Optimal Stewardship of Magnetic Resonance Imaging in the Treatment and Diagnosis of Musculoskeletal Injuries

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INTRODUCTION:

There is a lack of research on value-based healthcare as it pertains to medical imaging. Many studies around value-based healthcare focus on only a single joint or specific soft tissue injury. This study presents an isolated cost savings analysis with MRI cost data provided by a large private practice radiology group located in a major metropolitan city. The purpose of this study is to help providers make value- and evidence-based clinical decisions regarding musculoskeletal imaging.

METHODS:

A cost savings estimation was performed with orthopaedic MRI cost data from a 2019 MRI report of 47,867 patients. Individual percentage reductions were multiplied by the annual cost to find cost savings in studies. These data points were calculated in a range between 5-50% as the bounds for the analysis by applying the Program Evaluation Review Technique around activity time estimates, to derive a weighted average.

RESULTS:

We found that musculoskeletal MRIs cost between $24 million and $39 million annually. The pessimistic-case scenario is a 5% reduction in MRI attributing to $1.2 million without contrast compared with the optimistic-case scenario of a 50% reduction of MRIs with and without contrast for a proposed savings of $19.9 million annually. The most likely case is a 20% reduction in MRIs attributing to $6.4 million in annual savings. These calculations result in an overall projected savings of $7.8 million with a standard deviation of $3.1 million.

DISCUSSION AND CONCLUSION:

As the transition towards value-based healthcare progresses, physicians must understand the implications behind ordering an MRI. First, the financial burden associated with an MRI should be elucidated, as done here. Second, it should be understood that MRI findings may confound treatment plans. Third, if a patient is symptomatic but their injury does not warrant surgical intervention, non-operative management should be pursued. MRI should be considered after failed PT with subsequent orthopaedic surgery consultation or referral. Advanced medical imaging is a critical area in which value-based healthcare principles can be implemented. Although more and more hospitals and healthcare organizations are transitioning away from traditional fee-for-service payment models, physicians are required to make clinical decisions in the best interest of the cost-burden on their patients. Being cognizant of the literature on unnecessary MRIs, treatment recommendations, and cost savings may help physicians deliver value-based healthcare and contribute to a sustainable healthcare system that works for all stakeholders, but most importantly, for patients.

Figure 1. Beta Distribution of a Range Estimate for Predicting Uncertainty
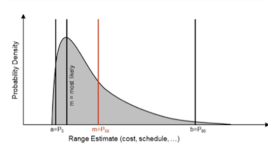
Table 3. Cost Savings Based on Three-Point Estimate

Study Type	Worst Case	Average Case	Best Case	Estimated Savings	Standard Deviation
Total Spine	$774,994	$4,084,565	$12,672,886	$4,964,357	$1,982,982
Shoulder	$162,938	$797,213	$2,356,684	$951,413	$365,624
Hip	$63,231	$313,394	$934,665	$375.25	$145,239
Knee	$211,681	$1,203,883	$3,902,608	$1,488,303	$615,154
Total	$1,212,843	$6,399,055	$19,866,842	$7,779,317	$3,109,000

Table 2. Cost Savings Estimates Based on Percentage Reduction

Study Type	Percentage Reduction in MRIs	Minimum Potential Cost Savings	Maximum Potential Cost Savings
Total Spine	5%	$774,994	$1,267,289
	20%	$3,099,976	$5,069,154
	30%	$4,649,963	$7,603,731
	40%	$6,199,951	$10,138,308
	50%	$7,749,939	$12,672,886
Shoulder	5%	$162,938	$235,668
	20%	$651,753	$942,674
	30%	$977,629	$1,414,010
	40%	$1,303,506	$1,885,347
	50%	$1,629,382	$2,356,684
Hip	5%	$63,231	$168,240
	20%	$252,922	$373,866
	30%	$379,383	$560,799
	40%	$505,844	$747,732
	50%	$632,306	$934,665
Knee	5%	$211,681	$390,261
	20%	$846,723	$1,561,043
	30%	$1,270,084	$2,341,565
	40%	$1,693,446	$3,122,086
	50%	$2,116,807	$3,902,608