



# National Trends in Lumbar Total Disc Replacement Utilization in the Treatment of Lumbar Degenerative Disc Disease from 2010- 2017



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## Objective

Analyze nationwide trends in the utilization of lumbar total disc replacement and lumbar fusion in the surgical treatment of lumbar degenerative disc disease from 2010-2017.

## Background

Lumbar degenerative disc disease (LDDD) is a medical condition with high life-time prevalence often described as roughly 40% by age 40 and 80% by age 80.<sup>1,2</sup> In patients with LDDD related low back pain unresponsive to conservative treatment, lumbar fusion (LF) techniques are the gold standard for surgical treatment. Between 2000-2009, 380,305 patients underwent surgical treatment of LDDD, with a 2.4-fold population adjusted increase from 2000 to 2009.<sup>3</sup> In 2004 lumbar total disc replacement (LDR) was approved in the United States as an alternative surgical treatment for LDDD. In the period of 2005-2009, LDR was performed in 2.7% of surgeries for LDDD.<sup>3</sup> There has been limited study of LDR utilization and treatment of LDDD over recent years.

## Methods

The National Inpatient Sample was queried for all patients having undergone primary single level LDR and LF for LDDD from 2010-2017 using ICD-9 and ICD-10 Codes. The National Inpatient Sample represents a 20% weighted sample of hospital discharges in the United States. Data extracted included total number of surgeries, patient characteristics, hospital characteristics, length of stay, complications, and costs. Weights were used to calculate national trends. Significant regression results were defined as having  $P < 0.0001$ .

## Results

- Over the course of 2010-2017 a total of 4,838 (1%) and 502,425 (99%) primary single level LDR and LF procedures were performed for LDDD. (Table 1)
- The proportion of LDR treatment decreased from 1.3% in 2010 and 2011 to 0.7% in 2016 and 2017 ( $p < 0.0001$ ) while overall LDR treatment decreased by 48.4% from 1066 in 2010 to 550 in 2017. (Figure 1/Table 1)
- Annual rates of surgical treatment for LDDD declined yearly from 80,446 procedures in 2010 to a low of 50,085 procedures in 2014 before rising to near 2010 levels at 76,645 total procedures in 2017. (Table 1)
- Patients age 55 and older are less likely to receive LDR than younger patients ( $p < 0.0001$ ). (Table 2)

## Results Continued

- Proportion of surgical treatment with LDR varied regionally (west:1.9%, Northeast:0.8%, South: 0.7%, Mid-West:0.7%).
- Patients with private insurance were more likely to receive LDR than patients with Medicare (OR 2.01,  $p < 0.0001$ ). (Table 2)
- Patients with higher Elixhauser Comorbidity Index were less likely to receive LDR (OR for ECI 1-4 relative to 0: 0.62,0.54,0.3,0.22,  $p < 0.0001$ ).
- The expected length of stay for LDR patients was shorter than LF patients by 0.48 days ( $p < 0.0001$ ) all other factors held constant.
- LDR patients had a lower rate of overall complications (OR 0.76,  $p < 0.05$ ), transfusion (OR 0.686,  $p < 0.05$ ), and neurological complications (OR 0.66,  $p < 0.05$ ) than LF patients.
- The expected costs for LDR patients were \$20,235 less than for LF patients ( $p < 0.0001$ ) all other factors held constant.
- LDR patients had a lower odds of discharge to facility than LF patients (OR 0.45,  $p = 0.0015$ ).

FIGURE 1: Proportion of LDR in Surgical Treatment of LDDD, 2010-2017

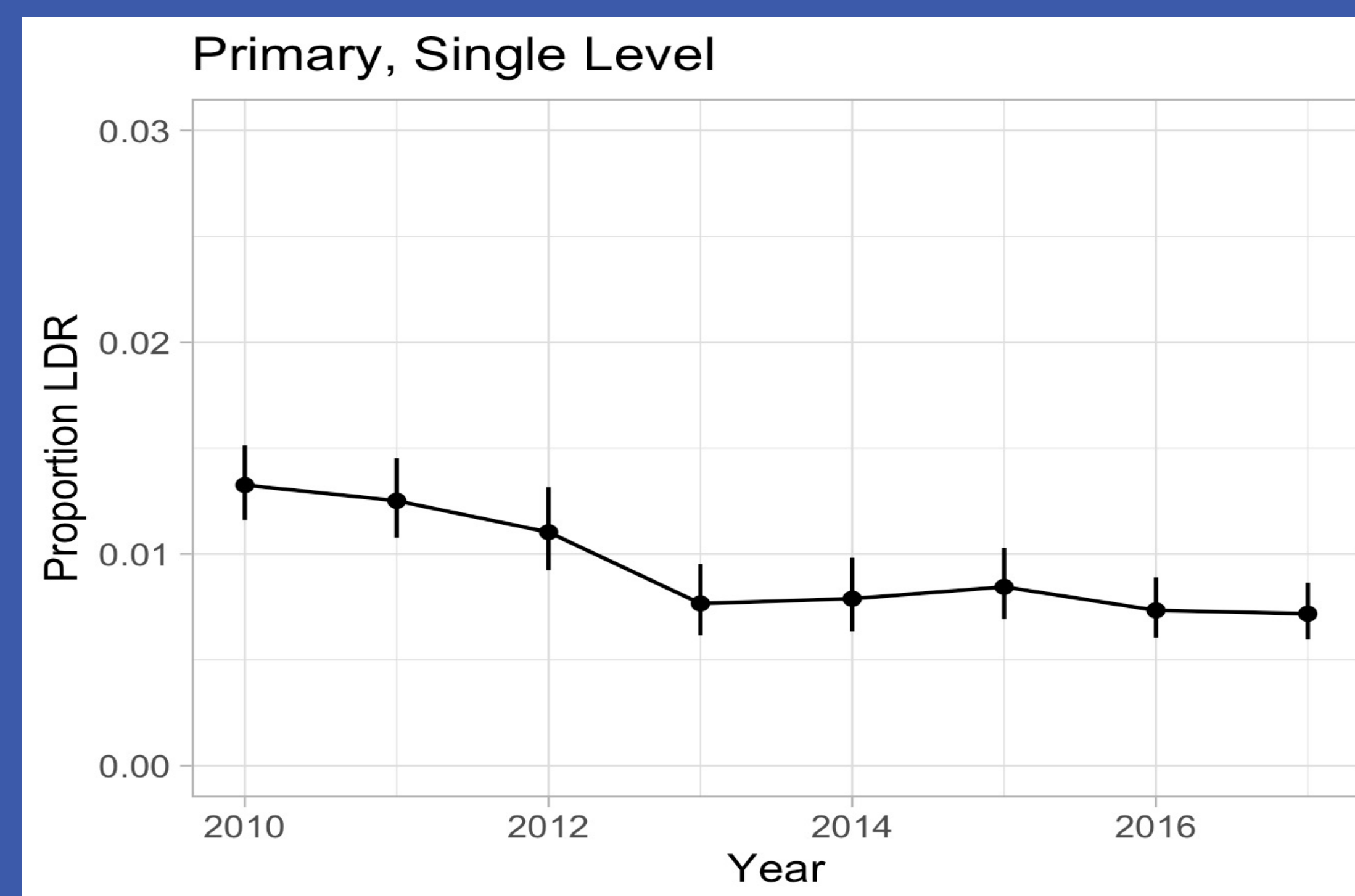


Table 1: Yearly Totals and Proportions of LDR and LF Surgical Treatment for LDDD from 2010-2017

	2010	2011	2012	2013	2014	2015	2016	2017	Total
Fusion	79380 (98.7%)	65230 (98.7%)	54250 (98.9%)	51825 (99.2%)	49690 (99.2%)	56950 (99.2%)	69005 (99.3%)	76095 (99.3%)	502425 (99%)
LDR	1066 (1.3%)	827 (1.3%)	605 (1.1%)	400 (0.8%)	395 (0.8%)	485 (0.8%)	510 (0.7%)	550 (0.7%)	4838 (1%)
Yearly Total	80446	66057	54855	52225	50085	57435	69515	76645	507263

Table 2: Regression Analysis of LDR Predictors

variable	Odds Ratio	CI	P-value
Intercept	0.01	(0, 0.01)	$P < 0.0001$
Age			
< 55	Reference		
55-64	0.16	(0.12, 0.21)	$P < 0.0001^*$
65-74	0.08	(0.04, 0.14)	$P < 0.0001^*$
75+	0.06	(0.02, 0.15)	$P < 0.0001^*$
Race			
White	Reference		
Black	0.97	(0.73, 1.29)	0.852817
Hispanic	0.91	(0.71, 1.16)	0.427665
Other	1.5	(1.13, 1.99)	0.004134
Payer			
Medicare	Reference		
Private	2.01	(1.43, 2.81)	$P < 0.0001^*$
Medicaid	1.37	(0.91, 2.06)	0.130694
Other	3.23	(2.28, 4.58)	$P < 0.0001^*$
Hospital Type			
Rural	Reference		
Urban Non-Teach	1.66	(1.11, 2.48)	0.013019
Urban Teaching	1.39	(0.93, 2.08)	0.102956
Hospital Region			
Midwest	Reference		
Northeast	0.94	(0.72, 1.23)	0.647418
South	0.95	(0.76, 1.18)	0.621235
West	2.88	(2.34, 3.56)	$P < 0.0001^*$

## Conclusions

From 2010-2017, the utilization of LDR in the treatment of LDDD declined from a proportion of 1.3% of surgeries in 2010-11 to 0.7% in 2016-17. Younger age (<55), private health insurance, lower ECI, and residence in the western United States correlate with higher odds of receiving LDR. From this data it may be reasonably inferred that some surgeons are moving away from use of the LDR procedure in the treatment of LDDD.

## Limitations

In 2015 the International Classification of Disease coding system transitioned from the use of ICD-9 to ICD-10 codes. ICD-10 provides a much greater variety of depth in how diagnoses and procedures are classified. Because of this a different set of codes were used from 2010-Q3 2015 than in Q4 2015 -2017 which may lead to a slight difference in the patient populations captured in our analysis.

## References

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