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Original Research

Trends in Orthopedic Management of Distal Radius Fractures Among Medicare Beneficiaries From 2019 to 2020: A Claims Analysis



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Purpose: Radius and ulna fractures are among the most common fractures. These fractures are managed through operative or nonsurgical treatment, with varying implications in terms of cost and functional outcome. There are few studies that robustly characterize the management of distal radius fractures (DRFs) in the United States during the COVID-19 pandemic. Furthermore, this has not been studied among the Medicare patient population, who are particularly vulnerable to fragility fractures and COVID-19. The purpose of this study is to analyze the services provided to Medicare beneficiaries both before and during the COVID-19 pandemic to determine how procedure volume was affected in this patient population.

Methods: We retrospectively analyzed services using the physician or supplier procedure summary data from the Centers for Medicare and Medicaid Services. All services provided by physicians between January 1, 2019, and December 31, 2020, were included. The data were stratified by US census region using insurance carrier number and pricing locality codes. We also compared data between states that maintained governors affiliated with the Democratic or Republican parties for the duration of the study. **Results:** There was an overall decrease in claims regarding DRFs management from 2019 to 2020. There was a dramatic decline in procedure volume (−6.3% vs −12.9%). Of all distal radius related claims there was a relative increase in the proportion of operatively managed DRFs in 2020, from 50.2% to 52.0%. The Midwest saw the greatest decline in operatively managed DRFs, whereas the West experienced the smallest per-capita decline across all procedures. After separating the data by party affiliation, it was also found that operative and nonsurgical procedure volumes fell more sharply in states with Democratic governors.

Conclusions: This study shows a decrease in DRF procedural volume among Medicare beneficiaries. This data suggests that the operative and nonsurgical management of DRFs may have been affected by pandemic factors such as quarantine guidelines and supply chain or resource limitations. This may assist surgeons and health care systems in predicting how similar crises may affect operative volume.

Type of study/level of evidence: Therapeutic IV.

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Radius and ulna fractures account for 44% of fractures that present in the emergency department.¹ These fractures are managed with operative or nonsurgical treatments, with varying implications in

terms of cost and functional outcome.² Although the COVID-19 pandemic saw an immense effect on the operative capabilities of hospitals and surgical centers, data on the effects of COVID-19 on distal radius fracture (DRF) volume and management are mixed.^{3–6} Although a study from India reported an increasing proportion of operatively managed DRFs, several groups in the United Kingdom reported an increase in nonsurgical management.⁷ It is also unclear whether the increase in nonsurgical management affected complication rates; one study of pediatric patients found increased deformity among pediatric patients with DRFs managed during the pandemic.^{8,9}

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When analyzing DRF management, the Medicare patient population provides valuable information regarding orthopedic care after the onset of COVID-19. Most individuals receiving Medicare coverage are aged 65 years or older, although exceptions exist for those with disabilities, end stage renal disease, or amyotrophic lateral sclerosis.¹⁰ Many patients in this cohort are prone to orthopedic injuries while also being at increased risk of severe illness if infected with SARS-CoV-2.¹¹ To date, most studies of Medicare patients focusing on orthopedic care during the pandemic have been limited to arthroplasty. Indeed, the COVID-19 pandemic substantially affected elective case volumes in the Medicare patient population, with severe revenue loss for hospitals and surgeons in the United States.¹²

Currently, we are not aware of any studies robustly characterizing the management of DRF in the United States during the COVID-19 pandemic. Furthermore, this has not been studied among the Medicare population, who are particularly vulnerable to fragility fractures and COVID-19. Thus, the purpose of this study is to analyze services provided to Medicare beneficiaries both before and during the COVID-19 pandemic to assess how procedure volume was affected in this patient population. We hypothesized that from 2019 to 2020, Medicare claims would show (1) a decrease in the number of operatively managed DRFs and an increase in the number of nonoperatively managed DRFs, and (2) an increase in the number of distal radius malunion corrections and distal radius osteotomies. We also hypothesized that states in the Midwest and South would show a relative increase in the volume of procedures, theorizing that an attenuated pandemic response would minimize the effect on operative capacity.

Materials and Methods

Data Source

After institutional review board approval, we retrospectively analyzed services provided to Medicare beneficiaries using the physician or supplier procedure summary data from the Centers for Medicare and Medicaid Services.¹³ All services provided by physicians between January 1, 2019, and December 31, 2020, were included. For nonsurgical management all specialties were included, whereas for operative management, only hand surgeons were included, given the small number of cases performed by other specialties.

Data Extraction

The physician or supplier procedure summary data includes an itemized list of calendar year Medicare Part B carrier and durable medical equipment fee-for-service claims and is organized by insurance carrier and pricing locality, while sorting claims using Health care Common Procedure Coding System codes. Additional fields specify the number of services that claims were submitted for and the total amounts reimbursed by Medicare. Data regarding operative (20690, 25606, 25607, 25608, and 25609) and nonsurgical (25600, and 25,605) management of DRFs were extracted using current procedural terminology codes. Nonsurgical treatment included closed reduction both with and without manipulation. Data regarding malunion correction and distal radius osteotomy were extracted using current procedural terminology codes 25350, 25400, 25405, 25415, and 25420.

Data were stratified by US census region using insurance carrier numbers and pricing locality codes. We also compared data from states that maintained governors affiliated with the Democratic or Republican parties for the duration of the study. Thus, we excluded data from Washington, DC because it does not have a governor.

Puerto Rico was excluded because it is not considered a US state, and Kentucky was excluded as its Republican governor was replaced by a Democrat in December 2019.

Statistical Analysis

To calculate per-capita rates of claims among Medicare beneficiaries, we used the Centers for Medicare and Medicaid Services data on Medicare enrollment by state and year.¹⁴ For each year studied, we examined the volume of submitted services that were approved by Medicare and the payment made from the Medicare trust fund for each service.

Results

A total of 212,823 claims for management of a DRF were recorded from 2019 to 2020. This included 104,137 claims for nonsurgical management and 108,686 claims for operative management, of which 3.5% were for osteotomies or malunion correction. A total of 125,753 claims were submitted by hand surgeons, 31,362 claims were submitted by hand surgeons, and 2,709 were submitted by plastic surgeons, the remainder were submitted by physicians across a variety of subspecialties (eg, emergency medicine, internal medicine, and family medicine). Among these claims, 42,529 were performed in an ambulatory surgical center; in 2019, this accounted for 19.0% of procedures related to DRF management, and in 2020, this accounted for 21.0% of procedures.

When comparing 2019 with 2020, there was an overall decrease in claims regarding DRF management, from 111,761 to 101,062 (9.6% decrease). There was a decrease in operative-related claims, 56,102 versus 52,584, a decline of 6.3%. This decline was greatest for closed reduction percutaneous pinning (CRPP) and external fixation, which declined by 23.2% and 14.7%, respectively, whereas open reduction and internal fixation (ORIF) declined by 4.3%. The volume of claims for nonsurgical management fell by 12.9% (Table 1). Of all distal radius related claims, there was a relative increase in the proportion of operatively managed DRFs in 2020, from 50.2% to 52.0%. The average reimbursement per claim increased for all procedures studied, with ORIF and external fixation experiencing the largest increase, by 6.1% and 8.3%, respectively. Total reimbursement across all claims for nonsurgical management decreased from \$14,462,027 to \$13,065,701, a decrease of 12.9%. Notably, the overall reimbursement for ORIF increased by 1.48%, to a total of \$52,416,824.

The data was also stratified by US census region. Between 2019 and 2020, the Midwest saw the greatest decline in operatively managed DRFs, 12,784 versus 11,189 (–12.5%) (Fig). After adjusting the number of claims by the population of Medicare beneficiaries in each region in each year, the West experienced the smallest per-capita decline across all procedures. In the Northeast, per-capita rates of operative and nonsurgical management fell by 13.5 and 35.2 procedures per 1,000,000 people, respectively. In the Midwest, they fell by 24.8 and 35.2 procedures per 1,000,000 Medicare beneficiaries, respectively (Table 2).

After separating the data by party affiliation, it was found that claims for operative management fell by 1,315 and 1,882 in states with Republican and Democratic governors, respectively (Table 3). A similar pattern was observed in nonsurgical procedure volume, which fell by 3,315 and 3,502 in states with Republican governors when compared with states with Democratic governors, respectively. This relationship remained after calculating per-capita rates of procedures among Medicare beneficiaries.

There was a 9.4% relative decrease in malunion correction claims and a relative increase in distal radius osteotomy claims of 21.5%. Changes in rates of malunion repair and distal radius osteotomy

Table 1
Annual Trends in DRF Procedure Claims and Medicare Reimbursement

Procedure Type	ORIF	CRPP	External Fixation	Closed Treatment	Osteotomy and Malunion Repair
Procedure volume					
2019	46,368	2,501	5,241	55,659	1,992
2020	44,342	1,920	4,469	48,478	1,853
(%) Change	-4.37%	-23.23%	-14.73%	-12.90%	-7.0%
Reimbursement					
2019	\$51,654,407	\$1,287,978	\$2,056,406	\$14,462,027	\$2,036,208
2020	\$52,416,825	\$1,007,061	\$1,898,298	\$13,065,702	\$1,994,968
(%) Change	1.48%	-21.81%	-7.69%	-9.66%	-2.03%
Reimbursement per claim					
2019	\$1,114.01	\$514.99	\$392.37	\$259.83	\$1,022.19
2020	\$1,182.10	\$524.51	\$424.77	\$269.52	\$1,076.62
(%) Change	6.11%	1.85%	8.26%	3.73%	5.32%

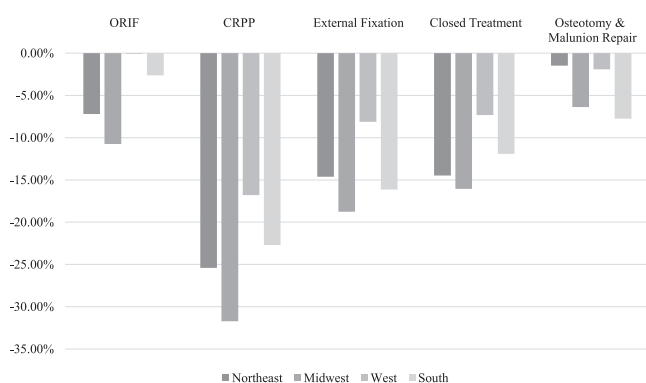


Figure. Percent change in DRF procedure claims from 2019 to 2020. Changes in claim volume were stratified by US census region.

were relatively similar. Rates of distal radius osteotomy increased by 21.1% (+0.33 procedures per 100,000 Medicare beneficiaries), and rates of malunion repair declined by 10.7% (-1.1 procedures per 100,000 Medicare beneficiaries). The South saw the greatest decline in osteotomy and malunion repair, 683 versus 630 (-7.8%). States with Republican governors saw a greater decline in aggregate volume of osteotomy and malunion repair, with 74 fewer (-8.5%) claims when compared with 21 fewer (-2.5%) claims in states with Democratic governors.

Discussion

This study evaluated the effects of the COVID-19 pandemic on the management of DRFs among Medicare beneficiaries. Our findings showed an overall decrease (9%) in claims for DRF management. Notably, there was a relative increase (2.3%) in the proportion of DRFs managed operatively. Among operative procedures, the most notable decreases were observed in CRPP (-23%) and external fixation (-15%), whereas rates of ORIF decreased by 4%. A similar pattern was observed in nonsurgical treatment, with a 13% decrease in the volume of closed reductions with and without manipulation. When evaluating the number of claims based on geography, the West experienced the smallest per-capita decline across all procedures. Furthermore, it was evident that Democratic states showed a greater decline in the volume of operative DRF management. Notably, the number of individuals covered by Medicare increased by 2.1% from 2019 to 2020, with stratified analysis showing that individual regions also showed increases between 1.5% and 2.5%.

The results of this study support our initial hypothesis that operatively managed DRF decreased in 2020 when compared with

2019 for Medicare beneficiaries. The 9.6% decrease in claim volume may reflect the overall decrease in the number of injuries during the COVID-19 pandemic. This was consistent with a study from two trauma centers in Poland, which found fewer adult patients with DRF (103 vs 132) during the COVID-19 pandemic.⁵ These findings may be a result of the strict quarantine guidelines, with fewer DRF fractures occurring while people were confined to their homes. It is also likely that fewer individuals presented to the hospital during the pandemic even if an injury was sustained, as fear of increased exposure to COVID infection could have affected patient decision-making.¹⁵ Furthermore, institutional factors may have limited the potential for various treatments, such as reduced operating room staffing capacity, supply chain limitations, and emergency department resource shunting. Given that hospitals across the nation had surpassed their capacity for critically ill patients, many could only support truly emergent procedures and operations.

Despite the overall decrease in treated injuries, our study found a relative increase in the proportion of DRF treated operatively. Although it is possible that patients with less severe injuries chose not to receive care, the relative increase of ~2% in operatively managed DRF may reflect a lower threshold for operative management. For instance, it is possible that the difficulty of obtaining serial radiographs to monitor reduction during the pandemic, led surgeons to be more aggressive in their surgical management. Studies have shown that regular follow-up during the COVID-19 pandemic was challenging, particularly when there was a need for radiographs during this period.¹⁶ This increase may also be a reflection of the continuing trend toward operative management of these common injuries.¹⁷ Finally, it is also possible that patients who presented with a DRF during this period may have had more severe injuries and were thus more likely to require operative management. This is supported by the increased cost per claim for ORIF and external fixation, perhaps suggesting increased surgical complexity. Our findings are the opposite of those seen in the United Kingdom, where an increase in conservative management of both adult and pediatric radius fractures was seen during the COVID-19 pandemic.^{7,18} The reasons for this remain unclear and merit further study. By contrast, DRF management using CRPP or an external fixator declined because these patients required additional in-person follow-up. Of all the procedures studied, operative treatment saw the largest relative increase, which is consistent with current literature showing increasing rates of ORIF in the treatment of DRF.¹⁷

Notably, although there was a decrease in claim volume for aggregate malunion repair and osteotomy, osteotomy alone increased by 22%. This could be considered a proxy for failed nonoperatively managed DRFs, with an increase reflecting challenges surrounding the close follow-up of nonsurgical fractures, the failure to treat some fractures operatively, and other barriers to

Table 2
Change in DRF Procedure Claims from 2019 to 2020, Adjusted for Region

Procedure Type	ORIF	CRPP	External Fixation	Closed Treatment	Osteotomy and Malunion Repair
2019–2020 change in procedure volume (raw)					
Northeast	–415	–62	–107	–1,706	–4
Midwest	–1,133	–221	–216	–2,303	–25
West	–5	–67	–73	–634	–8
South	–462	–223	–378	–2,400	–53
2019–2020 change in procedure volume per 100,000 Medicare beneficiaries					
Northeast	–4.5	–0.6	–1.1	–16.9	–0.1
Midwest	–9.9	–1.7	–1.8	–19.2	–0.2
West	–1.6	–0.6	–0.7	–6.4	–0.1
South	–3.7	–1.0	–1.8	–12.2	–0.3

Table 3
Change in DRF Procedure Claims from 2019 to 2020, Adjusted for Political Alignment

Procedure Type	ORIF	CRPP	External Fixation	Closed Treatment	Osteotomy and Malunion Repair
2019–2020 change in procedure volume (raw)					
Democratic	–1,165	–233	–463	–3,512	–21
Republican	–666	–331	–244	–3315	–74
2019–2020 change in procedure volume per 100,000 Medicare beneficiaries					
Democratic	–5.0	–0.8	–1.7	–13.1	–0.1
Republican	–4.0	–1.2	–1.0	–13.3	–0.3

musculoskeletal care during the COVID-19 pandemic. It is also possible that this represents the subacute presentation of a DRF resulting in osteotomy, whereas a more acute presentation would have resulted in ORIF.

When analyzing data by US regions, the most notable finding was that the West was least affected by COVID-19, with nearly negligible changes in procedure volumes. Given that the earliest reported SARS-CoV-2 cases in the United States were in the West,¹⁹ it is possible that this region showed considerable lead-time in implementing COVID-19 crisis response plans (eg, implemented in San Francisco over one month previous to the first known case in Massachusetts).²⁰ California was also the first state in the United States to enact a stay-at-home order.²¹ Together, this preparedness may have allowed West Coast medical centers to better accommodate the large increase in patients and maintain baseline operative capacity. In addition, the Western region had better access to the supply chain required for operating room workflow during the pandemic.²² When adjusting for political party, Democratic states saw greater decreases in both operative and nonsurgical management, compared to Republican states. This discrepancy was the greatest when examining ORIF. These findings may reflect party-associated differences in views on COVID-19 restriction policies, with Democrat-led states being more likely to support restriction policies.²³ Although this was outside the scope of this study, it is possible that these views led to less stringent hospital and operating room restrictions in Republican-led states.

There are several limitations to this study including coding errors inherent in large database studies. We are also unable to access individual patient characteristics and cannot analyze outcomes or complications of the different treatments for individual patients. In addition, the data analyzed was sorted by calendar year, not by month, thus does not precisely capture the window of the COVID-19 pandemic (declared by WHO in early March of 2020). Although claims data are subject to yearly changes, we believe that the large changes reported are more likely associated with the COVID-19 pandemic than normal year-to-year variation. This is also consistent with previous literature showing declines in orthopedic procedural volume among Medicare beneficiaries during the COVID-19 pandemic.²⁴ Future analyses could include the longitudinal trends in operative versus nonsurgical management of DRF, the change in procedure volume in

2020, on a month-to-month basis, and the role of Telehealth among Medicare beneficiaries receiving care for DRF. For the purpose of this analysis, we grouped closed treatment with and without manipulation as a nonsurgical category. An alternative approach would have separated these two entities, although this coding may not be as reliable given that reductions are sometimes performed in the emergency department, these would not be captured in this data.

In conclusion, there was an overall decrease in DRF claims from 2019 to 2020 for Medicare beneficiaries. The proportion of DRFs that were managed operatively increased, though it is difficult to ascertain what drove these changes. Furthermore, while distal radius osteotomies remain uncommon, they were performed more often in 2020. Finally, the Western United States was least affected by the decline in procedural volumes, suggesting a potential regional difference in orthopedic management during the COVID-19 pandemic.

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