

Changing Epidemiology of Distal Femur Fractures: Increase in Geriatric Fractures and Total Healthcare Cost

Tyler J Thorne¹, Graham John Dekeyser, Brook I Martin², Justin Haller²

¹Orthopaedics, University of Utah, ²University of Utah

INTRODUCTION:

Distal femur fractures (DFF) are associated with high morbidity and mortality rates, particularly in the elderly. Surgical treatment options include open reduction and internal fixation (ORIF), intramedullary nails (IMN), and distal femoral replacements (DFR). The purpose of this study is to describe the epidemiology of DFF in both the Nationwide Inpatient Sample (NIS) and a Medicare cohort by investigating 1) trends in DFF incidence, 2) trends in fixation choice, and 3) healthcare resources utilization costs by fixation type.

METHODS:

Trends in the annual rates and volume of inpatient DFF were estimated from NIS. Admissions for DFF were identified using International Classification of Diseases (ICD) codes, 9th and 10th revisions. Age, sex, and race-specific population data from the US Census served as the denominator for producing population rates (per 1 million) via a Poisson regression. The Medicare claims database (CMS) was queried based on Current Procedural Terminology codes from 2012-2019 to identify trends in treatment choice and healthcare utilization costs in patients ≥ 65 years of age. Healthcare cost in our study refers to the inflation-adjusted sum of actual Medicare payment amounts for inpatient, outpatient, provider (Part B), skilled nursing facilities, home health, and durable medical equipment claims through the 90-day postoperative period.

RESULTS:

The volume of DFF increased from 2002-2019 in the NIS database, with the majority of fractures occurring in patients over 60 years of age, and the highest volume and rate occurred in those ≥85 years of age (Figure 1). DFF patients in 2019 tended to be older (66 vs. 60.9, p<0.001), female (69.4% vs. 65.4%, p<0.001), White (76% vs. 73.5%, p<0.001), had a Charlson Comorbidity greater than 2+ (41.3% vs. 23.5%, p<0.001), insured by Medicare (63.9% vs. 55.1%, p<0.001), had fewer lengths of stay greater than 4 days (57.4% vs. 60.7%, p<0.001), and were more frequently discharged to a skilled nursing home (SNF) (63% vs. 57.6%, p<0.001) (Table 1).

Among 42,339 Medicare patients admitted for DFF, 3,487 were treated with IMN, 36,198 were treated with ORIF, and 2,654 received a DFR (Table 2). From 2012-2019, the percentage of DFF treated by IMN increased from 6.9% to 8.5%, ORIF decreased from 90.3% to 77%, and DFR increased from 2.8% to 14.5% (Table 3). The initial inpatient treatment cost for DFR increased by \$1,552 from 2012-2019, compared to an increase of \$607 for IMN and \$687 for ORIF (Table 5). From 2012-2019 the 90-day episode-of-care cost for IMN increased by 2.39 times, 2.56 times greater for ORIF, and 1.90 times greater for DFR (Table 5). Length of hospitalization decreased across all treatment groups, from 6.2 days to 5.7 in IMN, 6.3 days to 5.8 for ORIF, and 8.4 days to 8.2 for DFR.

DISCUSSION AND CONCLUSION: The rate and volume of DFF increased during our study period, predominantly in elderly patients with high levels of comorbidities. While recent studies have demonstrated equivocal or worse outcomes with DFR, there was greater than 5X increase in DFR treatment for DFF in the geriatric population. Future research needs to clarify indications for best treatment for geriatric DFFs. Despite increased concern about healthcare costs and a relatively stable facility/surgery cost, the total 90-day cost of DFF increased by 1.9 – 2.56 times, which translates to approximately a \$25,000 greater cost per patient. This average cost rose despite shorter inpatient admissions and was largely driven by a trend toward discharge to SNF or other long-term rehab centers. Focus should be placed on reducing the 90-day perioperative healthcare costs, especially given the rising rate of DFF.

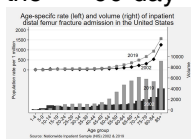


Table 1. Demographics of the Medicare cohort from 2012-2019.

Characteristic	2012-2019	2002-2019	p-value
Age (years)	66.0	60.9	<0.001
Female (%)	69.4	65.4	<0.001
Race (%)			
White	76.0	73.5	<0.001
Black	11.0	11.0	0.98
Hispanic	11.0	11.0	0.98
Other	1.0	1.0	0.98
Charlson Comorbidity Index	41.3	23.5	<0.001
Insurance			
Medicare	63.9	55.1	<0.001
Medicaid	1.0	1.0	0.98
Private	1.0	1.0	0.98
Other	1.0	1.0	0.98
Length of Stay (days)	5.7	6.2	<0.001
≤ 4	42.6	39.3	<0.001
> 4	57.4	60.7	<0.001
Discharge destination			
Home	37.0	42.4	<0.001
SNF	63.0	57.6	<0.001
Other	0.0	0.0	0.98

Table 2. Frequency of treatment type by year.

Year	IMN	ORIF	DFR	n	%
2012	363	4,755	166	5,284	2.8%
2013	400	4,860	164	5,424	2.8%
2014	434	4,913	162	5,509	2.8%
2015	450	4,792	169	5,411	2.8%
2016	456	4,640	266	5,362	2.8%
2017	490	4,149	169	4,808	2.8%
2018	509	3,194	580	4,283	2.8%
2019	485	3,102	1,022	4,609	2.8%

Table 3. Cost of DFF treatment by treatment type.

Year	IMN	ORIF	DFR
2012	\$1,144	\$1,144	\$1,144
2013	\$1,144	\$1,144	\$1,144
2014	\$1,144	\$1,144	\$1,144
2015	\$1,144	\$1,144	\$1,144
2016	\$1,144	\$1,144	\$1,144
2017	\$1,144	\$1,144	\$1,144
2018	\$1,144	\$1,144	\$1,144
2019	\$1,144	\$1,144	\$1,144

Table 4. 90-day episode-of-care cost by treatment type.

Year	IMN	ORIF	DFR
2012	\$1,144	\$1,144	\$1,144
2013	\$1,144	\$1,144	\$1,144
2014	\$1,144	\$1,144	\$1,144
2015	\$1,144	\$1,144	\$1,144
2016	\$1,144	\$1,144	\$1,144
2017	\$1,144	\$1,144	\$1,144
2018	\$1,144	\$1,144	\$1,144
2019	\$1,144	\$1,144	\$1,144

Table 5. Length of hospitalization by treatment type.

Year	IMN	ORIF	DFR
2012	5.7	6.3	8.4
2013	5.7	6.3	8.4
2014	5.7	6.3	8.4
2015	5.7	6.3	8.4
2016	5.7	6.3	8.4
2017	5.7	6.3	8.4
2018	5.7	6.3	8.4
2019	5.7	6.3	8.4

*All analyses are based on a consecutive weighted national sample.