decreased outpatient MR wait time to ~7 days

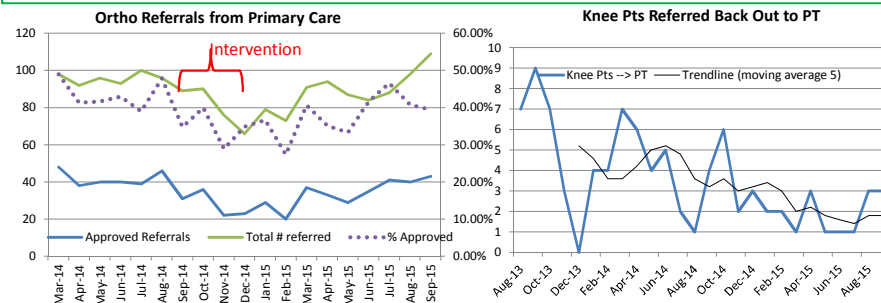


Results: Primary Care ↔ Ortho

As expected, the number of knee referrals for OA/DJD/chronic knee pain >55 decreased (at least temporarily) following the intervention, as the guideline stated that patients should be sent to physical therapy instead (for at least 12 weeks). Number of referrals subsequently returned to baseline after the 12 week period.

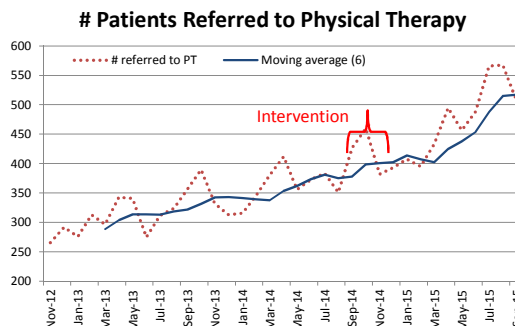
Number of patients referred back out to Physical Therapy from Orthopaedics Clinic has been declining

(Number of total knee arthroplasties per month also increased during this time, from 5-10/month to 3-4/week, based on an additional hire and additional OR time for orthopaedics)



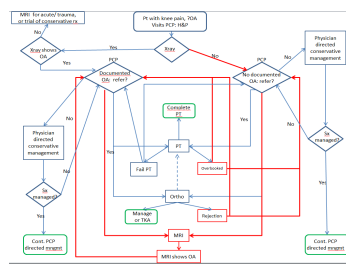
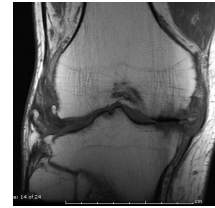
Results: Primary Care ↔ PT

- ~ 471 patients/month referred for knee pain post intervention, compared with 376/month in the 6 months prior to intervention. PT has a general upwards trend that increased more rapidly after the intervention.
- Direct referral to PT (when orthopaedics referral criteria not met) is active
- Additional site for PT added October 2014
- Wait time at the site previously fully booked is down to 23 days



DISCUSSION

When a high rate of unnecessary MRIs was initially investigated by radiology, our focus was on the very narrow window between the MR being ordered and the MR being performed. “Fix the fact that the MR was ordered at all, and you fix the problem.”



It soon became clear that the problem was much larger than that. The MRs were only a small part of a complex (and often convoluted) pathway that our knee OA patients were following, involving Primary Care, Physical Therapy, Orthopaedics, and the Referral Center. We couldn't just tell our physicians to stop ordering MRs on patients sitting in front of them with knee pain, because at that point they didn't have a clear management pathway to offer the patient as an alternative.

By collaborating with everyone on the pathway, we were not only able to reduce unnecessary MRIs by approximately 71%, save ~\$140,700/year at CMS rate, and save time on our magnets, but we were also able to increase adherence to the evidence based guidelines throughout the process.

A Few Things to Keep in Mind...

- Radiologists are not only an effective and integral part of interdisciplinary quality improvement teams, but they can also successfully lead the quality improvement effort.
- Regardless of the traditional culture of the organization, multidisciplinary collaboration can work. In a complex health system, sometimes with strained resources, the two academic institutions have not traditionally worked together to this degree to lead quality improvement efforts. The synergy of this project far exceeded what any of these individual institutions or departments could have accomplished alone.
- Standardized radiology reports and impressions, when matched with clinical treatment algorithms, can effectively drive efforts to decrease unnecessary and expensive clinical variance throughout a healthcare system.
- Careful planning prior to intervention is important. All parties had important information and ideas to contribute to the projects' success, so the earlier everyone gets involved, the better!
- This project has already fostered increased communication between these departments, and can serve as a framework for future projects. It is eminently reproducible in other settings.

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Questions?

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