



Fragility fractures: proposal of the best practice through the fracture coordination units: the experience of Mexico

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Abstract

Fragility fractures represent a health problem in Mexico and in the world. This paper reviews and puts forward the implementation of Fracture Liaison Services (FLS) as a feasible and cost-effective alternative in health institutions in our country through the identification, treatment, and follow-up of this type of fractures.

Keywords Fragility fractures · Osteoporosis · Mexico · Fracture liaison services (FLS)

Preface

Osteoporosis is one of the chronic diseases related to aging that leads to fragility fractures (FF), which, due to their high

morbimortality and economic burden, have a huge impact over patients' quality of life, medical care, and resources utilization by health system's hospital care [1]. Worldwide, one out of every three women and one every five men after 50 will have FF, and it is feared that by 2050; hip fracture incidence in population aged 50 or more will increase up to 310% for men and 210% for women compared to the rates observed in 1990 [2–5]. According to the United Nations' projections (UN), for every 100 people from 15 to 64 years old, there will be 16 people over 65 by 2050, increasing the population at potential risk of bone deterioration [6]. This dependency relationship called “old age” will increase dramatically throughout the XXI century. Such demographic changes make osteoporosis and FF a challenge to health systems in the near future and a priority to any prevention programs.

In Mexico, FF also represent a public health problem; recent reports state rates of almost 2000 cases for every 100,000 inhabitants with an expected sevenfold increase by 2050 [7]. Hip fracture cases will go up from 155,875 to 226,886 in 2050 (5.2 to 7.2 times more than those registered in 2005) [8]. Such data is alarming as the Mexico health care system infrastructure is not ready to provide care to such number of fractured patients. Moreover, same estimations expect the risk of having a subsequent fracture may be up to 12% within 24 months following the first fracture [9]. More recently, a meta-analysis shows that the relative risk of suffering a hip or vertebral fracture is of approximately two times higher in any type of previous fracture, while for a vertebral fracture, the subsequent risk is 4 times higher

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[10]. In our country, the risk of suffering a hip fracture after 50 years old is 8.5% in women and 3.8% in men [7].

International experts reported an increase of mortality related to FF from 12 to 20% within the first year after a fracture in developed countries [11–13]. Projections are similar for Mexico: mortality after any FF was 20.2% according to the ICUROS-MX study. Quality of life after FF is affected significantly. The ICUROS study in Mexico showed the negative impact these FF represent during the immediate phase and even months after them in all types of FF included [14]. The costs related with the handling of non-pharmacological low bone mass (osteopenia), osteoporosis, and FF are high in our country; they reach over \$ 5191 million (MXP) in 2010 and \$7575 million (MXP) in 2020 [15].

In Mexico, the Victorio de la Fuente Narváez Unit at Instituto Mexicano del Seguro Social (IMSS) estimates that by the year 2050, the traumatology unit alone will require a budget greater than \$315 million (MXP) per year. The aforementioned amount results from projecting the annual admission of 9063 patients with proximal femur fractures, with a bed-day cost for a health institution of approximately \$5156 (MXP) and assuming an average 7-day hospital stay that will equal to \$36,092 (MXP) [16]. This portrays that the impact of this pathology is huge and similar to estimations in other countries. Table 1 shows direct costs derived from the most frequent FF with no comorbidities according to the diagnostic-related groups (DRGs) published in 2017 by the IMSS with costs updated to 2020 [17]. Theoretical projections of the costs and benefits of implementing Fracture Liaison Services (FLS) in Latin America (Brazil, Mexico, Colombia, and Argentina) have been made and will need to be tested with studies and data collected after functional implementation of FLS in these regions [18].

With these data in mind, the Mexican health system needs to plan a priority care program for the detection of bone fragility, post-fracture care, and the correct follow-up of the cases to prevent subsequent fractures.

Fracture Liaison Services with a worldwide successful experience for the care of FF patients offer diverse and feasible models enable to adapt to the particularities of health care systems in different countries being implemented [19]. The aim of this review is to put forward the possible

implementation of the International Osteoporosis Foundation (IOF) *Capture the Fracture*® program in Mexico.

In order to put this program in context, we start with a brief description of the Mexican health care system and some of the barriers we identify for the diagnosis, treatment, and follow-up of FF in Mexico. And overall, we will describe what a FLS is and how to adapt an FLS to different health institutions in our country.

The Mexican health care system

The Mexican health care system comprises two sectors: public and private (Fig. 1) by 2015, 98.03% of the population used some health service of the 119.5 million inhabitants registered in that year [20]. Within the public sector, there are social security institutions such as the Instituto Mexicano del Seguro Social (IMSS), Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE), Petróleos Mexicanos (PEMEX), Secretaría de la Defensa Nacional (SEDENA), and Secretaría de Marina (SEMAR). These institutions offer health care services to their beneficiaries and their families. Health institutions and programs that provide services to people without social security are Servicios Estatales de Salud (SESA), Programa IMSS-Bienestar (former IMSS-Oportunidades), and the newly created Instituto de Salud para el Bienestar (INSABI; previously known as Seguro Popular de Salud) (see Fig. 1) [21]. According to affiliation data recorded by Instituto Nacional de Estadística y Geografía (INEGI 2015), 30.31% of the population is affiliated with the IMSS; 5.63% ISSSTE; 38.62% INSABI or their different denominations; 0.89% PEMEX, SEDENA, or SEMAR; and 10.55% to other institutions including 14.0% that receive care from private health institutions [20].

In 2018, Mexican health expenses as a percentage of the GNP (gross national product) were 3%, rather below the 6 to 8% the World Health Organization (WHO) recommends [22]. Therefore, it is a priority to develop health care programs that optimize scarce resources and increase the quality of life of patients.

In Mexico, the internationally validated tool for fracture risk assessment FRAX® was calibrated with Mexican fracture epidemiology and included in the *Sistema de indicadores de salud SIS* (health indicator system) to carry out screening in elderly patients at first care service as an osteoporosis primary prevention strategy. However, to date, there are no specific national policies regarding secondary prevention strategies targeted to patients who have already suffered a first FF and are at risk of a subsequent fracture. Nor the guidelines for osteoporosis management contains recommendations on post-fracture care services.

Hip fracture patients are identified mostly because they currently attend emergency services for functional disability

Table 1 Frequency and costs of the different types of FF according to groups related by diagnosis (DRGs) in 2017 updated to 2020

Fracture type	Relative weight	Cost in USD	Number of GRD
Hip	3.65	\$ 7971.44	468
Wrist	0.92	\$ 2022.46	512
Humerus Proximal	1.65	\$ 3598.22	494
Vertebral	1.27	\$ 2771.03	909

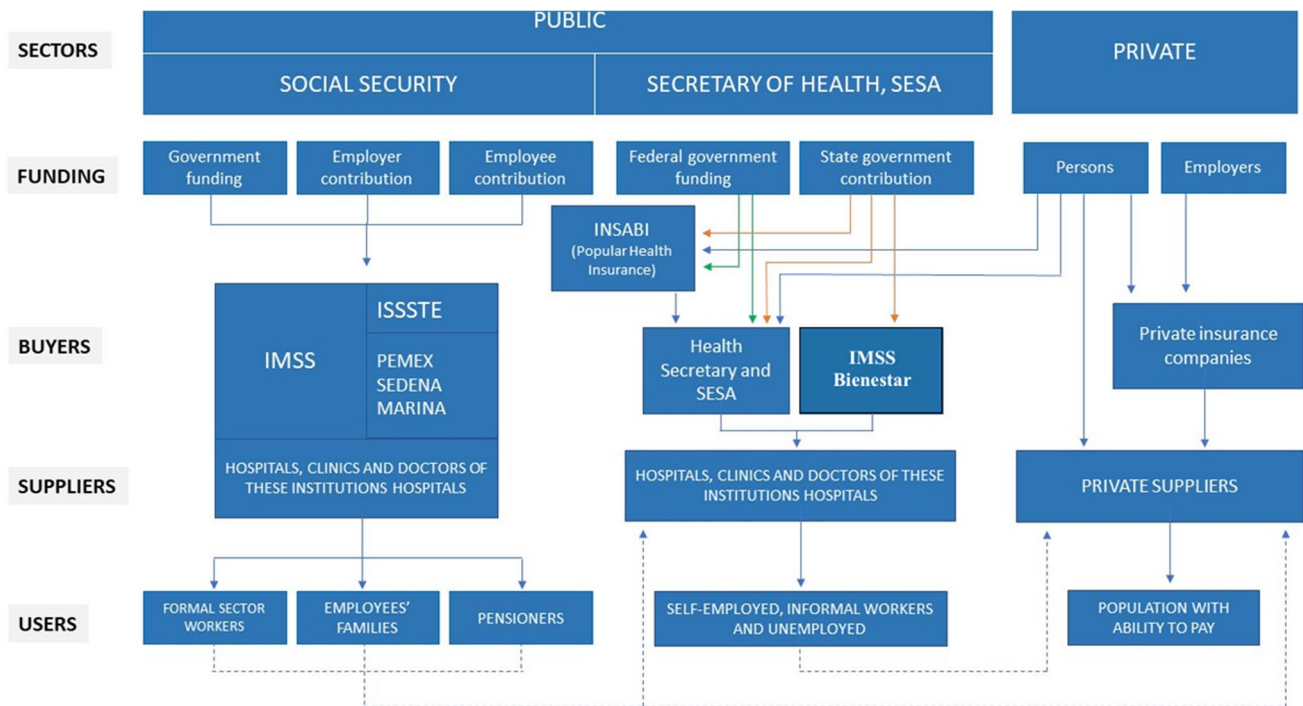


Fig. 1 Health care system in Mexico

and enrolled by hospitals for treatment; other serious fractures such as forearm and distal humerus can be likely identified. Unlike vertebral fractures which go unnoticed in 70% of the cases and where the recommendation would be an intended seek of these fractures as off 70 years old [23, 24]. But, despite most of FF patients go to emergency rooms, one of the most frequent problems is the lack of osteoporosis diagnosis and the appropriate follow-up of these patients, which do not largely get pharmacological or non-pharmacological treatment. In order to close this gap, there are overall post-fracture care strategies, such as the FLS, that began two decades ago and have evolved in the last few years having currently diverse models in several countries and which we will describe below [25, 26].

Post-fracture coordination units/Fracture Liaison Services: a feasible alternative for current and future care of the FF due to osteoporosis in Mexico

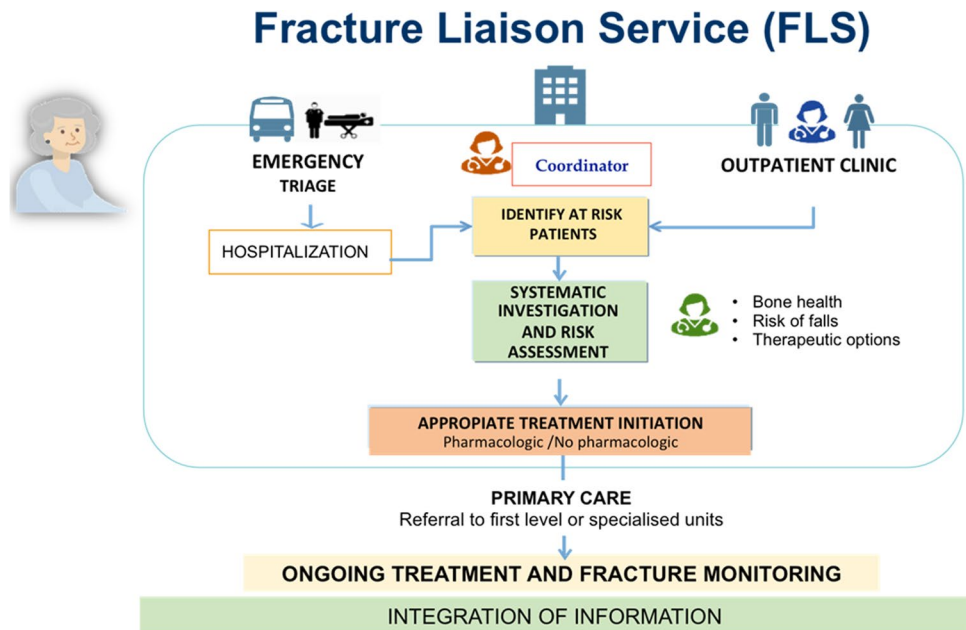
FLSs represent a health care model based on the coordination of a multidisciplinary team of health professionals that ensures effective secondary fracture prevention for all adults aged 50 years and over with a diagnosed FF [27]. The primary aim of the FLS is the prevention of subsequent fractures. FLSs are designed to enhance and optimize the overall care and approach of FF, enabling communication between

health professionals for the short and long-term benefit of hospitalized patients and outpatients [28].

A key role of FLS programs is to be the link between the orthopedic teams, and the orthogeriatric services, osteoporosis clinic, the patient, and the primary care physician. FLSs enable (a) identification of eligible patients; (b) the assessment of fracture risk factors; (c) the execution of laboratory and imaging investigations; (d) inform treatment recommendations; and (e) follow-up to ensure adherence to treatment. These programs have proven to be cost-effective in those countries, regions, and health institutions that have adopted them [26]. Studies show that the implementation of a FLS program can increase up to 135% the identification of patients and their treatment [29].

FLS basic structure focuses on the identification of patients (case detection) who have suffered FF. Regularly, this happens in the hospital emergency room (ER) or during outpatient consultation (Fig. 2). After detection, a sequence of steps that follows include: (a) overall assessment of the patient including the clinical background and main risk factors for fracture risk, comorbidities as well as those laboratory and imaging results; (b) personalized advice including lifestyle (smoking alcohol, nutrition, and physical activity), calcium and vitamin D supplementation, and anti-osteoporosis medication; (c) patient's follow-up plan to ensure and reinforce therapeutic adherence, including fall prevention strategies, registry of subsequent fractures and falls; and (d) gathering FLS data to assess performance and identify quality improvement opportunities [26].

Fig. 2 FLS's clinical pathway



A FLS model that has successfully widespread worldwide is IOF *Capture the fracture*[®] (CTF) program that puts forward a *Best Practice Framework (BPF)* that comprises 13 criteria that allows the assessment of the level performance of the FLS at the organizational level, enables sustainability and offers better patient care. The establishment of these criteria may be adapted to the peculiarities of each institution and can be reviewed at the following link: <https://www.capturerefracture.org/map-of-best-practice> (consulted in May 2021). Additionally, the new key performance indicators (KPI's—Key performance indicators) [30], map the patient-level performance indicators required for services to become more effective [25]. The program includes free online tools, virtual and in-person training, networking, and a global map of best practice, which, up to December 2020, reached 567 FLS worldwide [28].

FLS experience and proposals in our country

In Mexico, at the end of 2020, 17 health institutions have either enrolled in the CTF program or were at different stage of development and implementation of this care model, while other 15 were assessing its adoption, which consist of a precedent to avoid secondary fractures in our country. A recent survey among Latin American FLSs mapped in the CTF best practice map carried out by IOF Latin American office reports that 91% of services have an FLS champion and that orthopedic surgeon (89%), endocrinology (4.4%), and geriatrics (4.1%) are the top three medical specialties leading FLS implementation. Survey respondent indicates primarily identification is 98% hip

fractures, 73% vertebral fracture, and 66.5% other outpatient fractures. While there is widely access to anti-osteoporosis medication (AOM), the type of treatment is driven by the type of institution, with more options in the private health institutions than the public ones. Access to DXA shows a similar situation and the cost of testing varies accordingly. In terms of strengths, the survey lists patient identification, investigation, and treatment identification as the top three, while lack of organizational support, fall prevention clinic, and data base management being the top three weaknesses.

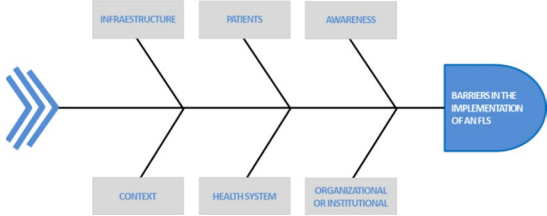
One of the groups that stands out for its multicentric coordination is the FLS-MX group, that has carried out *Capture the Fracture*[®] pilot program studies adapted to the characteristics and feasibilities of different institutions (IMSS, INR and ISSSTE) with the main aim to standardize implementation, measurement, and follow-up tools.

Among the areas of opportunities in the implementation of the *Capture the Fracture*[®] program are the assessment of new fractures' risk, fall prevention programs, nutritional and educational recommendations in healthy aging, and check and ensure adherence to treatment, all of them focused on patients' recovery of functional capability and independence to regain their daily life activities.

One of the main areas of opportunity in Mexico consists in increasing the identification of patients at risk and to offer effective treatment and follow-up. The key component is building quality improvement indicators when initiating FLS implementation as to facilitate service improvement at a later stage.

The fishbone diagram below (Table 2) lists the barriers impacting the development of FLSs in Mexico which are

Table 2 Barriers for FLS implementation in Mexico



	<p>Low awareness among clinicians, patients, and policy makers about the importance of secondary fracture prevention</p> <p>Approach towards immediate resolution of the index fracture without considering long-term consequences</p> <p>Lack of control on adequate prescription of treatment and follow-up</p> <p>Lack of staff training for osteoporosis care based on clinical practice guidelines</p>
AWARENESS	
	<p>Lack of active patient society voice during policy decision making</p> <p>Lack of therapeutic adherence and access to pharmacological treatment</p>
PATIENTS	
	<p>Lack of integration between the services involved for comprehensive care</p> <p>Lack of implementation of systems for the identification and registration of vertebral fractures</p> <p>Inadequate functioning of the referral and counter-referral system that makes it difficult to monitoring and follow-up</p> <p>Lack of leadership and coalition of FLS</p> <p>Lack of evidence generation through unified information from the FLS in Mexico</p> <p>Unfamiliarity with benchmarking</p>
ORGANIZATIONAL STRUCTURE	
	<p>Logistical difficulties for patient registration</p> <p>Poor access to bone densitometry</p> <p>Difficult access to medications</p>
HEALTH SYSTEMS	
	<p>Poor focus on preventive medicine</p> <p>Subsystems that involve open population have difficulty in monitoring and adherence</p> <p>Lack of information and interest from stakeholders and policy makers</p> <p>Lack of clear clinical and health economic benefit and budget impact model of FLS in Mexico using national data</p>
HEALTH POLICY	

very much in line with findings of the Latin American survey mentioned above. The diagram analysis is an effort of the FLS local mentors and the FLS-MX group to start building a case that drive dialogue with policy makers. These barriers include a series of factors required for an effective and efficient FLS and has been as well mentioned in several studies [31–33, 34].

These factors are included in different categories as follow: awareness, patients, organizational structure, health system,

and health policy. All these factors were exacerbated by the COVID-SarsCOV-2 pandemic context since March 2020.

Considering aspects mentioned above, we can infer that the development and establishment of this care model allows us to offer an appropriate overall care to FF patients and improve their quality of life, decrease mortality as well as the economic impact in the elderly after their first fracture.

Conclusions

The implementation of UCF and FLS in the world has proven that these programs have benefits in the quality of life of FF patients, and in the use of health resources. The development of this care model allows the reduction of hospitalization and FF recovery as well as the catastrophic expenses of their treatment, recovery, and wasted years with independence.

The initial experience in the implementation of the *Capture the Fracture*® program and in diverse Mexican institutions shows us that this program is feasible of being adapted for its implementation in countries with as heterogenous health systems as Mexico. FLSs have the potential to diminish the negative impact that FF have in patients, their social environment, and the health care systems.

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Declarations

Conflict of interest MKJ has received honoraria and grant support from Amgen, UCB and Kyowa Kirin Hakin outside of the development of this manuscript. The rest of the authors do not declare any conflict of interest in the development of this manuscript.

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