MD Epidemiology and
Real World Data Sciences (Epi-RWDS)

LONG BONE FRACTURES: OVERVIEW OF INTRAMEDULLARY NAILING BY FRACTURE TYPES AND PATIENT PROFILE

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Disclosures

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Abhishek S Chitnis, Mollie Vanderkarr, Charisse Sparks, Yuriy Grebenyuk, and Chantal E Holy are employees and stockholders of JnJ

Jill Ruppenkamp was contractor with JnJ at the time of the study

Background

- A broken hip or femur is one of the most serious fall injuries and is associated with disability and premature death[1, 2]
- Each year over 300,000 older people are hospitalized for femur fractures[3]
- Tibia fractures are common but unanticipated trauma results in painful and prolonged recovery, often associated with complications[4]
- Tibia and fibula fractures annually result in 77,000 hospitalizations[4]
- The incidence of humeral fractures has been increasing with the aging population resulting in a large socioeconomical burden[5]

Background

Surgical treatment for long-bone fractures may require medical devices such as pins/plates, external fixators or intramedullary nails (IMN)

The utilization of surgical treatment by fracture anatomy and patient presentation is characterized in this study

Objectives

- To evaluate the patient characteristics in long bone fractures including femur, tibia and humerus
- To determine the utilization of surgical repair procedures by fracture anatomy
- To evaluate the patient/fracture characteristics associated with IMN
- To determine the utilization of IMN by fracture anatomy over years

Methods

Retrospective Cohort study

IBM® Marketscan® Commercial databases between 2007 and 2019

Patients <65 years old, diagnosed with femoral, tibial or humeral fractures during an inpatient admission

Exclusion

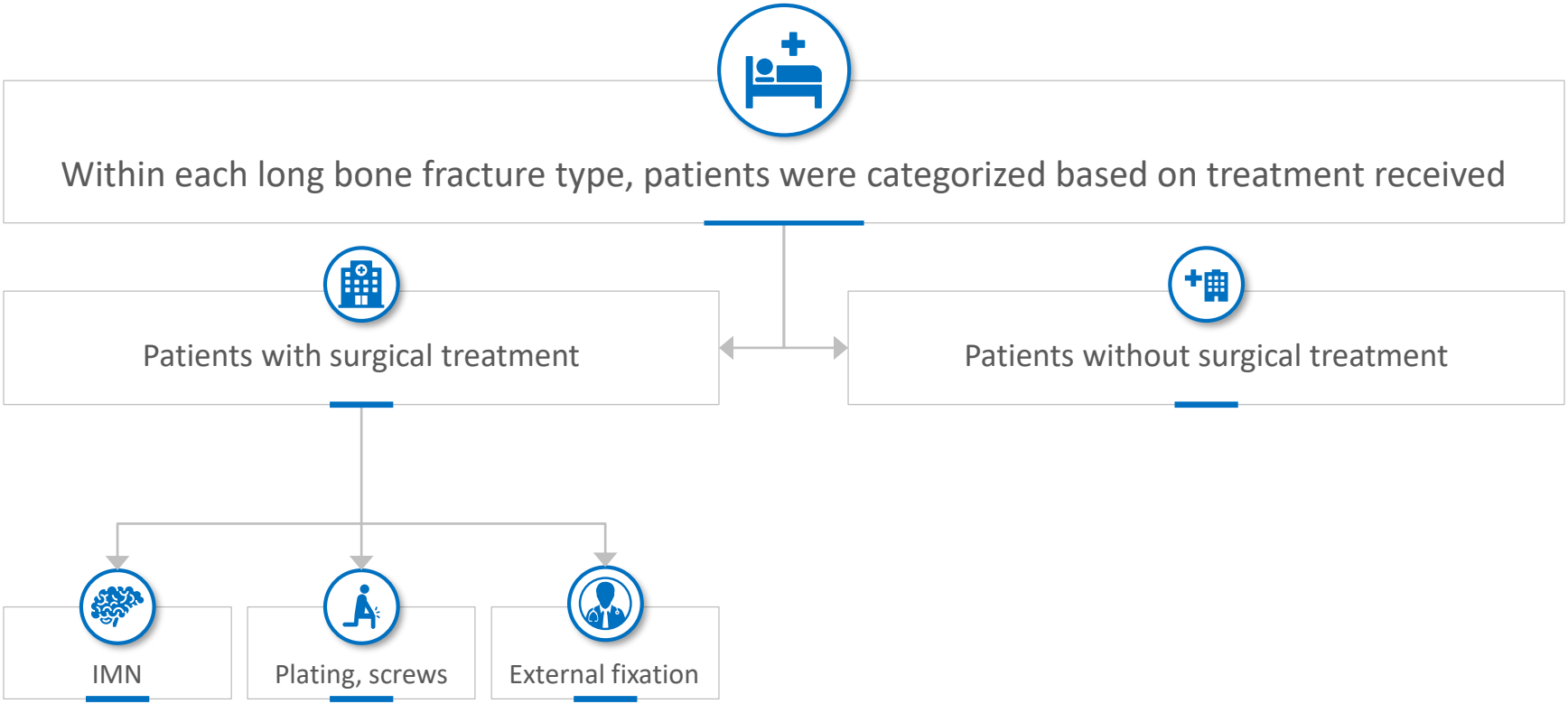
- If patients had long bone fractures in the six months prior to initial fracture hospitalization
- If patients lacked continuous enrollment six months prior to fracture diagnosis
- If patients had amputation procedure at time of fracture diagnosis
- If patients had fractures in multiple bones at time of initial fracture hospitalization (polytrauma)

Study Measures

Patients were categorized into three groups based on long bone fracture

- Femoral fractures
- Tibial fractures
- Humeral Fractures

Study Measures



Other Study Measures

- Age
- Gender
- Year of fractures
- Region
- Insurance Plan type
- Obesity
- Osteoarthritis
- Osteoporosis
- Open fracture
- Shaft fracture
- Comminuted fracture
- Displaced Fracture
- Upper end fractures
- Lower end fractures
- Elixhauser comorbidities
- Functional Comorbidity Index

Statistical Analysis

Mean and Standard deviation (SD) were reported for continuous measures

Proportions were reported for categorical measures

Logistic regression were conducted to determine the factors associated with receipt of IMN

Rates of utilization for IMN were reported over the 12 years for femoral, tibial and humeral fractures

Results

Study Cohort

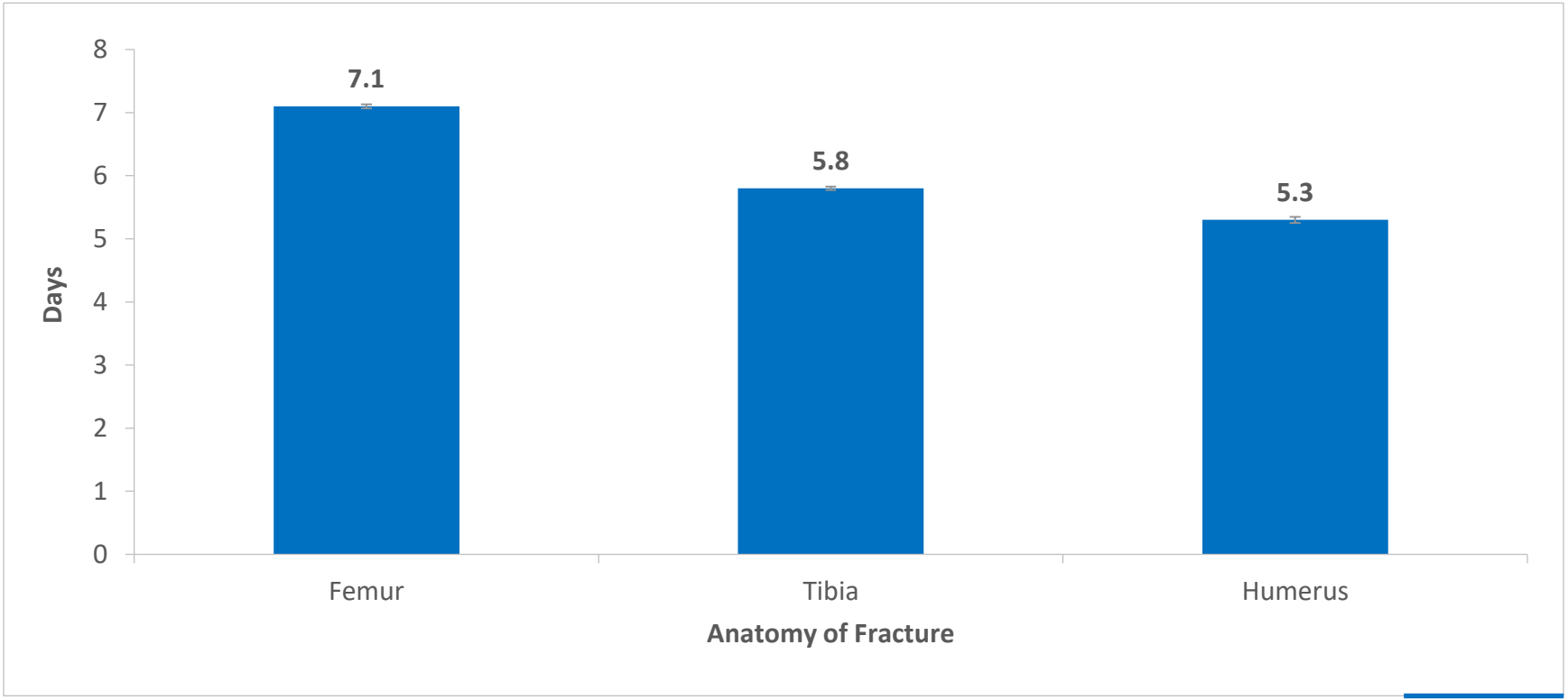
A total of 81,057 patients with femoral fractures, 68,693 patients with tibial fractures and 43,533 patients with humeral factors were identified

Factors	Femur Fractures	Tibia Fracture	Humerus Fractures
Age, mean (SD) in years	44.2 (19.5)	41.2 (16.4)	37.9 (22.1)
Female	49.7%	43.9%	54.2%
Region			
South	43.5%	42.6%	41.1%
North Central	23.5%	22.7%	21.9%
West	16.5%	17.6%	19.1%
Northeast	15.2%	16.0%	16.7%
Unknown	1.3%	1.22%	1.1%
Insurance plan type			
Preferred provider organization	62.5%	62.4%	62.1%
Health Maintenance Organization	11.0%	11.5%	11.9%

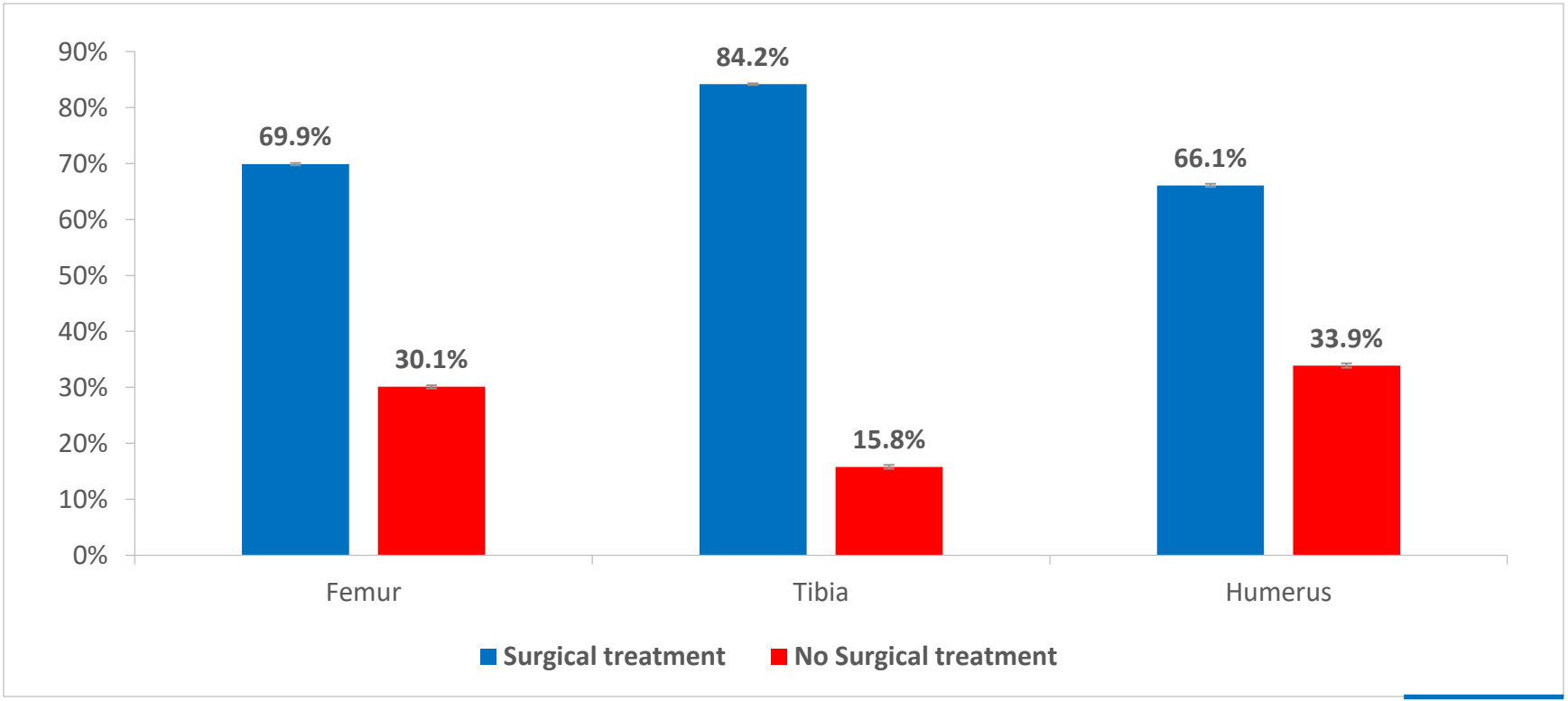
Patient Presentation

Factors	Femur Fractures	Tibia Fractures	Humerus Fractures
Hypertension	24.3%	18.0%	22.1%
Osteoarthritis	16.6%	5.0%	2.8%
Diabetes	11.7%	8.6%	11.6%
Open fractures	9.3%	20.2%	10.3%
Shaft fractures	31.0%	47.8%	22.7%
Displaced fractures	12.1%	16.6%	12.1%
Comminuted fractures	2.39%	4.4%	3.1%
Upper end fractures	1.0%	38.9%	39.2%
Lower end fractures	13.8%	7.4%	25.9%
Functional comorbidity index			
0	43.1%	55.0%	51.0%
1	19.1%	19.9%	18.5%
2	14.0%	11.4%	11.8%
3	9.5%	6.4%	8.0%
4 plus	14.3%	7.2%	10.8%

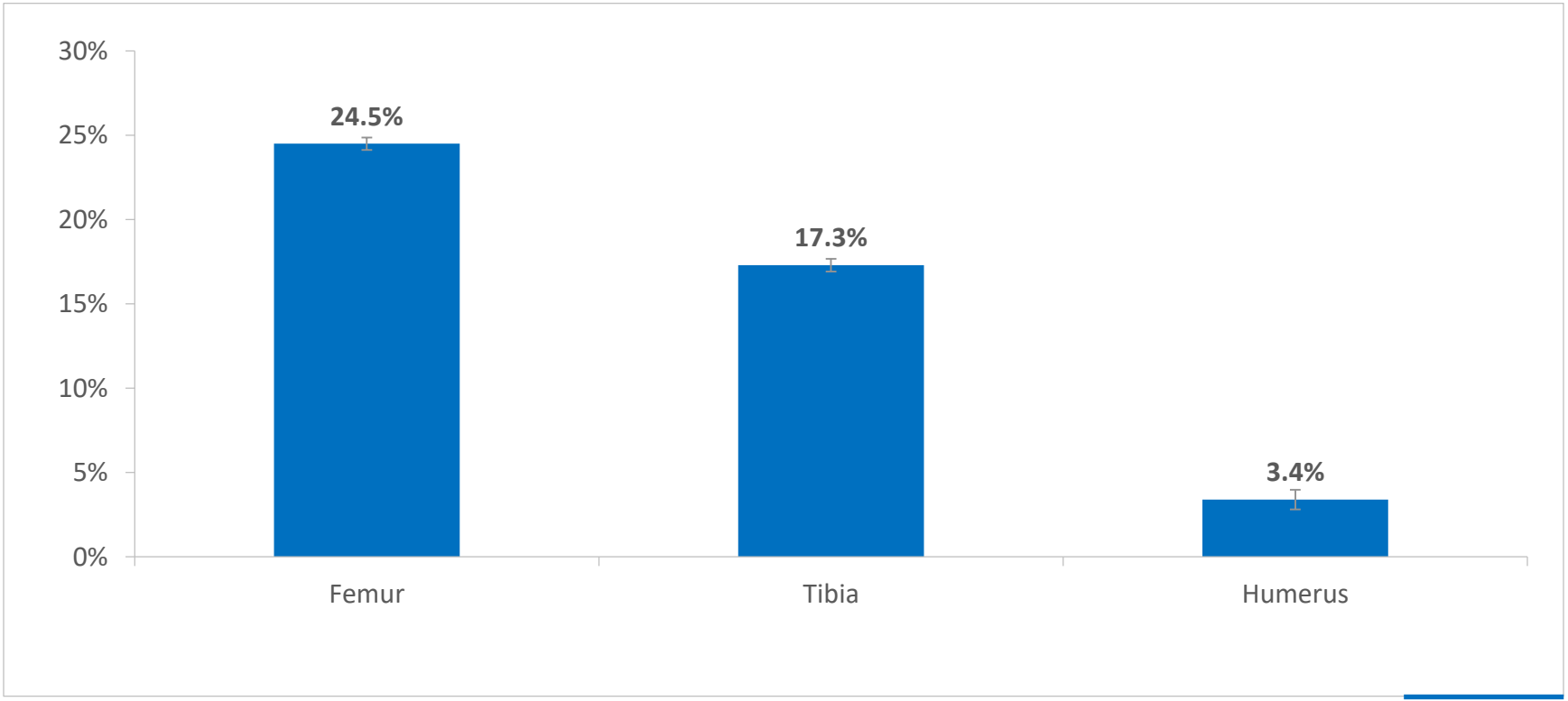
Mean Length of Stay for Initial Fracture Hospitalization



Rates of Surgical Treatment vs Non-Surgical Treatment by Fracture Anatomy



Rates of IMN among Patients with Surgical Treatment by Fracture Anatomy



Factors Statistically Significantly Associated With Receipt of IMN in Femur Fractures

Factors	Odds Ratio	95 % Confidence Interval		p-value
Age	1.1	1.0	1.1	<.0001
Female vs Male	0.9	0.9	1.0	0.048
FCI score 1 vs 0	0.9	0.8	0.9	0.002
FCI score 2 vs 0	0.8	0.7	0.9	<.0001
FCI score 3 vs 0	0.7	0.7	0.8	<.0001
FCI score 4 plus vs 0	0.8	0.7	0.9	<.0001
Osteoporosis vs Not	1.1	1.0	1.2	0.007
Open fracture vs Not	1.2	1.2	1.3	<.0001
Shaft fracture vs Not	4.3	4.1	4.6	<.0001
Trochanteric fractures vs Not	3.2	3.0	3.4	<.0001
Displaced fractures vs Not	2.3	2.1	2.6	<.0001
Comminuted fracture vs Not	1.6	1.4	1.8	<.0001
Upper end fracture vs Not	0.7	0.6	0.9	0.003
Lower end fracture vs Not	0.7	0.7	0.8	<.0001

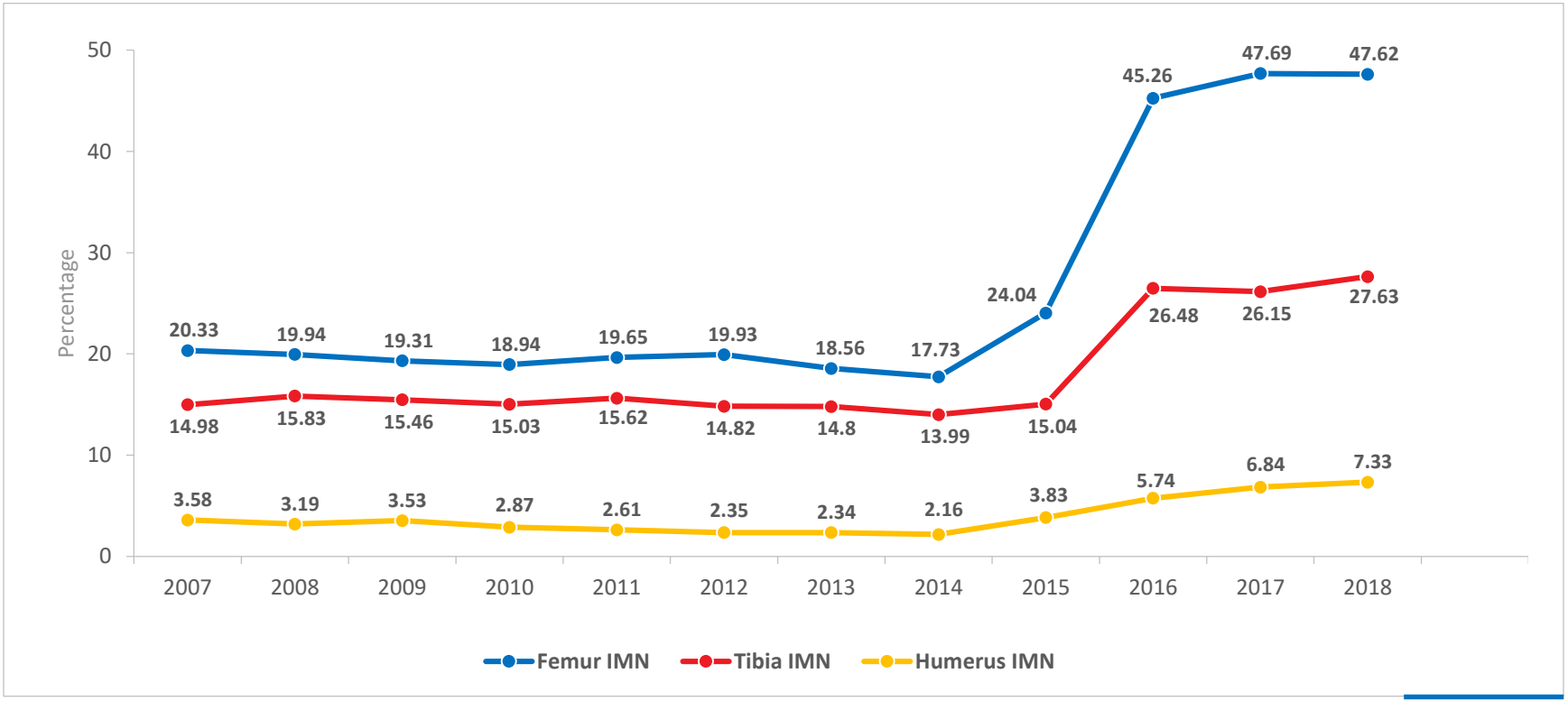
Factors Statistically Significantly Associated With Receipt of IMN in Tibia Fractures

Factors	Odds Ratio	95 % Confidence Interval		p-value
Procedure year 2016 vs 2007	2.1	1.8	2.5	<.0001
Procedure year 2017 vs 2007	2.2	1.9	2.6	<.0001
Procedure year 2018 vs 2007	2.2	1.9	2.7	<.0001
Procedure year 2019 vs 2007	2.8	2.2	3.7	<.0001
Metastatic cancer vs Not	2.9	1.8	4.5	<.0001
Obesity vs Not	0.7	0.6	0.8	<.0001
Open fracture vs Not	1.8	1.7	1.9	<.0001
Shaft fracture vs Not	16.9	15.4	18.4	<.0001
Neck fractures vs Not	0.6	0.4	0.9	0.014
Displaced fractures vs Not	1.3	1.1	1.5	0.0001
Comminuted fracture vs Not	1.5	1.3	1.7	<.0001
Upper end fracture vs Not	0.7	0.6	0.7	<.0001

Factors Statistically Significantly Associated With Receipt Of IMN in Humerus Fractures

Factors	Odds Ratio	95 % Confidence Interval		p-value
Age	1.0	1.0	1.0	0.025
Procedure year 2019 vs 2007	2.0	1.1	3.7	0.034
Lymphoma vs Not	3.8	2.6	5.5	<.0001
Metastatic cancer vs Not	3.8	2.7	5.5	<.0001
Osteoporosis vs Not	1.7	1.4	2.1	<.0001
Shaft fracture vs Not	4.8	4.0	5.7	<.0001
Neck fractures vs Not	0.5	0.4	0.6	<.0001
Lower end fracture vs Not	0.3	0.2	0.3	<.0001

Rates of IMN Over Years by Fracture Anatomy



Limitations

Temporal relations cannot be made

All measures and factors included were only those available in the claims, from recorded diagnoses for those who have insurance coverage

There may be under-estimation of surgical procedures when patients do not seek care (or are denied access)

- To that end, these data reflect estimated resource use of those who sought care and were covered by one of the many plans in the database

Conclusions

A significant proportion of long bone fractures require surgical repair

In the past 12 years, utilization of IMN for femoral, tibial and humeral fractures have increased and now represent the predominant device used for specific fractures such as shaft fractures

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THANK YOU