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## IS PRESCRIPTION OF KNEE MRI ACCORDING TO STANDARD CLINICAL GUIDELINE?

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### ABSTRACT

**Introduction:** Knee pain is one of the most common complaints that caused patients visit their physician. Among all medical imaging technologies; using Magnetic Resonance Imaging (MRI) is significant. The aim of this study was to determine the appropriateness of knee MRI prescription in Sabzevar Vasei hospital in 2014.

**Materials and methods:** This study is descriptive and analytic, while the statistical population included 115 patients referred to MRI Unit in Sabzevar Vasei hospital, while they were selected randomly. A questionnaire was used for data collection and to determine the appropriateness of prescription; a local clinical guideline was used as well. Data analysis was done by using SPSS16, descriptive statistics, Spearman test, Pearson chi-square and Fisher exact tests.

**Results:** Among 115 prescribed knee MRI patients, 52 prescriptions (45.2%) were inappropriate, 2 prescriptions (1.7%) were uncertain and 61 prescriptions (53%) were considered appropriate. The financial burden arising from inappropriate prescriptions was 39204000 Rials. Besides, there is a significant difference between the appropriate prescriptions and patients' gender, occupation, education, the specialty of a prescriber physician as well as referral institution ( $P < 0.05$ ).

**Conclusion:** Considering the high rate of inappropriate prescriptions, it is essential to find some reasons and to do continuous monitoring. The use of local clinical guidelines can improve the quality of the health system and avoid additional costs.

**Key words:** appropriateness, MRI, knee, hospital.

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### Introduction

Various medical imaging methods are conducted by using waves or special radiations. MRI is one of these methods which have the following features<sup>(1)</sup>. MRI is a medical imaging technology while its first version was introduced in 1978 to the clinical arena and it has continually accelerated its evolution. In 1991, the first MRI machine was imported to Iran, and since then this technology has been very rapidly distributed in Iran<sup>(2)</sup>. MRI is non-invasive and accurate when it is compared with other paraclinical diagnosis<sup>(3-5)</sup>. No iodinated contrast medium is used in MRI and no recovery time is

needed<sup>(6)</sup>. On the other hand, it has some limitations such as being expensive, time-consuming, lack of access for all patients, as well as long waiting time for MRI turn<sup>(7)</sup>. Among the body joints, knee joints are the most involved one, and we usually can witness the most common complications such as perforation and stretching of ligaments, meniscal lesions, cartilage lesions in patients' joints<sup>(8, 9)</sup>. Despite of high prevalence of knee joint injuries, but its diagnosis is still challenging and it is a difficult mystery in medical science diagnosis.

Health systems have faced with significant and rapid changes in response to change in population needs and cost raises<sup>(10-12)</sup>.

Studies show that a large part of provided health care is inappropriate or unnecessary which is about 15% to 30% in many countries and 40% in some private clinics<sup>(13, 14)</sup>. Quality and access to health care is not associated with high costs in the health care system<sup>(15)</sup>. Medical imaging costs have increased all around the world that may be due to their overuses. In fact, among all medical imaging technologies, using magnetic resonance imaging (MRI) is considerable and it has been following an increasing trend<sup>(8,16-22)</sup>. In a study conducted by Lehnert and Bree, 74% of administrated CT and MRIs were reported as appropriate and 26% as inappropriate, while the inappropriate examples including; knee, back and shoulder MRIs<sup>(23)</sup>. Ebrahimipour et.al assessed the clinical appropriateness of knee MRI prescribed in Mashhad and they found that 54.8% of them were inappropriate, 14.8% were uncertain and 30.4% were appropriate. Meanwhile, the calculated economic costs of inappropriate prescriptions were 38159100 Rials<sup>(24)</sup>. Therefore, the concerns about prescribed MRI have been increased.

Experts of the Ministry of Health have suggested developing clinical guidelines as a way to control the induction services and so the physicians can prescribe in accordance with local clinical guidelines. Thus, in order to avoid the patients' wasting time, and to save money and have economic costs imposed on the country's health care system which leads to nothing but a waste of financial resources and loss of opportunity for the people who are in need of health, providing the medical services in accordance with clinical guidelines is required<sup>(25, 26)</sup>.

**Materials and methods**

This study is descriptive and analytic, while the statistical population included 115 patients referred to MRI Unit in Sabzevar Vasei hospital and they were selected randomly in 2014. The patients who had knee MRI prescription were included in this study, while the patients with a history of knee surgery were excluded. The number of samples, considering  $P = 0.26$  and  $d = 0.07$ , was related to Lehnert and Bree study<sup>(23)</sup> in which 115 cases were estimated. Data collection was conducted in the field and by questioning the patients. The questionnaire consisted of 12 items about patients' demographic characteristics and questions related to prescription, while its validity and reliability were con-

firmed in Salari et.al Study<sup>(27)</sup>. To determine the appropriateness of the prescriptions, the local clinical guideline by Ebrahimipour et.al was used<sup>(28)</sup>. Therefore, the patients' clinical history was given to an experienced specialist who helped in developing clinical guidelines and appropriateness of prescription was determined based on clinical guidelines. Finally, with regard to patients share and different insurances in paying the costs of knee MRI, financial burden for insurance companies and patients was measured. The data analysis was done by using SPSS 16, descriptive statistics, Spearman, Pearson chi-square and Fisher's exact test (Level of significance was 0.05)

**Results**

Among 115 patients participated in this study, 90 patients (78.3%) were male. Most patients, 38 patients (30.5%) were in the age range of 20-30 years old and most of them 53 patients (46.1%) had a high school diploma. 57 patients (49.6%) were self-employed. 112 patients (97.4%) had insurance and 12 patients (10.4%) had complementary insurance. 108 patients (93.9%) were examined by a physician. Applicant for MRI administration in 110 cases (95.7%) was a specialist. Referral institution in 110 patients (73.3%) was a private office and in 40 patients (26.7%) was a state hospital. 110 patients (95.7%) of requests were made by orthopedic specialist. The frequency of knee MRI prescriptions according to separation of appropriateness was shown in table 1.

Appropriateness conditions	Frequency	percent
Appropriate	61	-53%
Uncertain	2	-1.70%
Inappropriate	52	-45.20%
Total	115	-100%

**Table 1:** Frequency of knee MRI prescriptions according to the appropriateness conditions.

Based on the statistical test Chi-Square, there is a significant difference between the appropriateness of prescriptions and patients' gender and occupation as well as specialty of physician and referral institution. Also, according to Spearman statistical test, there is a significant correlation between the prescription appropriateness and patients' education ( $P < 0.05$ ).

The price of knee MRI in 2014 was 660,000 Rials. Social security and health services insurances pay 70% of the cost and the remaining 30% as a franchise is done by the patient. Armed Forces Insurance pays 90% of the amount and the patients share is 10%. Other insurance companies including banks and oil organization insurance companies pay 100% of the cost of services. The results showed that from the total financial burden resulting from inappropriate prescriptions, 70% of which have been imposed to insurance companies. Table 2 showed the financial burden imposed on patients and insurance companies.

Insurance	Inappropriate prescription Frequency/ percentage	Cost imposed on patients (Rials) Frequency/ percentage	Cost imposed on patients (Rials) Frequency/ percentage	Total financial burden (Rials)
Health Services	18	3564000	8316000	11880000
	(34.60%)	(30%)	(70%)	
Social security	30	3960000	20724000	24684000
	(57.70%)	(30%)	(70%)	
Armed forces	2	132000	1188000	1320000
	(3.80%)	-10%	(90%)	
Uninsured	2	1320000	0	1320000
	(3.80%)	(100%)		
Total	52	8976000	30228000	39204000

**Table 2:** Estimated cost of inappropriate knee MRI prescriptions in patients referred to MRI Unit of Vasei hospital.

**Discussion**

The present study aimed to examine the appropriateness of MRI prescriptions in Sabzevar Vasei hospital in 2014. This study showed that 77% of the financial burden was imposed on insurance companies. If about half of prescribed MRIs in Iran are regarded inappropriate (regardless of uncertain prescriptions), at least half of the cost that insurance companies reimburse to patients or the cost that patients pay for MRI are financial burdens that intentionally or unintentionally have been imposed on patients or insurers by physicians. The rapid rise in the cost of health care around the world has caused that health economists, and even physicians in all countries attempt to find new ways to control the costs<sup>(29-31)</sup>.

The inappropriate and unnecessary care debate is an economic issue related to quality of service which is associated with payment systems, the financing of services, and induced demand. Iran,

like other developing countries suffers from lack of resources. It is expected that despite the lack of resources, available resources be used efficiently and effectively and to use technologies that would avoid wasting resources. The MRI prescription and administration in Iran is higher than the international standards and a lot of recommended MRIs are unnecessary. This diagnostic service is prescribed more than society needs due to unknown reasons. Therefore, these prescriptions have to be reduced through proper strategies<sup>(30,32)</sup>.

This study showed that from 115 knee MRI prescriptions, 52 cases were inappropriate. Salari et.al evaluated the clinical appropriateness of MRI prescription from lumbar spine and they showed from 300 lumbar spines MRI, 167 cases were inappropriate. The economic costs of inappropriate prescriptions have been 88900000 Rials<sup>(27)</sup>. Ebrahimipour et. al investigated the costs of inappropriate prescription of knee MRI in Mashhad and they concluded that 54.8% of prescriptions were inappropriate and the resulting financial burden arising from was 38,159,100 Rials<sup>(24)</sup>.

A huge financial burden on insurance companies and patients makes it essential that these evidences be taken into account by policy makers. In this study, there is a statistically significant relationship between patients' gender and appropriateness of prescription which means that inappropriate prescriptions were more in males than females. This finding is consistent with Marzban et.al and Keshtkaran et.al studies<sup>(30, 33)</sup>. But the results of a study conducted in Mashhad showed no significant difference between inappropriate prescriptions in males and females<sup>(24)</sup>.

The results of this study showed a significant relationship between the prescription appropriateness and the referral institution, as the number of inappropriate prescriptions in patients who were referred to the physician office was more than the patients who were admitted in hospital. Besides, the results of a study on inappropriateness of back MRI prescriptions in Shiraz showed a smaller percentage of patients referred to state hospitals have had inappropriate prescriptions. It seems that physicians in training hospitals spend more time on examining their patients<sup>(33-35)</sup>. However, Ebrahimipour et.al in a study on appropriateness of knee MRI prescriptions in Mashhad showed no significant relationship<sup>(24)</sup>.

According to the results of this study, there is a significant relationship between appropriateness of prescriptions and the patients' occupations, while the most inappropriate prescription was among housewives. However, the results of a study conducted in Shiraz showed that the highest percentage of inappropriate prescriptions was among the students and the lowest was among housewives<sup>(33)</sup>. But Ebrahimpour et.al concluded that there is no significant difference between the appropriateness of prescription and the patients' occupations<sup>(24)</sup>.

#### **Limitations of the study include**

Sporadic turns of knee MRI during the day and long time for data collection due to no cooperation of some patients.

#### **Recommendations based on research findings**

Management of expensive diagnostic and medical equipment in Iran

Development of a culture to eliminate unnecessary prescriptions from the health system

Consideration of final scenario as a basis for payments to physicians by the insurance companies.

#### **Recommendation for future research**

Conducting similar research with larger sample size to generalize the results to the society

Doing some researches to investigate the causes of induced demand for the indiscriminate use of diagnostic services by physicians

Developing physician payment reform model to eliminate unnecessary prescriptions

Doing further studies by using developed clinical guidelines of this study to determine the appropriateness of knee MRI prescriptions all around the country.

#### **Conclusion**

The results of this study showed that the rate of inappropriate prescriptions of knee MRI is extensively high. High costs of this diagnostic method from one side and access to local clinical guideline in this field in our country from the other side have made it necessary for physicians to use guidelines in order to give proper services for knee MRI prescriptions. Therefore, the use of local clinical guidelines could be a step toward standardizing treatment and avoid from additional costs.

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