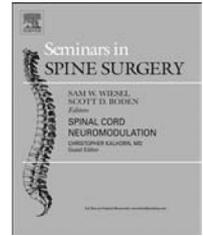
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# Changes in the care of spine surgical patients following health reform in Massachusetts: A review of the literature

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## ABSTRACT

**Objectives:** The purpose of this manuscript is to summarize the impact of the Massachusetts Health Care Reform (MHR) on spine surgical care. **Findings:** The MHR improved insurance coverage across Massachusetts for the plurality of surgical specialties including spine surgery. However, rates of surgical interventions for spine patients remained unchanged post-reform. Quality measures of healthcare such as length of stay, failure to rescue, mortality, and complication rates were reduced among patients who sustained cervical spine fractures. **Conclusions:** The MHR improved insurance coverage for spine care, however the rates of spine surgical intervention remained stable. Further research is needed to explore the impact of the reform on cost savings for spine care and to confirm these quality of life improvements for other spinal conditions.

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## Introduction

In 2006, Massachusetts became one of the first states to require universal health insurance coverage among all residents by passing Ch. 58, An Act Providing Access to Affordable, Quality, Accountable Health Care (otherwise known as the Massachusetts Health Care Reform [MHR], colloquially known as Romneycare). Four years later, the federal Patient Protection and Affordable Care Act (PPACA), colloquially known as Obamacare, was signed into law. Much of the PPACA was modeled on the reforms enacted in Massachusetts in 2006.<sup>1</sup> The MHR paralleled the aims of the Affordable Care Act (ACA) in improving access to care, enhancing quality and decreasing costs.<sup>2–6</sup> Recently implemented provisions that strive to achieve such goals include the establishment of Accountable Care Organizations (ACOs), bundled-payment programs and pay for performance initiatives.<sup>2,3,5–8</sup> The MHR

has been used as an analogous model for the ACO expansion since it shared similar aims and was implemented years earlier. The purpose of this article is to review the MHR's impact on surgical care, and more specifically, the impact on spine surgical care.

## Massachusetts Health Reform (MHR)

The primary stated intent of the MHR was to decrease financial barriers of health care for all citizens of Massachusetts. By 2008, more than 96% of Massachusetts residents had health insurance. Patient reported access to care was improved and the burden of out-of-pocket costs was reduced, particularly for lower-income residents.<sup>9,10</sup> Although more citizens were covered by health insurance and costs were reduced, questions were still being raised about how this translated to patient care.

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Massachusetts lawmakers postulated that by improving access to primary care physicians, there would be a marked decrease in unwarranted and expensive emergency department (ED) visits. Furthermore, this would lead to an increase in the initiation of preventative health care measures. The MHR also specifically sought to initiate the first formalized step toward reimbursing hospitals and providers who cared for the uninsured. Overall, the MHR increased access to health care, encouraged primary care use and attempted to mitigate unnecessary hospital visits.

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## Orthopaedic surgery

The anticipated benefits of the MHR on primary care groups was clear. However, the impact of the MHR on surgeons was unknown until recently. Preliminary research maintained that the MHR increased insurance coverage for surgical procedures, increased rates of surgical interventions and reduced mortality.<sup>11–17</sup> Although there was a trend toward increased rates of surgery following implementation of the MHR, it is unclear how this applies to specific specialties and subgroups. Insurance expansion may yield greater utilization of surgery for all specialties. Alternatively, the rates of surgery may vary for specific cases (i.e. emergent vs. elective), procedures (i.e. spinal fusion vs. laminectomy) and patient populations (i.e. degenerative spine vs. trauma).

The preliminary impact of the MHR yielded moderate improvements in insurance coverage among multiple groups of patients undergoing orthopaedic surgery. Earp and colleagues investigated insurance rates among orthopedic hand surgery patients in a level one academic trauma center.<sup>18</sup> These investigators found that the number of encounters with uninsured patients decreased by approximately 2%, while encounters with privately insured patients increased by approximately 3.5%. However, no significant change in the percentage of patients with state sponsored Medicaid (MassHealth) was appreciated.

The percentage of uninsured patients presenting for treatment of orthopaedic traumatic injuries was also found to be positively impacted by the MHR.<sup>19</sup> For example, Toussaint and colleagues investigated the effect of the MHR on the number of uninsured individuals treated for orthopaedic trauma at three of the four level one trauma centers in Boston, MA.<sup>20</sup> There was a significant reduction in the uninsured rate from 23.8 to 14.4% following the MHR ( $p < 0.001$ ). There was also a concomitant decrease in the proportion of uncompensated care from 16.7 to 11.5%. The authors concluded that there was an estimated 40% reduction in the rate of uninsured individuals within the orthopaedic trauma population in metropolitan Boston following the MHR. It appears that orthopaedic trauma benefitted from the MHR, however orthopaedic subspecialties performing predominantly elective surgical care were still unaddressed.

Kurtz et al. attempted to answer this question within a population of patients undergoing total joint arthroplasty.<sup>21</sup> Their work revealed that the period of health insurance expansion in Massachusetts was associated with a greater proportion of patients covered by government programs for low income individuals including Medicaid, Commonwealth Care, and Health Safety Net. However, they found minimal change in

the payer mix, rate of surgical intervention and cost for joint replacement surgeries compared to national trends. Kurtz and colleagues concluded that despite extending insurance coverage for all citizens of Massachusetts, there was little change in actual utilization trends for joint replacement.

In summary, the MHR reduced the number of uninsured orthopaedic surgery patients in trauma, hand and joint replacement. However, there was minimal change in the payer mix and cost associated with joint replacement surgery. Furthermore, it is still unclear how the MHR affects quality of care and costs across all subspecialties of orthopaedic surgery. Although there was insurance expansion among all populations reviewed, the number of uninsured orthopaedic trauma patients, at a minimum, still remained high (14.4%).

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## Spine care

There was a concern that the MHR would negatively impact the delivery of spinal care, limiting the types of surgical interventions offered to patients, impairing outcomes and penalizing centers that treated largely underserved populations. In financial reform models, spine surgery is a commonly targeted subspecialty due to the relatively high volume of procedures performed annually and cost per episode. The most flexible spending within spine surgery involves the cost of implants and technology used during the procedure, post-operative length of hospital stay, and readmissions.

The first investigation regarding the impact of the MHR on spine care was conducted by Ellimootil and colleagues using the SID for Massachusetts and control states (New York and New Jersey).<sup>15</sup> New York and New Jersey were used as control states because of their close geographic proximity to Massachusetts and relatively similar demographic composition. The researchers compared inpatient surgical rates for discretionary and nondiscretionary surgical procedures and used “back surgery” as a subgroup of their analysis. The authors found that post-reform, back surgery rates were unchanged from pre-reform levels ( $p = 0.28$ ). Since spine surgery was not the emphasis of this study, further research was required to confirm this preliminary result (Table 1).

At the time of this writing, only one study has specifically focused on the impact of the MHR on spine surgical care. Schoenfeld et al. investigated changes in the environments of care, hospital processes and quality on cervical fractures in the setting of the MHR using the SID (State Inpatient Dataset) for Massachusetts.<sup>22</sup> The SID for Massachusetts was an appropriate dataset for the investigation since it captures relevant inpatient data across all non-Federal healthcare facilities within the state.<sup>17</sup> Schoenfeld et al. maintained that patients with cervical fractures represented an ideal population for study since the condition is non-discretionary with relatively high rates of morbidity and mortality. As a result, care provided to individuals with cervical spine fractures was felt to be more sensitive to changes in quality of care potentiated through the MHR. The authors found that the rates of surgical intervention remained unchanged pre- and post-reform. However, hospital length of stay and the FTR (failure to rescue) rate among surveillance insensitive complications were significantly reduced following health reform. Furthermore,

**Table 1 – Summary of the influence of Massachusetts Health Reform (MHR) on aspects of spine surgical care.**

Authors	Dataset used	Rate of spine surgical interventions	Rate of uninsured patients	Mortality	Complications	Failure to rescue	Length of stay
Elimoottil et al. (2014) <sup>15</sup>	State inpatient dataset (MA, NJ, NY)	Unchanged ( $p = 0.28$ )	N/A	N/A	N/A	N/A	N/A
Schoenfeld et al. (2015) <sup>22</sup>	State inpatient dataset (MA)	Unchanged ( $p = 0.25$ )	N/A	Decreased 22%* ( $p = 0.04$ )	Decreased 30%* ( $p = 0.03$ )	Decreased 40%* ( $p = 0.01$ )	Decreased 4.3 hs ( $p < 0.001$ )
Villeli et al. (2017) <sup>23</sup>	State inpatient dataset (MA, NY)	Unchanged ( $p = 0.68$ )	Decreased ( $p = 0.0001$ )	N/A	N/A	N/A	N/A

Note: \*Academic centers (not including safety net hospitals).

post-reform academic centers experienced a 22% reduction in mortality, a 40% decrease in FTR, a 30% decrease in surveillance insensitive complications and a 67% reduction in FTR after surveillance insensitive morbidity. Lastly, length of stay was reduced by approximately 4.3 h in the post-reform period, similar to previous research in post-reform vascular surgery patients.<sup>16</sup> With respect to the translatability of the study results, Schoenfeld and co-authors opined that it remained unclear as to whether similar quality of care alterations could be anticipated in non-spinal orthopaedic trauma, or in other procedures specific to spine surgery. In summary, the period following the MHR led to significant improvements in hospital process and quality measures around the care of patients with cervical spine fractures.

Villelli and colleagues also examined neurosurgical case volume and reimbursement for physicians using the Massachusetts SID.<sup>23</sup> After 2008, there was a decline in the number of uninsured patients who underwent neurosurgical spine procedures in Massachusetts. Although spine case volume increased after the new reform, the rate at which it increased was not different from the pre-reform trajectory. The authors concluded that the MHR did not increase spine surgical procedure volume within Massachusetts, similar to the findings for orthopaedic surgical populations.<sup>21,22</sup> In summary, spine surgery rates appear to be stable, in contrast to the consensual evidence from other surgical specialties.<sup>11–17</sup> This may be explained by the predominantly elective nature of spine surgical care. It is also plausible that spine surgery may be affected differently than other surgical specialties, as it often treats less acute pathology.

Villelli and colleagues performed a subsequent study that investigated the impact of the MHR on spine surgery patient payer-mix and age.<sup>24</sup> The authors analyzed 81,821 spine surgeries performed in Massachusetts and 248,757 in New York, which was again used as a control. After 2008, there was a decrease in patients receiving spine surgery who were uninsured or covered by private insurance. There was also an increase in Medicare coverage for Massachusetts, while Medicaid case numbers remained unaltered. These results correlated to an increase in the overall number of surgeries performed in patients 65–84 years old, with a reduction in surgeries for those 18–44. New York State demonstrated an increase in surgical interventions across all insurance categories and adult age groups. Within the spine surgical field, the primary shift in payer mix can be explained by the aging population transitioning from a privately insured and uninsured status to Medicare. A reduction in surgical procedures performed among the uninsured and a concomitant increase in Medicare coverage for surgical patients implies enhanced reimbursement for surgeons and hospitals in theory. Villeli et al. concluded that universal health care did not impede access to spine surgical care or reimbursements to spine surgeons.

An important variable that was largely ignored across most of these was the cost savings resulting from the MHR. Some researchers believe that modest savings could be achieved if legislation was passed to better align patient and provider expectations. For example, in a study evaluating variation in Medicare payments for episodes of lumbar spine surgery, Schoenfeld et al. reported that large amounts of discretionary spending were associated with post-procedural care.<sup>5</sup> Moreover, this was magnified in the setting of complex surgical

procedures, such as interbody fusion. Streamlined and standardized post-surgical care pathways, as well as increased stringency with respect to the use of more intensive spine surgical procedures would likely be necessary to facilitate financial success among spine surgical providers participating in both state and national health reform efforts.<sup>5,25</sup> The ability of changes associated with MHR to alter the use of discretionary spine surgical procedures has yet to be examined but suggests a further important line of research.

The consensus of the papers reviewed here is mixed regarding the generalizability of MHR to national health reform. The MHR provides a natural experiment to observe the effects of universal health care on spine surgical practice, however there are several gaps in the literature and methodological limitations need to be considered as well. The variables addressed in the studies reviewed are limited to the datasets employed and most details were overwhelmingly derived from the SID. This dataset lacks clinical granularity and restricts outcome surveillance to the period leading up to hospital discharge. Reliance on the SID also carries the potential for misinformation, including errors in coding or incomplete diagnoses. There was also variability in the hypotheses investigated, specifically for spine care, and more research is thus necessary with a larger scope to corroborate the evidence presently available.

In conclusion, the MHR improved insurance coverage among recipients of spine surgery, however procedural rates remained relatively static. Further research is needed to better understand the impact of the reform on cost savings for spine surgical procedures and to confirm the putative improvements in care delivery appreciated among patients treated for certain spinal conditions.

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