

Comparing costs and timing of ankle sprain care in two first-tier care systems

Comparación de costos y oportunidad de la atención del esguince de tobillo en dos sistemas de atención de primer nivel

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Abstract

Objective: To compare the costs of care and the opportunity of care for the management of grade I-II ankle sprain in two Family Medicine Units, one with rehabilitation service (FMU 13) and one without rehabilitation service (FMU 41). **Method:** Observational analytical study, records with diagnosis of grade I-II ankle sprain attended at the FMU were included January-November 2021. Consultations were recorded in the emergency department, family medicine, rehabilitation, cabinet studies and time to grant the appointment in the rehabilitation service (opportunity of care), the Mann-Whitney U test was used to compare costs of care and timeliness of care. **Results:** In FMU 41, care costs were higher compared to FMU 13 (\$13,990 vs \$8,063); however, this difference was not significant, as was the cost of care in family medicine, rehabilitation, and opportunity of care. **Conclusions:** The costs of care and the opportunity of care were similar in both models of care (FMU 13-FMU 41) of grade I-II ankle sprain.

Keywords: Ankle sprain. Cost of care. Cost analysis. Rehabilitation.

Resumen

Objetivo: Comparar los costos de atención y la oportunidad de la atención del manejo del esguince de tobillo de grado I-II en dos Unidades de Medicina Familiar, una con servicio de rehabilitación (UMF 13) y otra sin servicio de rehabilitación (UMF 41). **Método:** Estudio observacional analítico en el que se incluyeron expedientes con diagnóstico de esguince de tobillo de grado I-II atendidos en las UMF 13 y 41, de enero a noviembre de 2021. Se registraron las consultas en los servicios de urgencias, medicina familiar y rehabilitación, los estudios de gabinete y el tiempo en otorgar la consulta en el servicio de rehabilitación (oportunidad de la atención). Para comparar los costos en la atención y la oportunidad de la atención se utilizó la prueba de U de Mann-Whitney. **Resultados:** En la UMF 41, los costos en la atención fueron mayores en comparación con la UMF 13 (\$13,990 vs. \$8,063); sin embargo, esta diferencia no fue estadísticamente significativa, al igual que en el costo de atención en medicina familiar y rehabilitación y la oportunidad de la atención. **Conclusiones:** Los costos de la atención y la oportunidad de la atención fueron similares en ambos modelos (UMF 13-UMF 41) para la atención del esguince de tobillo de grado I-II.

Palabras clave: Esguince de tobillo. Costo de atención. Análisis de costos. Rehabilitación.

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Introduction

Ankle sprain is one of the most common musculoskeletal injuries. In the United States, 2 million acute sprains occur annually¹, and emergency services report an incidence rate of 2 to 7 per 100 people per year², resulting in high costs for treatment both in emergency services and in primary care units^{3,4}. In Mexico, it is also one of the main reasons for consultation in rehabilitation services⁵.

In 2004, the Instituto Mexicano del Seguro Social (IMSS) implemented rehabilitation services at the primary care level to provide more timely care to patients with ankle sprains and other low-complexity diseases⁶.

To determine the timeliness of care and the costs of treating the main musculoskeletal conditions in the rehabilitation service at the primary care level, a study was conducted back in 2008. This study demonstrated that the timeliness of care was faster in Family Medicine Units (UMFs) with rehabilitation services, and costs were lower vs a UMF without rehabilitation services at the primary care level⁷. One of the conditions studied was ankle sprain, but we consider that the sample of the study was limited and that the current conditions of health care services⁸ may differ from those previously reported. Therefore, the objective of this study is as follows: to compare health care costs and the timeliness of care for people with grade I-II ankle sprain in a UMF with rehabilitation services at the primary care level versus another UMF without rehabilitation services at the primary care level.

Method

We conducted an observational analytical study from January through November 2021 in 2 UMFs: UMF 13, which has rehabilitation services, and UMF 41, which does not have rehabilitation services. The sample was obtained through non-probabilistic consecutive case sampling in both UMFs, including records of patients over 18 years old who consulted for acute grade I-II ankle sprain. Patients with a history of sprain in the past year, who reported data on osteoarthritis or previous surgical procedures in the evaluated limb, peripheral vascular insufficiency, neuropathy, or joint instability, were excluded.

Patient information was obtained from the electronic health record. General data collected included age, sex, body mass index (BMI), diagnosis, days of incapacity, type of incapacity, consultations in emergency

services, family medicine, and rehabilitation, imaging modalities, and the time taken to provide the consultation in the rehabilitation medicine service (timeliness of care) and exercise prescription.

The costs for the analysis were obtained from the 2021 Official Journal of the Federation for first and third-level care⁹. The data on accumulated incapacity days and the type of incapacity were obtained from the family clinic database, and the costs of consultations and imaging modalities were obtained from the IMSS procurement portal¹⁰. The costs were categorized as follows:

- Total cost of emergency service: Sum of the cost for consultation in emergency services at the first or third level, as appropriate, plus the cost of imaging studies (in all cases, simple radiographs).
- Total cost of care at the UMF: Cost for the number of consultations provided at the UMF.
- Total cost of care in the rehabilitation service: Cost for the number of rehabilitation medicine consultations plus the cost for the number of physiotherapy sessions.
- Total cost of general care: Total cost of the emergency service plus the total cost at the UMF plus the total cost of care in the rehabilitation service.

Statistical Analysis

Quantitative variables were summarized using measures of central tendency and dispersion: mean and standard deviation if they met the normality assumption, and median and interquartile range if they did not meet the assumption. For inferential analysis, since the cost variables did not meet the normality criteria, medians were compared using the non-parametric Mann-Whitney U test, and the chi-square test was used for nominal variables.

Ethical Considerations

The study was submitted to the national research committee and the ethics committee, obtaining the registration number R-2021-785-016.

Results

A total of 256 patients were included, with 128 patients from each UMF. The mean age in UMF 13 was 38.7 years, while in UMF 41 it was 34 years. In both groups, more than 50% were male, over 70% had overweight or obesity, grade I ankle sprain was

Table 1. Demographic Characteristics

Variable	UMF 41 (no rehabilitation) (n = 128)		UMF 13 (with rehabilitation) (n = 128)		p
	n o X	SD (%)	n o X	SD (%)	
Age (Mean ± SD)	34.31	(11.49)	38.76	13.14	0.004
Male Sex	76	59.40%	71	55.50%	0.52
Female Sex	52	40.60%	57	44.50%	0.52
Body Mass Index (BMI)					
Normal	28	21%	38	29.70%	0.002
Overweight	54	42.20%	58	45.30%	
Obesity Grade I	33	25.80%	32	25%	
Obesity Grade II	13	10.20%	0	0%	
Ankle Sprain Grade I	64	50%	64	50%	1
Ankle Sprain Grade II	64	50%	64	50%	
Type of Disability					
General Illness	71	55.50%	61	47.70%	0.029
Work Risk	31	24.20%	50	39.10%	
Commute Risk	26	20.30%	17	13.30%	

SD: Standard Deviation.

Table 2. Total Emergency Costs in Mexican Pesos

Variable	UMF 41 (n = 113)		UMF 13 (n = 110)		p
	Median	Range CI	Median	Range CI	
Emergency Consultation Cost	3258	3258-3258	3258	671-3258	0.512
X-ray Cost	570	570-570	570	360-570	0.762
Total Emergency Cost	3828	3838-3828	3828	1031-3828	0.512

CI: confidence interval.

the most frequent, and most of the disabilities were due to general illness (Table 1).

Regarding emergency service costs, the costs were similar in both UMFs (Table 2).

There were no statistically significant differences in total days of disability, number of family doctor consultations, total cost per UMF consultation, and total care cost, with equal medians in both UMFs (Table 3).

Regarding the percentage of patients referred to a physical medicine and rehabilitation unit, it was identified that in UMF 41, 24.2% of patients were referred vs 19.5% in UMF 13. Of the total patients treated, 64% in UMF 41 received instructions to do home exercises, and 60% in UMF 13 received such instructions.

Regarding rehabilitation service care, no statistically significant differences were found in both clinics for variables such as timeliness of care, number of consultations with a rehabilitation specialist, number of physical therapy sessions, and cost per session, with similar medians for timeliness of care, showing only a difference

of 2 days (greater in UMF 13). The total rehabilitation cost was higher in UMF 41, as patients were referred to a third-level care unit; however, the difference was not statistically significant (Table 4).

The overall care cost included the total emergency service cost, the overall care cost at the UMF, and the overall rehabilitation service cost, with an increase in costs at UMF 41, though no statistically significant differences were observed (Table 5).

Discussion

In our study, no statistically significant differences were found in the costs of care or the timeliness of rehabilitation services between UMF13 and UMF41 in patients with grade I-II ankle sprains.

In the studied sample, the prevalence of ankle sprains was slightly higher in men vs women (57.4 vs 42.6), which is similar to what has been reported by some studies^{11,12}; however, it differs from the findings

Table 3. Cost in Mexican Pesos in the UMF

Variable	UMF 41 (no rehabilitation) (n = 128)		UMF 13 (with rehabilitation referral) (n = 128)		p
	Median	Range CI	Median	Range CI	
Total days of disability	14	3-71	14	4-71	0.344
Number of consultations by family doctor	3	1-7	3	1-6	0.214
Total consultation costs by UMF	2511.27	831-5914	2511	837.09-5914	0.24

CI: confidence interval.

Table 4. Comparison of Medians Between Both Groups with Rehabilitation Referral (n = 56)

Variable	UMF 41 (no rehabilitation) (n = 31)		UMF 13 (with rehabilitation) (n = 25)		p
	Median	Rango IC	Mediana	Rango IC	
Opportunity for care (number of days)	6	1-12	8	3-15	0.098
Number of consultations	1	1-2	1	1-2	0.457
Number of rehabilitation sessions	1	1-4	1	1-4	0.098
Cost per rehabilitation session	2831	2831-11,324	1162	1162-4648	0.077
Total rehabilitation cost in Mexican Pesos	5140	2309-15,942	2324	6972-2324	0.098

CI: confidence interval.

of other studies^{2,13}, due to differences in the studied populations. In these latter studies, individuals with high physical activity (athletes and military personnel) were included, and in this population, women suffer a higher number of sprains vs men, in contrast to our population, where most individuals are sedentary, thus reducing the risk of sprains in women¹⁴.

The BMI was similar to that reported in another study¹³, where 75% of the population had overweight and obesity. This is important since it has been demonstrated that female sex and overweight are the most significant risk factors for the development of post-traumatic ankle osteoarthritis; therefore, considering the characteristics of our population, early rehabilitation programs should be strengthened for individuals with risk factors¹¹.

The age of onset of ankle sprains reported in the literature is higher in children vs adolescents, and higher in adolescents vs adults¹¹⁻¹³; however, in our study, due to the characteristics of the study population and the inclusion criteria, the mean age of onset was 36 years because ankle sprains are considered injuries associated with physical activity, and these are more frequent at younger ages^{2,15}.

More than 50% of the disabilities were issued for general illness, which may be related to the high incidence of ankle sprains during extracurricular activities,

Table 5. Total Costs in Mexican Pesos (Emergency Service, UMF, and Rehabilitation Service)

Variable	UMF 41		UMF 13		p
	Median	Rango IC	Median	Rango IC	
Total Costs	13,990	(837.10-20,155)	8063	(1674-15,822.54)	0.241

CI: confidence interval.

such as sports¹⁴. It is suggested that future studies consider the activity being performed at the time of the ankle sprain.

Regarding emergency service costs, a higher cost was identified in UMF 41, as patients with ankle sprains were directly referred to third-level care, resulting in the highest costs; however, this difference was not statistically significant. Also, 21 ankle sprain patients from UMF 13 attended both the UMF emergency service and the trauma hospital, generating double expenses for the same service. This may have contributed to the lack of statistically significant differences in costs between both care models, despite the expectation that patients using the UMF emergency service would incur lower care costs (UMF 13). This is important because with proper clinical evaluation, clinical conditions requiring referral to second or third-level care can be ruled out¹⁶, which is why we believe

that training family doctors at the first level of care in the timely diagnosis of grade I or II sprains will help save resources and time, benefiting both the patient and IMSS⁴.

As for the costs of care at the UMF, no differences were found between the two UMFs, and similarly, the days of disability and number of consultations were very similar. However, the costs differ from those reported by Sánchez-Hernández et al.⁷, who found that in the UMF with rehabilitation services, the number of disability days and the average cost were lower compared to the UMF without rehabilitation services, likely due to better timeliness of care (shorter waiting times) for accessing rehabilitation services.

Once patients with ankle sprains (24.2%) from UMF 41 were referred to the physical medicine and rehabilitation unit, they received an average consultation in which a home exercise program was provided to improve ankle functionality. Similarly, patients from UMF 13 referred to the rehabilitation unit at the first level of care (19.5%) received a consultation and a home program. The referral of ankle sprain patients from the first level of care to rehabilitation services in our study differs from a study conducted in the United States, in which only 6.8% of patients with ankle sprains were referred to rehabilitation services¹⁷. Regarding timeliness of care, it was similar in both UMFs, in contrast to what was found by Sánchez-Hernández et al.⁷ in their study.

Prescribing exercise programs by the primary care physician is key to functional recovery. Scientific evidence has shown that therapeutic exercise is one of the most effective interventions for restoring functionality^{16,18}; however, in this study, exercise was only prescribed by UMF doctors in 65% of cases, which is why we believe it is important to train family doctors to prescribe therapeutic exercises early and reduce the need for rehabilitation referrals. This could improve the patient's functional recovery and reduce health care costs.

This is important because various studies have demonstrated that early physical therapy intervention in patients with different musculoskeletal problems reduces hospital stay time, promotes early discharge and functional recovery, and improves the patients' quality of life who receive rehabilitation programs compared to those who do not or who do not start early; additionally, with a reduction in costs^{19,20}.

To improve the care of musculoskeletal problems at first-level care units, different models have been implemented; for example, in Sweden, in recent years, a model adapted from triage systems used in emergency

services for classifying and caring for patients with musculoskeletal problems commonly seen in primary care services has been implemented²¹. The triage model aims to provide immediate contact with physical therapists for an initial examination and treatment, reducing the burden on first-level care physicians, decreasing waiting times, and ensuring rapid access to evaluations, suggestions, and effective treatments^{19,22}.

In this study, no statistically significant differences were observed in the variables studied, but it allows us to observe that the care times in both rehabilitation services are very similar, as is the type of therapy provided and the number of sessions administered for the treatment of grade I-II ankle sprains. Therefore, we believe it is necessary to maintain continuous training for first-level care doctors in ankle sprain management, emphasizing diagnosis and early prescription of exercise. Likewise, new care models for low-complexity conditions in first-level care can be implemented.

Limitations

Since data were obtained from the electronic health records, it was not possible to evaluate the functional condition of the ankle at discharge, know the effectiveness of both first-level care systems, or perform a cost-effectiveness analysis. It is also likely that exercise prescription was underestimated, as some doctors may not have recorded the intervention in the health record.

Strengths

This study provides insight into the care process for patients with ankle sprains from the emergency service to discharge from medical services, as well as identifying referral times to rehabilitation services in both care models and the costs associated with ankle sprain care until the patient returns to work. It also lays the foundations for continuing this line of research with comprehensive economic evaluations of cost-effectiveness or cost-utility for new care models at the first-level medical care.

Implications for Clinical Practice

This study identifies areas of opportunity in the care process for patients with ankle sprains, specifically the evaluation by the emergency service and the lack of early exercise prescriptions in more than 30% of

patients. Continuous training programs in the diagnosis and treatment of ankle sprains should be strengthened for first-level care physicians to improve functional recovery, reduce medical care costs, and avoid overloading emergency services with low-complexity conditions.

Conclusions

The costs of care and the timeliness of care in rehabilitation services were similar in both care models (UMF 13 and UMF 41) for grade I-II ankle sprains.

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