

INTRAMEDULLARY NAILING OF HUMERAL FRACTURES: PATIENT CHARACTERISTICS ASSOCIATED WITH POSTOPERATIVE COMPLICATIONS

A. Chitnis, MPharm, PhD¹; J. Ruppenkamp, MS¹; M. Vanderkarr, MS²; C. Sparks, MD³; Y. Grebenyuk³, MD; C. Holy, PhD¹

¹ Johnson & Johnson, Medical Devices Epidemiology, Real World Data Sciences, New Brunswick, NJ, USA

² Health Economics and Market Access, DePuy Synthes, West Chester, PA, USA

³ Medical Affairs, DePuy Synthes, West Chester, PA, USA

INTRODUCTION

- Intramedullary nailing (IMN) is a common procedure for patients with humeral fractures requiring surgery
- The aim of this treatment is anatomic reduction and stable fixation allowing an early function after treatment
- The technology has been utilized for > 50 years and has shown favorable outcomes
- However, limited data are available on postoperative complications following IMN for patients with humeral fractures

OBJECTIVES

To evaluate patient characteristics associated with postoperative complications following IMN for patients with humeral fractures

METHODS

Study Design: Retrospective, observational cohort study

Data Source: Health care claims from the IBM® MarketScan® Commercial database

Study population:

- Patients <65 years of age with humeral fractures during an inpatient admission with surgery requiring IMN between 2007-2019 were identified
- The date of inpatient admission for IMN was defined as index
- Patients with continuous enrollment 6-months pre-index were included
 - Continuous medical enrollment in the pre-index period was required to capture the patient demographic and clinical characteristics
- Patients were excluded if they had prior long bone fractures in the 6 months pre-index period

Outcomes:

Postoperative complications at 365 days post discharge were reported. These included occurrence of nonunion, compartment syndrome (CS), deep infection (DI) and mechanical complication (MC)

Statistical Analysis:

- Means and standard deviations were provided for continuous variables
- Proportions were provided for categorical variables
- Kaplan-Meier survival analyses were performed and the median time to each complication type was reported
- Multivariable Cox proportional hazard model was built to evaluate the factors associated with MC

RESULTS

- The study included 982 patients with humeral fractures requiring IMN
- The mean (standard deviation (SD)) age of the cohort at the index was 48.3 (17.0) and there were 56.6% females (**Table 1**)
- Top three comorbidities among these patients were hypertension (27.9%), osteoporosis (18.1%) and solid tumor without metastasis (16.7%)
- Most patients had few comorbidities at time of index, Charlson comorbidity index: mean: 1.5 (SD: 2.5)

Table 1. Patient demographic and clinical characteristics

	Overall (n=982)
Gender	
Female	56.6%
Age	
Mean (SD)	48.3 (17.0)
Charlson Comorbidity Index	
Mean (SD)	1.5 (2.5)
Geographic Region	
Northeast	14.5%
North Central	19.6%
South	49.3%
West	15.5%
Unknown	1.2%
Year of Procedure	
2007	9.1%
2008	8.5%
2009	9.8%
2010	9.4%
2011	9.3%
2012	8.4%
2013	6.3%
2014	5.5%
2015	6.0%
2016	8.8%
2017	9.1%
2018	8.4%
2019	1.7%

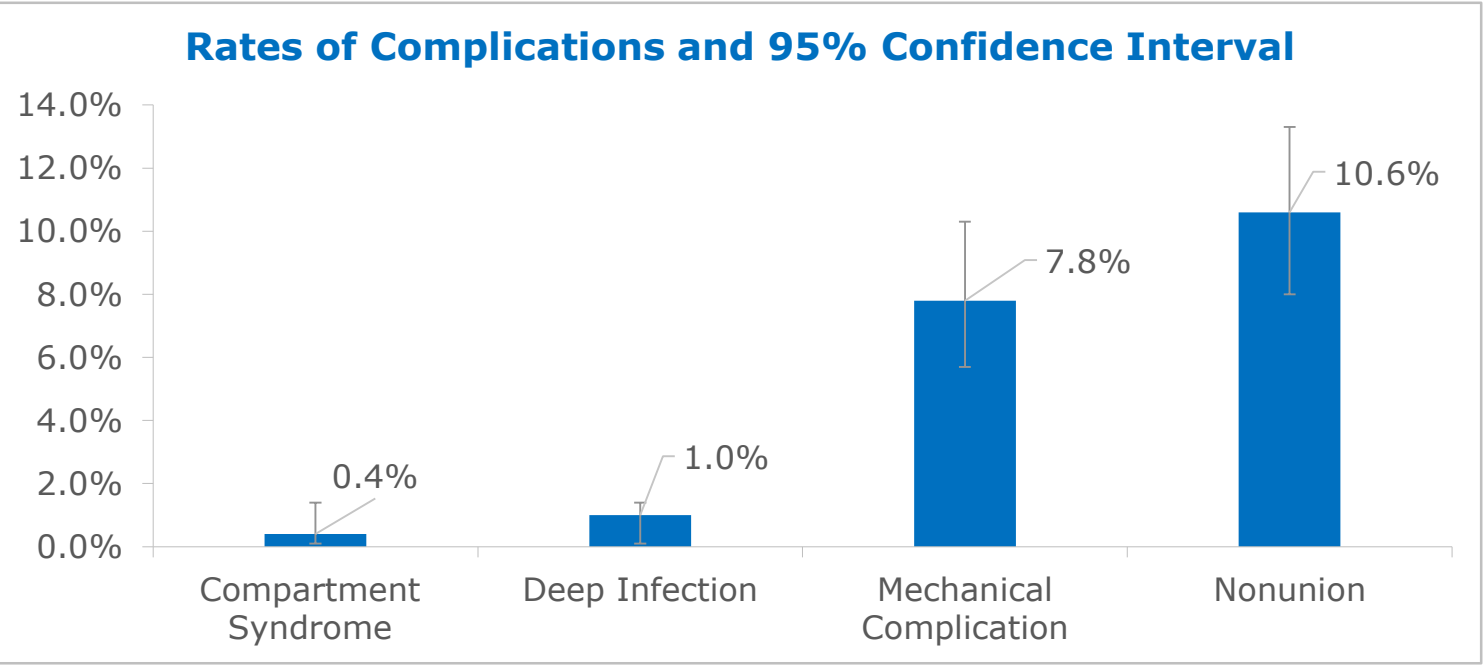
RESULTS

Table 1. Patient demographic and clinical characteristics (cont.)

	Overall (n=982)
Fracture Type	
Open	12.7%
Shaft	71.7%
Neck	12.1%
Lower end	7.9%
Upper end	39.5%
Tuberosity	2.3%
Comorbidities	
Hypertension	27.9%
Osteoporosis	18.1%
Solid tumor without metastasis	16.7%

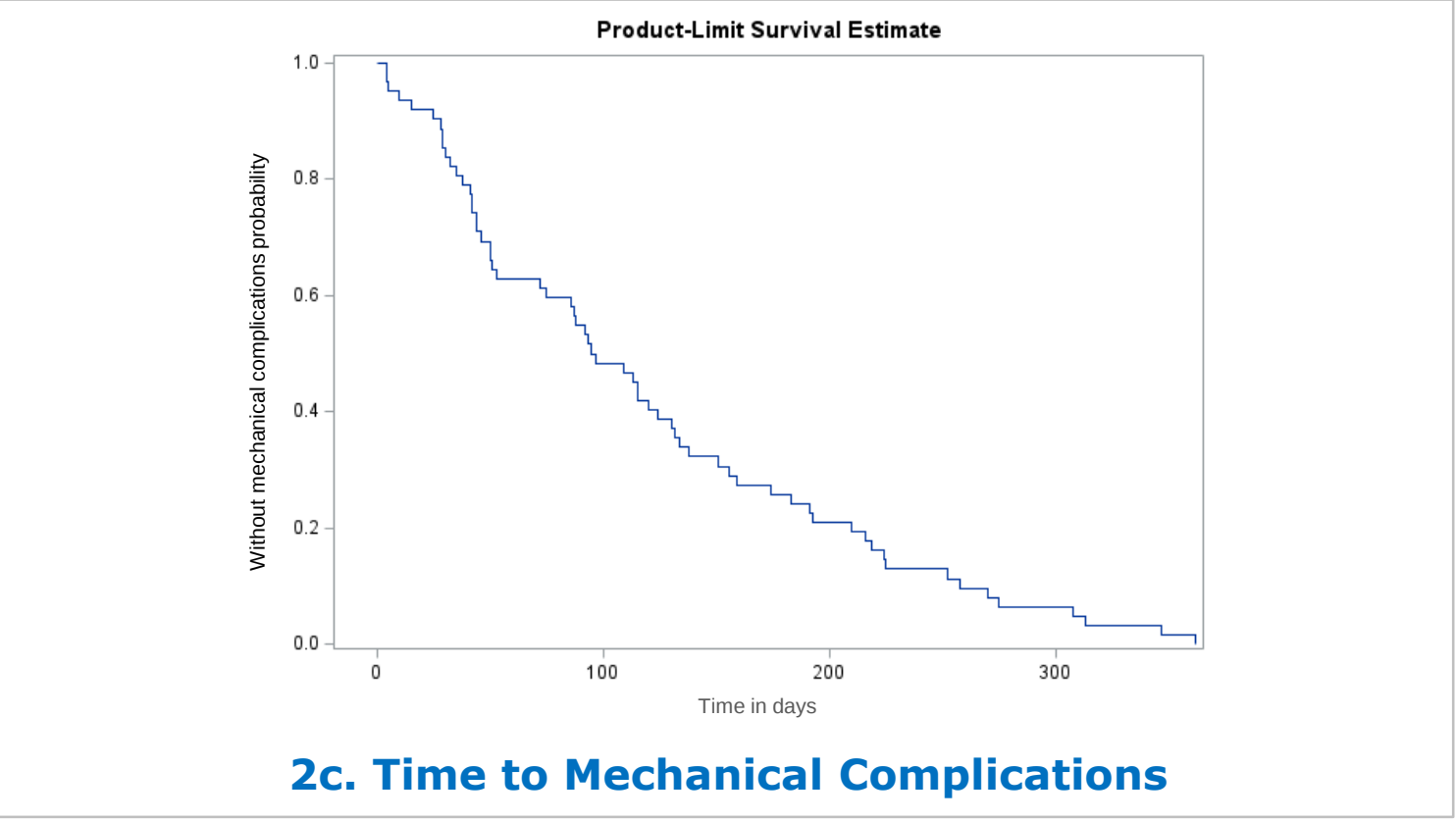
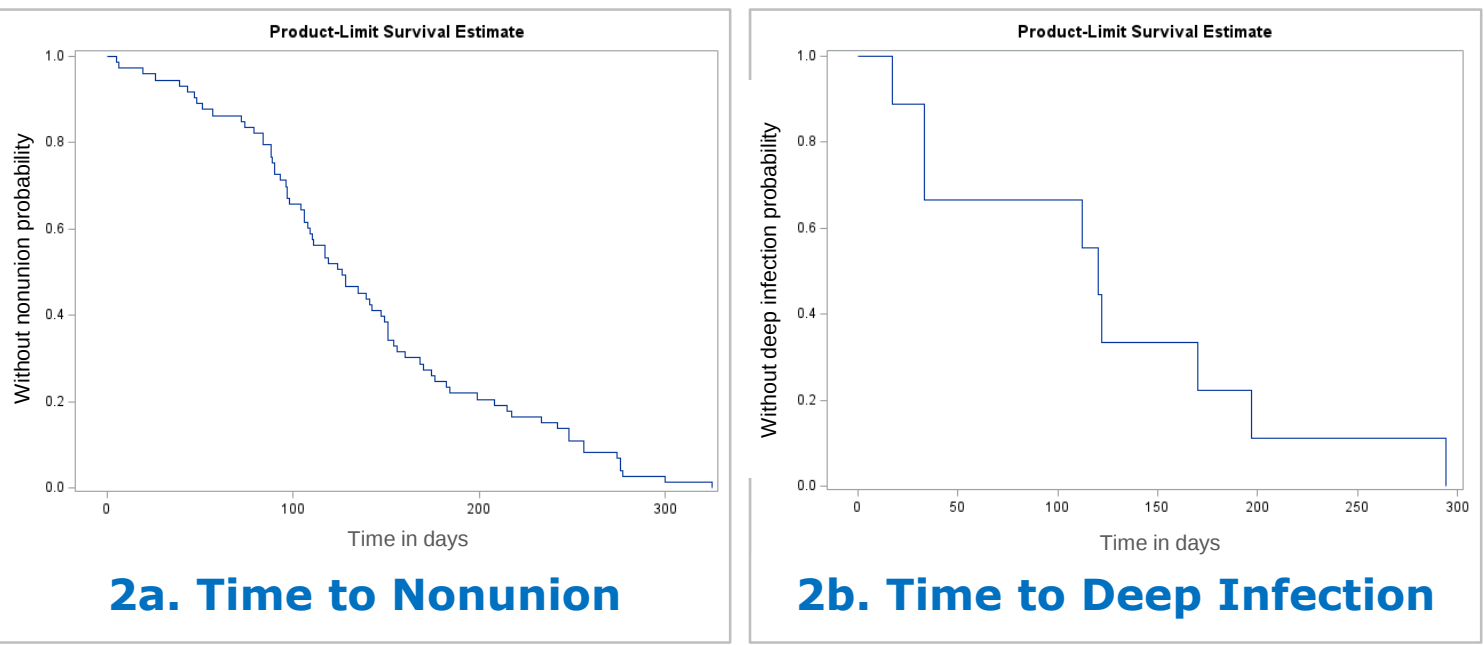
- Among patients with continuous enrollment for 365 days, crude rates over 365 days for CS, DI MC and nonunion rates reached 0.4% (95% confidence interval (CI): 0.1%-1.4%), 1.0% (95% CI: 0.1%-1.8%), 7.8% (95% CI: 5.7%-10.3%), 10.6% (95% CI: 8.0%-13.3%) respectively (**Figure 1**)

Figure 1. Postoperative complications following Intramedullary nailing for patients with humeral fractures over 365 days



- Among patients that had a complication within 365 days, the median time to nonunion was 126 days, DI was 120 days and MC was 96 days (**Figure 2**). Median time to CS was not reported because of the very low counts

Figure 2. Kaplan Meier curves for time to nonunion, DI and MC



- Region, procedure year, depression, neck fractures and upper end fracture of the humerus were significantly associated with MC (**Table 2**)

Table 2. Multivariable Cox proportional hazard models to evaluate the factors associated with MC

	HR	95% CI		p-value
For MC				
North Central vs West	2.87	1.17	7.03	0.0208
Procedure year 2017 vs 2007	0.10	0.01	0.94	0.0435
Neck fracture vs Not	2.30	1.09	4.84	0.0286
Upper end fracture vs Not	1.87	1.08	3.25	0.0259
Depression vs Not	2.85	1.51	5.41	0.0013

CONCLUSION

- Nonunion was the most common complication following fracture treatment with IMN
- Patient characteristics, such as depression and parts of the humerus fracture were associated with increased risks for complications