2015 National Neurosurgery Quality & Outcomes Database (N²QOD-Spine Care)  
Qualified Clinical Data Registry (QCDR)  
Non-PQRS Measures Specification

N²QOD Spine Care Measure #1  
Spine Pain Assessment

National Quality Strategy (NQS) Domain: Person and Caregiver-Centered Experience Outcomes

PQRS # / NQF #: Non-PQRS; PQRS 131, NQF 420 and PQRS 109-modification

Measure Type (Process/Outcome): Outcome

DESCRIPTION:  
Percentage of patients aged 18 years and older with documentation of a pain assessment through discussion with the patient including the use of a standardized back or neck pain tool(s) at baseline and 3 months following index therapy for treatment of spine related pain symptoms AND documentation of follow-up plan

DENOMINATOR: N²QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:  
Number of patients aged 18 years and older with documentation of a pain assessment through discussion with the patient including the use of a standardized back or neck pain tool(s) at baseline and 3 months following index therapy for treatment of spine related pain symptoms AND documentation of follow-up plan

RATIONALE:  
Spine related pain is a highly prevalent and disabling condition. Approximately one quarter of adults in the United States reported at least 1 full day of low back pain over a 3 month span, and low back pain accounts for 2.3-2.8% of all physician visits.¹² Low back pain alone represents the most expensive cause of work-related disability in the United States.¹ A recent analysis of 4,970 patients enrolled in the N²QOD Spine Registry found significant levels of baseline spine pain in patients scheduled to undergo elective spine surgery (average pain score 6.5 on a scale of 1-10).³ Significant improvements in back pain have been reported following surgery for a variety of lumbar spine conditions.⁴⁻⁸ Further, these studies have established the minimal clinically important change in back pain scores following surgery, representing a threshold to distinguish meaningful patient improvements.⁴⁻⁸ Given the prevalence and debilitating nature of spine related pain, accurate assessment of patients’ spine discomfort pre and post therapy is essential to assess the impact of interventions and make appropriate plans for continuing care.

REFERENCES:  


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**N°QOD Spine Care Measure #2**  
Extremity (Radicular) Pain Assessment

**National Quality Strategy (NQS) Domain:** Person and Caregiver-Centered Experience Outcomes

**PQRS # / NQF #:** Non-PQRS; PQRS 131, PQRS 109-modification

**Measure Type (Process/Outcome):** Outcome

**DESCRIPTION:**  
Percentage of patients aged 18 years and older with documentation of a pain assessment through discussion with the patient including the use of a standardized leg or arm pain tool(s) at baseline and 3 months following index therapy for treatment of spine related pain symptoms AND documentation of follow-up plan

**DENOMINATOR:** N°QOD QCDR Patients, See Appendix 1

**DENOMINATOR EXCLUSIONS/EXCEPTIONS:** See Appendix 1

**NUMERATOR:**  
Number of patients aged 18 years and older with documentation of a pain assessment through discussion with the patient including the use of a standardized leg or arm pain tool(s) at baseline and 3 months following index therapy for treatment of spine related pain symptoms AND documentation of follow-up plan

**RATIONALE:**  
Extremity pain related to spinal disorders (i.e., radicular pain) is a highly prevalent and disabling condition. Lumbosacral radicular pain alone has been estimated to have an annual prevalence of 10-25% in the general population. A recent analysis of 4,970 patients enrolled in the N°QOD Spine Registry found significant levels of patient reported baseline radicular pain in patients scheduled to undergo elective spine surgery (average pain score 6.9 on a scale of 1-10). Significant improvements in radicular pain have been reported following surgery for a variety of lumbar spine conditions. Further, these studies have established the minimal clinically important change in radicular pain scores following surgery, representing a threshold to distinguish meaningful patient improvements. Given the prevalence and debilitating nature of radicular pain, accurate assessment before and after therapy is essential to assess the impact of interventions and make appropriate plans for continuing care.

**REFERENCES:**  


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**N²QOD Spine Care Measure #3**

**Functional Outcome Assessment for Spine Intervention**

**National Quality Strategy (NQS) Domain:** Person and Caregiver-Centered Experience Outcomes

**PQRS #: NQF #:** Non-PQRS; PQRS 220, PQRS 223, PQRS 182, PQRS 109, PQRS 217, PQRS 218, PQRS219 and NQF 0422,0423,0424 modification

**Measure Type (Process/Outcome):** Outcome

**DESCRIPTION:** Percentage of patients aged 18 years and older undergoing index spine therapy (s) who completed baseline and 3-month follow up (patient reported) functional outcome assessment

**DENOMINATOR:** N²QOD QCDR Patients, See Appendix 1

**DENOMINATOR EXCLUSIONS/EXCEPTIONS:** See Appendix 1

**NUMERATOR:** Number of patients aged 18 years and older undergoing index spine therapy (s) who completed baseline and 3-month follow up (patient reported) functional outcome assessment

**RATIONALE:** Degenerative spine disease is recognized as a leading cause of disability in society¹, and low back pain is the most expensive cause of work-related disability in the United States.² Measures of spine-related patient disability have been established and validated.³ A recent analysis of 4,970 patients enrolled in the N²QOD Spine Registry found significant levels of patient reported baseline functional impairment in patients scheduled to undergo elective spine surgery (average disability index 50 (severe disability))).⁴ Improvements in disability scores following spine surgery have been demonstrated in a number of conditions.⁵⁻¹¹ One multicenter study investigated the outcomes of treatment for lumbar
spinal stenosis, which represents the most common indication for surgery in patients over 65 years old. In an astreated analysis of 654 patients with 4-year follow-up, functional disability was found to be significantly reduced in patients undergoing surgery compared those treated without surgery. Given the prevalence, socio-economic impact and relative severity of spine related functional impairment, accurate assessment of patients’ functional status pre and post therapy is essential to assess the impact of interventions and make appropriate plans for continuing care.

REFERENCES:

N²QOD Spine Care Measure #4
Quality of Life Assessment for Spine Intervention

National Quality Strategy (NQS) Domain: Person and Caregiver-Centered Experience Outcomes

PQRS # / NQF #: Non-PQRS

Measure Type (Process/Outcome): Outcome
DESCRIPTION:
Percentage of patients aged 18 years and older undergoing index spine therapy (s) who completed baseline and 3-month follow up (patient reported) quality of life assessment

DENOMINATOR: N²QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older undergoing index spine therapy (s) who completed baseline and 3-month follow up (patient reported) quality of life assessment

RATIONALE:
Patient reported quality of life is increasingly recognized as an important tool to allow clinicians to assess the effectiveness of various therapies, particularly when combined with traditional clinical measures of health. Impaired quality of life is commonly caused by spinal disorders, and routine use of quality-of-life instruments along with other patient reported outcomes tools has been recommended in association with spine therapies. A recent analysis of 4,970 patients enrolled in the N²QOD Spine Registry found significantly diminished levels of baseline patient reported quality of life (average baseline EQ-5D 0.54 on a scale of 0-1 where 0 is the worst) in patients scheduled to undergo elective spine surgery. Improvements in quality of life measures following spine surgery have been demonstrated in a number of conditions. One multicenter study investigated the outcomes of treatment for lumbar spinal stenosis, which represents the most common indication for surgery in patients over 65 years old. In an as-treated analysis of 654 patients with 4-year follow-up, quality of life was found to be significantly improved in patients undergoing surgery compared those treated without surgery. Given the prevalence, and relative severity of spine-related impairment of quality of life, accurate assessment of patients’ self-reported QOL pre and post therapy is essential to assess the impact of interventions and make appropriate plans for continuing care.

REFERENCES:


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**N²QOD Measure #5**

**Patient Satisfaction with Spine Care**

**National Quality Strategy (NQS) Domain:** Person and Caregiver-Centered Experience Outcomes

**PQRS # / NQF #:** Non-PQRS, PQRS 304 modified

**Measure Type (Process/Outcome):** Outcome

**DESCRIPTION:**
Percentage of patients aged 18 years and older undergoing index spine therapy (s) who completed 3-month follow up (patient reported) satisfaction with care assessment

**DENOMINATOR: N²QOD QCDR Patients, See Appendix 1**

**DENOMINATOR EXCLUSIONS/EXCEPTIONS:** See Appendix 1

**NUMERATOR:**
Number of patients aged 18 years and older undergoing index spine therapy (s) who completed 3-month follow up (patient reported) satisfaction with care assessment

**RATIONALE:**
Patient satisfaction represents a subjective assessment of a patient’s overall healthcare experience, and has emerged as a common outcome measure following spine surgery.¹ In part due to its ease of assessment, both healthcare organizations and third-party payers have used patient satisfaction as a proxy for quality of care.¹² Further, The Joint Commission on Accreditation of Healthcare Organizations has identified patient satisfaction as an important measure and suggests that it be used for accreditation purposes.³ A recent analysis of 4,970 patients enrolled in the N²QOD Spine Registry found significant improvements in patient-reported satisfaction after elective spine surgery, although almost 20% of patients reported less than satisfactory experiences.⁴ While there is some evidence that patient satisfaction may not be a valid means of assessing quality⁵, other studies have found positive correlations between patient satisfaction and other measures of pain and disability.⁶ Given the increased interest in patient satisfaction, studies have more recently sought to determine what factors contribute to these scores. At least two such studies have now found that one important factor in improving patient satisfaction following surgery is accurately establishing realistic patient expectations prior to surgery.⁷⁸ Given the increasing relevance of satisfaction metrics in advancing patient-centered measures health-care services, along with improvement opportunities identified in a large national clinical data
program, accurate assessment of patients’ self-reported satisfaction with care pre and post therapy is essential to assess the impact of interventions and make appropriate plans for continuing individual care along with improving systemic aspects of care.

REFERENCES:

N2QOD Spine Care Measure #6
Spine-related procedure site infection

National Quality Strategy (NQS) Domain: Effective Clinical Care

PQRS # / NQF #: Non-PQRS; NQF 0130 PQRS 357, 165 Modification

Measure Type (Process/Outcome): Outcome

DESCRIPTION:
Percentage of patients aged 18 years and older who had a site infection within 30 days of the index spine procedure

DENOMINATOR: N2QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older who had a site infection within 30 days of the index spine procedure

RATIONAL:
Surgical site infection (SSI) following spine surgery is associated with significant morbidity and economic burden that can require extended hospital stays, long-term use of IV antibiotics, increased pain requirements, and delayed return to activity and work1. Care processes that influence the incidence of spinal SSI span the first 3 major phases of care. In the
preoperative phase, certain high-risk modifiable risk factors, mainly diabetes, smoking, steroid and opioid use, and obesity, should be identified and corrected\textsuperscript{2,3}. Additionally, identification of active infections and routine patient decontamination are key elements. In the intra-operative phase, impeccable surgical aseptic technique, timing and selection of antibiotic prophylaxis, and minimizing blood transfusions are key processes\textsuperscript{4–9}. In the postoperative phase, aseptic wound care and early detection of wound inflammation or breakdown contribute to prevention of delayed contamination and subsequent infection.

The 30-day surveillance window was chosen based on common patient presentations for spinal SSI. The most common spinal infectious microorganism is Staphylococcus species resulting in non-indolent infections that present with wound swelling, tenderness, erythema, drainage, or dehiscence within this timeframe\textsuperscript{10,11}. Furthermore, all patients in the registry receive active follow-up at the 3-month timeframe, including assessment for SSI, with documented data completeness of 98.1% with follow-up of 85% at that time point\textsuperscript{12}.

In summary, tracking rates of SSI in spinal surgery is essential to help determine causes and reduce the incidence of spine related SSI.

REFERENCES:
N^2QOD Spine Care Measure #7
Complication Following Spine-Related Procedure

National Quality Strategy (NQS) Domain: Effective Clinical Care

PQRS # / NQF #: Non-PQRS; NQF 0705 modification

Measure Type (Process/Outcome): Outcome

DESCRIPTION:
Proportion of Patients undergoing spine-related procedures that have a complication (specifically, DVT, PE, MI, Stroke, UTI, unexpected new neurological deficit) in the 30-day Post-Procedure Period

DENOMINATOR: N^2QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of Patients undergoing spine-related procedures that have a complication (specifically, DVT, PE, MI, Stroke, UTI, unexpected new neurological deficit) in the 30-day Post-Procedure Period

RATIONALE:
Although overall complication rates for elective spine surgery are low, certain potentially preventable complications of spine surgery, namely DVT, PE, MI, stroke, UTI, or unexpected neurological deficit, are associated with significant morbidity and economic burden resulting in functional impairment, increased resource utilization, and delayed return to activity and work^1-5^ . A recent analysis of the N^2QOD Spine Registry found a 2.2% incidence of major adverse events within the first 30 days after elective spine surgery^2^. The prevalence of spine-related procedures (perhaps over 300,000 patients per year) translates into a significant opportunity to improve care and increase national health care value by tracking post-surgical complications.

Care processes that influence the incidence of these complications span the first 3 major phases of care. In the preoperative phase, certain high-risk modifiable risk factors, mainly diabetes with insulin use, smoking, long-term steroid use, should be identified and mitigated^6-9,10,11,12^. In the intra-operative phase, attention to physiologic parameters, use of neuromonitoring adjuncts, judicious use of autologous blood transfusions, and shorter surgical times all reduce the likelihood of complications^13,14^. In the postoperative phase, appropriate mechanical and chemical prophylaxis for clots, timely removal of urinary catheters, careful blood sugar control, appropriate mobilization of patients, and close neurological monitoring can reduce the incidence of these events^15-17^. Implementation of most of these factors is non-uniform, and often varies by physician within a given institution, leading to variability in complication rates and types.

REFERENCES:


**N2QOD Spine Care Measure #8**

Hospital Mortality following Spine Procedure

**National Quality Strategy (NQS) Domain:** Effective Clinical Care

**PQRS # / NQF #:** Non-PQRS; PQRS 345 modified, NQF 0119 Modification

**Measure Type (Process/Outcome):** Outcome

**DESCRIPTION:**

Percent of patients aged 18 years and older undergoing index spine procedure who die, including all deaths occurring during the hospitalization in which the spine procedure was performed, even if after 30 days
DENOMINATOR: N²QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older undergoing index spine procedure who die, including all deaths occurring during the hospitalization in which the spine procedure was performed, even if after 30 days

RATIONALE:
Mortality is the most important negative outcome associated with any surgical procedure. Mortality after elective spine surgery is rare, as demonstrated by a recent analysis of the N²QOD Spine Registry which found a 0.3% overall perioperative mortality following elective spine surgery. Mortality is impacted by processes that span the first 3 major phases of care. In the preoperative phase, certain high-risk modifiable risk factors, long-term opioid use, smoking, uncontrolled diabetes, should be identified and mitigated. In the intra-operative phase, lower blood loss, judicious use of autologous blood transfusions, and shorter surgical times all reduce the likelihood of mortality. In the postoperative phase, appropriate mechanical and chemical prophylaxis for clots, appropriate mobilization of patients, close neurological monitoring, and timely resumption of cardiac and cerebrovascular prophylactic medications (anti-thrombotic and anticoagulants) can reduce mortalities. Intra- or post-operative CVA or MI dramatically increases perioperative mortality rates, and risk factor reduction and peri-operative surveillance measures to reduce CVA directly impact on mortality. Implementation of most of these factors is non-uniform, and often varies by physician within a given institution, leading to variability in complication rates and types. In summary, although overall mortality rates for elective spine surgery are low, the prevalence of these procedures (perhaps over 300,000 patients per year) translates into a significant opportunity to improve care and increase national health care value by tracking immediate post-surgical deaths.

REFERENCES:
**NQOD Spine Care Measure #9**
Referral for post-acute care rehabilitation following spine procedure

**National Quality Strategy (NQS) Domain:** Effective Clinical Care

**PQRS # / NQF #:** Non-PQRS, PQRS 36 Modification

**Measure Type (Process/Outcome):** Process

**DESCRIPTION:**
Percent of patients undergoing spine procedure who are prescribed physical therapy in the 3 month period following index procedure

**DENOMINATOR:** NQOD QCDR Patients, See Appendix 1

**DENOMINATOR EXCLUSIONS/EXCEPTIONS:** See Appendix 1

**NUMERATOR:**
Number of patients undergoing spine procedure who are prescribed physical therapy in the 3 month period following index procedure

**RATIONALE:**
Post-acute care inpatient rehabilitation can be an important adjunct to surgical therapies for spinal disorders. Use of rehabilitation services after spine-related surgeries have been shown to improve both back and leg pain and improve back-related functional status compared to patients who receive no rehabilitation.¹⁻⁴ Physical therapy, including gait training, has also been shown to improve mobility and reduce the incidence of complications such as DVT and PE⁵. The timeframe during which these rehabilitation programs have shown to have proven efficacy span the period from immediately post-operatively with inpatient rehabilitation services to programs starting 4 to 6 weeks post-surgery. Accurate assessment of post-surgical physical therapy assignment is essential to assess the impact of these interventions, better understand overall resource utilization in spine care and assist continuing care planning.

**REFERENCES:**
\textbf{NQOD Spine Care Measure \#10}  
Unplanned Reoperation Following Spine Procedure Within the 30 Day Post-Operative Period  

\textbf{National Quality Strategy (NQS) Domain:} Patient Safety (also, Efficiency and Cost Reduction)  

\textbf{PQRS \# / NQF \#}: Non-PQRS; PQRS 355 Modification  

\textbf{Measure Type (Process/Outcome):} Outcome  

\textbf{DESCRIPTION:}  
Percentage of patients aged 18 years and older who had any unplanned reoperation for spine-related procedure within the 30 day postoperative period  

\textbf{DENOMINATOR:} NQOD QCDR Patients, See Appendix 1  

\textbf{DENOMINATOR EXCLUSIONS/EXCEPTIONS:} See Appendix 1  

\textbf{NUMERATOR:}  
Number of patients aged 18 years and older who had any unplanned reoperation for spine-related procedure within the 30 day postoperative period  

\textbf{RATIONALE:}  
Unplanned reoperations after spine surgery delay recovery and can impact the functional outcomes of our patients, while contributing to rising healthcare costs. It is thus important to measure and report their rate after spinal procedures. Reoperations are among the most common complications of spine surgery. Several studies have used our proposed measure to quantify this phenomenon.  

A recent analysis of the NQOD Spine Registry for 4970 lumbar spine surgery patients\textsuperscript{1} from 2012 to 2014, revealed an overall 90-day reoperation rate of 2.3%.\textsuperscript{2} In addition, a study of the American College of Surgeons NSQIP registry (2006-2011) revealed an overall 30-day reoperation rate of 3.2% for spine surgery patients.\textsuperscript{3} In a different study of the same population, reoperation was the second most common unexpected postoperative outcome and accounted for almost one-third of all adverse events.\textsuperscript{4} In addition, spine pathologies are diverse, and reoperation rates vary by procedure, and comorbidities. Analysis of single level lumbar discectomy data (2010-2012) from the SPORT trial (242 patients) demonstrated a 1-year reoperation rate of 7%.\textsuperscript{5} Patients who underwent the same procedure, and were registered in ACS-NSQIP, experienced 30-day reoperation rates of 2%.\textsuperscript{6}  

There is an increasing body of literature on the association of reoperations with worse patient level functional outcomes. Retrospective review of a prospective multicenter thoracolumbar spinal deformity database (2010-2012) revealed that reoperation within 30 days was associated with higher mean leg pain score (3.8±3.2 vs. 3.3±2.9, p=0.0026), higher ODI score (34.2±21.2 vs. 25.7±19.2, p=0.04), and lower SRS-22 scores (3.2±1 vs. 3.6±1.1, p=0.04).\textsuperscript{7} In addition, a retrospective study of 149 patients undergoing surgery for spinal deformity found that reoperation in the first two years following surgery was associated with significantly reduced HQROL score.\textsuperscript{8}  

In summary, reoperations are common in spine surgery and are often tracked with our proposed measured in the literature. The prevalence of unplanned reoperations and their impact on functional outcomes and quality of life make them a clear target for quality improvement.
REFERENCES:

N2QOD Spine Care Measure #11
Unplanned Readmission Following Spine Procedure within the 30 Day Post-Operative Period

National Quality Strategy (NQS) Domain: Patient Safety (also, Efficiency and Cost Reduction)

PQRS # / NQF #: Non-PQRS; PQRS 356 Modification

Measure Type (Process/Outcome): Outcome

DESCRIPTION:
Percentage of patients aged 18 years and older who had any unplanned readmission for spine-related procedure within the 30 day postoperative period

DENOMINATOR: N2QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older who had any unplanned readmission for spine-related procedure within the 30 day postoperative period

RATIONALE:
Unplanned postoperative readmissions contribute significantly to excessive resource utilization and drive healthcare cost. Consequently, readmissions have been under increasing scrutiny by CMS. Their prevalence is high in spine surgery, and we believe our proposed metric captures their magnitude, in accordance with national standards.
Analysis of 343,068 Medicare patients in the period 2003-2007 revealed an overall 30-day readmission rate of 7.3% for lumbar operations. The most common cause of readmission in this cohort was surgical complications, which accounted for 26-33% of all events.\(^1\) Analysis of the 2011 and 2012 ACS-NSQIP data revealed an overall unplanned readmission rate of 4.4%. The most common etiology was wound complications (38.6%), including superficial and deep infection, hematoma, or seroma development.\(^2\) In neurosurgery specific data, a study of 4970 patients undergoing lumbar spine surgery in the N\(^2\)QOD registry demonstrated an overall 30-day readmission rate of 3.7%, with a 90-day readmission rate of 8.9%.\(^3\) Readmissions varied by pathology and operation, with 2.4% of patients with disc herniation, 3.4% of patients with spondylolisthesis, and 4.9% of patients with spinal stenosis requiring readmission within 30 days.\(^3\) This reflects the fact that spine surgery encompasses a variety of different pathologies and procedures, and rates of readmission vary between these different entities. Sub-group analysis of 2011 ACS-NSQIP data also revealed differences in unplanned readmission rates between diagnoses with 3.5% of patients with disc herniation being readmitted within 30 days, in comparison to 6.4% of patients with acquired spondylolisthesis. A study of 197 patients with primary and 164 patients with metastatic tumors of the spine revealed unplanned readmission rates of 6.1% and 16.8% respectively.\(^5\)

Readmissions are often associated with poor outcomes and increased hospitalization costs. Analysis of 185,954 Medicare patients undergoing spine surgery from 2005-2007 revealed that readmissions account for a substantial proportion (20-50%) of variation in cost between hospitals, even after accounting for spinal fusions.\(^6\)

In summary, readmissions clearly represent a large driver of cost in some settings, and are often the result of wound-site complications. Thus, readmission rates are important to measure for surgical quality improvement efforts by providers, payers, and administrators.

REFERENCES:

N\(^2\)QOD Spine Care Measure #12
Selection of Prophylactic Antibiotic Prior to Spine Procedure

National Quality Strategy (NQS) Domain: Patient Safety

PQRS # / NQF #: Non-PQRS; Modification of PQRS 21, NQF 0268

Measure Type (Process/Outcome): Process
DESCRIPTION:
Percentage of patients aged 18 years and older undergoing index spine-related procedure with the indications for prophylactic antibiotics who had an order for antimicrobial prophylaxis.

DENOMINATOR: N²QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older undergoing index spine-related procedure with the indications for prophylactic antibiotics who had an order for antimicrobial prophylaxis.

RATIONALE and CLINICAL RECOMMENDATIONS:
Surgical site infection is a potentially preventable cause of increased morbidity and mortality for spine patients. From a policy perspective, these complications contribute to mounting healthcare costs. Wound infection was found to be the most common precipitating event (38.6%) of 30-day readmissions in the 2012 ACS-NSQIP data for 15,668 patients undergoing lumbar spine surgery. The National Healthcare Safety Network (2006-2007) demonstrated a surgical site infection rate of 2.8 – 9.7% for spine surgery. Given the magnitude and the potential impact of postoperative infections on spine patients, establishing process measures to, in part, prevent these complications is of paramount importance.

Preoperative prophylactic antibiotics are central in preventing postoperative infections, and their use is an ideal quality improvement target. A meta-analysis of 6 randomized trials evaluating prophylactic antibiotic efficacy in spine surgery demonstrated that their use resulted in significantly reduced postoperative infection rates (OR 0.37, 95% CI 0.17-0.78, p<0.01). The majority of these trials used a cephalosporin (such as cefazolin) or beta-lactam antibiotic (such as oxacillin), though one trial used vancomycin and gentamicin. The most common pathogens causing postoperative infections in spinal surgery are Staphylococcus aureus, coagulase-negative Staphylococcus, beta-hemolytic Streptococcus, and gram-negative bacilli. Cefazolin is the current agent of choice for prophylaxis in spine surgery, given its activity against Staphylococcus species and beta-hemolytic Streptococcus. Vancomycin and clindamycin are common choices in patients who have adverse reactions or allergies to cephalosporins and beta lactam antibiotics.

However, resistance is increasingly a problem for first and second generation cephalosporins and beta-lactam antibiotics. A study of 7529 patients undergoing any spine surgery was reported to the CDC NHSN database. In this sample the most common pathogen of postoperative spine infections was Staphylococcus aureus (45.2%), followed by Staphylococcus epidermidis (31.4%). Methicillin resistant organisms were present in 34.3% of cases, and gram-negative organisms (61.6% cefazolin resistant) were found in 30.5% of cases. This could reflect selection bias, since reported infections may predominantly represent resistant organisms in an institution that routinely uses preoperative antibiotics. Appropriate prophylactic antibiotics should be tailored to institutional patterns of antimicrobial resistance.

In summary, given the current evidence for efficacy of antibiotic prophylaxis in the prevention of postoperative infections in spine surgery, ensuring their use would likely improve surgical outcomes. Routine antibiotic prophylaxis in this patient population therefore constitutes an important quality improvement metric.

For most procedures, cefazolin is the drug of choice for prophylaxis because it is the most widely studied antimicrobial agent, with proven efficacy. It has a desirable duration of action, spectrum of activity against organisms commonly encountered in surgery, reasonable safety, and low cost. However, vancomycin or clindamycin may be effectively used in patients with serious allergy or adverse reactions to β-lactams.
REFERENCES:

NQOD Spine Care Measure #13
Discontinuation of Prophylactic Parenteral Antibiotics Following Spine Procedure

National Quality Strategy (NQS) Domain: Patient Safety

PQRS # / NQF #: Non-PQRS; Modification of PQRS 22, PQRS 45, NQF 0271

Measure Type (Process/Outcome): Process

DESCRIPTION:
Percentage of patients aged 18 years and older undergoing index spine procedures with the indications for prophylactic parenteral antibiotics AND who received a prophylactic parenteral antibiotic, who have an order for discontinuation of prophylactic parenteral antibiotics within 24 hours of procedure end time.

DENOMINATOR: NQOD patients who received prophylactic antibiotics QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: Patients with exclusions listed in Appendix 1, an additional exclusion is not having received prophylactic antibiotics (refer to measure 12).

NUMERATOR:
Number of patients aged 18 years and older undergoing index spine procedures with the indications for prophylactic parenteral antibiotics AND who received a prophylactic parenteral antibiotic, who have an order for discontinuation of prophylactic parenteral antibiotics within 24 hours of procedure end time.

RATIONALE:
Although appropriate use of prophylactic antibiotics can prevent long term complications after spine surgery and decrease cost, excessive utilization can contribute to the development of pan-resistant microbes, with potential catastrophic impact on healthcare outcomes and cost.

Published data question the efficacy of prophylactic antibiotic administration extending past the first 24 hours postoperatively. A meta-analysis of 28 randomized trials comparing single and multiple dose regimens failed to demonstrate any advantage for the latter. From 1597 patients undergoing lumbar spine surgery between 1999 and 2004, 0.8% developed a postoperative infection after receiving multiple doses of prophylactic antibiotics, whereas 0.4%
had a similar complication after a single dose. This difference was not significant. However, culture results demonstrated increased prevalence of resistant organisms (83%) in the multiple-dose group compared to the single-dose group (0%). Similarly, another study of 284 patients undergoing lumbar spine surgery without instrumentation compared prolonged and limited prophylactic antibiotic regimens and did not identify a difference in the rate of postoperative infections (2.8% in the prolonged regimen vs. 1.4% in the limited group). Two of the patients in the multiple-dose group went on to develop *Clostridium difficile* colitis.

Prolonged antibiotic use has also shown no benefit in other surgical sub-specialties, and is associated with increased risk of secondary infections. In a retrospective review of 201 cases of *Clostridium difficile* colitis, 55% of total cases were related to prolonged perioperative antibiotic prophylaxis. A study of 114 postoperative ICU patients found that bacteremia (17% vs. 3%) and line infections (15% vs. 2%) were more common in patients receiving more than 4 days of prophylactic antibiotics compared to those receiving 1 day of antibiotics. Additionally the authors noted an excess hospitalization cost of $40,000 for patients with prolonged regimens, during the study period. Lastly, continued antibiotic use increases the risk of allergic reactions, and drug-interactions.

In summary, the shortest effective duration of antimicrobial administration to prevent postoperative infection is not known. However, evidence is mounting that prolonged postoperative antimicrobial administration is not necessary for most spinal procedures. Prophylactic antibiotics should be discontinued within 24 hours after the operation to prevent patient-level complications, contain health-care costs, and protect the community from the development of resistant bacterial strains. Therefore, tracking the appropriate discontinuation of prophylactic antibiotics is a crucial quality measure for spine surgery.

REFERENCES:
DESCRIPTION:
Percentage of patients aged 18 years and older undergoing spine related procedures, discharged from operative facility, and seen within 30 days following discharge in the office by the physician, prescribing practitioner, registered nurse, who had a reconciliation of the discharge medications with the current medication list documented in the outpatient medical record.

DENOMINATOR: NQOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older undergoing spine related procedures, discharged from operative facility, and seen within 30 days following discharge in the office by the physician, prescribing practitioner, registered nurse, who had a reconciliation of the discharge medications with the current medication list documented in the outpatient medical record.

RATIONALE:
Incomplete or inaccurate medication reconciliation is widespread and has been associated with adverse events including drug interactions, dangerous starting or cessation of medications for chronic conditions, and avoidable hospital readmission. Hospitalization puts patients at high risk for medication errors after discharge at least in part because medication records are often incomplete. Medication reconciliation post-discharge is, therefore, a critical component of care coordination. Post-discharge medication reconciliation is an important opportunity to catch potentially harmful omissions or changes in prescribed medications, particularly in elderly patients who are prescribed a greater quantity and variety of medications. Although the magnitude of the effect of medication reconciliation alone on patient outcomes is not well studied, there is agreement among experts that potential benefits outweigh the harm. Post-discharge medication reconciliation is an effective tool to reduce preventable adverse drug events associated with injury or death, minimize duplication and complexity of a medication regimen to support adherence, and has the potential to reduce emergency department visits, hospital readmission rates, and morbidity. Post-discharge medication reconciliation is recommended by the Joint Commission patient safety goals, the American Geriatric Society, and the Society of Hospital Medicine, and measurement of post-discharge medication reconciliation is a priority area of the National Quality Forum and the National Priorities Partnership.

REFERENCES:

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**NQOD Spine Care Measure #15**

Risk – assessment for elective spine procedure

**National Quality Strategy (NQS) Domain:** Communication and Care Coordination

**PQRS # / NQF #:** Non-PQRS, PQRS 182, PQRS 358 modified

**Measure Type (Process/Outcome):** Process

**DESCRIPTION:**

Percentage of patients who underwent elective therapy (s) for spine related disorders with documentation of risk factor assessment by their treatment team prior to therapy and who received personal discussion of those documented risks with the healthcare provider.
DENOMINATOR: N2QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients who underwent elective therapy(s) for spine related disorders with documentation of risk factor assessment by their treatment team prior to therapy and who received personal discussion of those documented risks with the healthcare provider

RATIONALE:
Preoperative risk assessment and communication between surgeons and patients is critical for effective informed consent and shared decision making in surgical care. Shared decision-making is considered an integral component of patient-centered care, especially for preference-sensitive issues.\(^1\)\(^2\) Evidence suggests that there is room for improving the informed consent and shared decision-making process.\(^3\)\(^5\) Use of a risk calculator helps improve the quality of the informed consent and shared decision-making process by providing a personalized, customized, empirically-based estimate of a patient’s risk of post-operative complications. Moreover, evidence suggests that sharing numeric estimates of patient-specific risk may enhance patient trust in providers.

ACS NSQIP now offers a risk calculator that can be used for operations in many surgical subspecialties including spine surgery.\(^6\) The NSQIP data has been used to identify a number of predictors of postoperative complications and mortality following spine surgery.\(^7\) The international spine study group demonstrated the feasibility of using a multicenter prospective database to identify predictors of surgical complications and health related quality of life following spinal deformity surgery.\(^8\)\(^11\) Others have developed models for predicting post-operative medical complications.\(^12\) A recent analysis of the N2QOD Spine Registry found that certain covariates were strongly associated with patient outcomes following elective spine surgery. Among the most important variables were patient educational status, occupation, diagnosis, baseline patient reported outcomes, and smoking status.\(^13\)

REFERENCES:


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**N^2^QOD Spine Care Measure #16**
Depression and Anxiety Assessment Prior to Spine-Related Therapies

**National Quality Strategy (NQS) Domain:** Communication and Care Coordination

**PQRS # / NQF #:** Non-PQRS

**Measure Type (Process/Outcome):** Process

**DESCRIPTION:**
Percentage of patients aged 18 years and older with documentation of depression and/or anxiety assessment through discussion with the patient including the use of a standardized assessment tool prior to index therapy (s) for treatment of spine related pain symptoms

**DENOMINATOR:** N^2^QOD QCDR Patients, See Appendix 1

**DENOMINATOR EXCLUSIONS/EXCEPTIONS:** See Appendix 1

**NUMERATOR:**
Number of patients aged 18 years and older with documentation of depression and/or anxiety assessment through discussion with the patient including the use of a standardized assessment tool prior to index therapy (s) for treatment of spine related pain symptoms

**RATIONALE:**
Preoperative psychological screening is emerging as an important method to predict outcomes following elective spine surgery and potentially identify modifiable conditions to improve spine care outcomes. Depression and anxiety are prevalent in patients undergoing spine surgery. A recent analysis of the N^2^QOD Spine Registry found that 12.8 and 21.3% of patients undergoing elective spine surgery identified themselves as anxious or depressed, respectively.\(^1\) Furthermore, baseline depression and anxiety were strongly associated with patient outcomes following elective spine surgery. There is evidence that depression and anxiety predict outcomes including return to work\(^2\), medical
complications\textsuperscript{3}, functional recovery\textsuperscript{4,5}, and quality of life.\textsuperscript{6} Screening may aid in appropriate patient selection. In one large prospective study, depressive symptoms predicted functional improvement after non-surgical treatment of chronic low back pain.\textsuperscript{7} Screening may also guide interventions aimed at treating depression and anxiety that can in turn improve outcomes after spine surgery. In one study, patients whose depression improved after spine surgery had improved outcomes resembling those of non-depressed patients.\textsuperscript{8} Despite the evidence for screening, a minority of spine surgeons currently screen for psychological factors,\textsuperscript{9} suggesting that there is an opportunity to improve outcomes by encouraging screening.

REFERENCES:
1. N\textsuperscript{2}QOD, unpublished results.

\textsc{N\textsuperscript{2}QOD Spine Care Measure #17}
Narcotic Pain Medicine Management Following Elective Spine Procedure

\textbf{National Quality Strategy (NQS) Domain:} Communication and Care Coordination

\textbf{PQRS \# / NQF \#:} Non-PQRS; PQRS 180 Modification

\textbf{Measure Type (Process/Outcome):} Process

\textbf{DESCRIPTION:}
Percentage of patients aged 18 years and older who underwent elective therapies for spine related pain who have been assessed for narcotic use/requirements at time of discharge. Performance met if patient not receiving narcotics post-
discharge or receiving narcotics for pain less than 2 weeks post-discharge or expected to require narcotics for > 2 weeks post index procedure and had documentation of a narcotic management plan.

DENOMINATOR: NQOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older who underwent elective therapies for spine related pain who have been assessed for narcotic use/requirements at time of discharge. Performance met if patient not receiving narcotics post-discharge or receiving narcotics for pain less than 2 weeks post-discharge or expected to require narcotics for > 2 weeks post index procedure and had documentation of a narcotic management plan.

RATIONALE:
Narcotic pain medication is an important part of post-operative pain management in patients undergoing spinal surgery. However, long-term use of narcotics should be avoided due to adverse effects, the risk of opioid dependence, and diminished effectiveness in treating pain.\(^1\)\(^2\) Chronic opioid therapy places patients at risk of intolerable adverse effects, aberrant drug-related behaviors, opioid dependence, and failure to make progress towards therapeutic goals. Furthermore, total pain relief with chronic opioid therapy is rare. Trials suggest that improvement averages less than 2 to 3 points on a 0 to 10 scale.\(^3\)\(^4\) Monitoring length and dose of narcotic pain medication for patients undergoing spinal procedures is integral to appropriate management. Preoperative opioid use is strongly associated with persistent opioid use after surgery making it feasible to predict which patients will require longer-term narcotic management.\(^5\)\(^6\) In cases of chronic opioid therapy, it is important for clinicians to discuss a management plan prior to initiating a course of treatment and on an ongoing basis while patients are on therapy with plans varying based on patient needs and risks.\(^2\)\(^7\)

REFERENCES:
PQRS # / NQF #: Non-PQRS; Modification of PQRS 226, NQF 0028

Measure Type (Process/Outcome): Process

DESCRIPTION:
Percentage of patients aged 18 years and older who were assessed for tobacco use prior to spine-related therapy(s) and who received cessation counseling intervention if identified as a tobacco user.

DENOMINATOR: N²QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older who were assessed for tobacco use prior to spine-related therapy(s) and who received cessation counseling intervention if identified as a tobacco user.

RATIONALE
There is a growing body of evidence regarding the negative impact of cigarette smoking on outcomes following spine surgery. Smoking, nicotine exposure, and tissue hypoxemia have been identified to have deleterious effects on wound healing, general spine and bone health, and bony fusion. Clinical smoking has been shown to increase the risk of pseudoarthrosis (non-union), surgical site infection, reoperation and overall patient dissatisfaction. These negative effects have been observed not only for fusion but also simple laminectomy and across all age groups.

Interventions toward smoking cessation have been shown to decrease these complications as well as those associated with general perioperative risk from non-spine surgery. Furthermore, cessation of smoking has been shown to decrease spine pain even in medically managed patients.

A recent analysis of the N²QOD database revealed that 17% of patients undergoing elective spine surgery identified themselves as active smokers. An analysis of the same database identified smoking as a significant driver of postsurgery outcomes. Smoking assessments and cessation interventions hold the potential to significantly improve outcomes following elective spine surgery.

REFERENCES:
16. Godil, Saniya S. MD; McGirt, Matthew J. MD; Glassman, Steven D.; Knightly, John J. MD; Mummaneni, Praveen V. MD; Oetting, Gregory MD; Theodore, Nicholas MD; Gottfried, Oren N. MD; Khairi, Saad; Schmidt, Meic H. MD; Boakye, Maxwell MD; Kalkanis, Steven N. MD; Rabin, Doron MD, FRCS; Ryken, Timothy C. MD, MS; Balturshot, Gregory W. BS, MD; Chaddock, James; Fassett, Daniel Robert MD; Reeder, Ralph E. MD; Miller, Clinton F. MD; Briggs, Thomas B. MD; Zhang, Dang; Bambakidis, Nicholas C. MD; Shaffrey, Mark Edwin MD; Hadley, Mark N. MD; Karahalios, Dean G. MD; Angevine, Peter D. MD; Martin, Michael D. MD; Ewend, Matthew G. MD; Bydon, Ali MD; Kremer, M. Adam BS, MD; Holly, Langston T. MD; Slotkin, Jonathan MD; Kaakaji, Wayel MD; Powers, Alexander K. MD; Griffitt, Wesley E. MD; Tippett, Troy M. MD; Cozzens, Jeffrey W. MD; Christiano, Lana D. MD; Grahm, Thomas W. MD; Guthrie, Barton L. MD; Harrington, J. Frederick MD; Shaffrey, Christopher I. MD; Elowitz, Eric H. MD; Foley, Kevin T. MD; Watridge, Clarence B. MD; Asher, Anthony L. MD, Defining the Effectiveness of Lumbar Spine Surgery in a Nationwide, Prospective Longitudinal Quality of Life Registry: An Analysis of Variability in Patient-Reported Outcomes and Preliminary Predictive Models of Treatment Failure, Neurosurgery: August 2014 – Volume 61.
17. N²QOD, unpublished results

_N²QOD Spine Care Measure #19_
Body Mass Assessment and Follow-up Coincident with Spine Related Therapies

_National Quality Strategy (NQS) Domain:_ Community and Population Health

_PQRS # / NQF #:_ Non-PQRS; Modification of PQRS 128, NQF 0421

_Measure Type (Process/Outcome):_ Process
DESCRIPTION:
Percentage of patients aged 18 years and older with a weight and height recorded at time of initial evaluation and/or treatment of spine related disorder documented in the medical record AND if the most recent BMI is outside of normal parameters, a follow-up plan is documented (baseline)

1. Normal Parameters:
   - Age 65 years and older BMI = 23 and < 30
   - Age 18 – 64 years BMI = 18.5 and < 25

2. If the most recent documented BMI is outside of normal parameters, then a follow-up plan must be documented during the encounter or during the previous six months of the current encounter. The documented follow-up plan must be based on the most recent document BMI outside of normal parameters, example: “Patient referred to nutrition counseling for BMI above normal parameters” (See Definitions for examples of a follow-up plan treatments). If more than one BMI is reported during the measure period, the most recent BMI will be used to determine if the performance has been met

DENOMINATOR: N2QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Number of patients aged 18 years and older with a weight and height recorded at time of initial evaluation and/or treatment of spine related disorder documented in the medical record AND if the most recent BMI is outside of normal parameters, a follow-up plan is documented (baseline)

1. Normal Parameters:
   - Age 65 years and older BMI = 23 and < 30
   - Age 18 – 64 years BMI = 18.5 and < 25

2. If the most recent documented BMI is outside of normal parameters, then a follow-up plan must be documented during the encounter or during the previous six months of the current encounter. The documented follow-up plan must be based on the most recent document BMI outside of normal parameters, example: “Patient referred to nutrition counseling for BMI above normal parameters” (See Definitions for examples of a follow-up plan treatments). If more than one BMI is reported during the measure period, the most recent BMI will be used to determine if the performance has been met

RATIONALE
Obesity, defined as a body mass index greater than or equal to 30 has a prevalence of approximately 34% in the United States.\(^1\) It has long been recognized that obese patients are at increased risk for complications related to nearly all types of surgery.\(^2\) Patients suffering from obesity may be more likely to present to a spine surgeon for potential treatment as obesity is a significant risk factor for spine disease.\(^3\) Spinal surgery in the obese population has also been found to be associated with higher risk for many adverse outcomes.\(^4-7\) These outcomes include higher volumes of blood loss during surgery, greater hospital length of stay\(^7\), as well as a higher incidence of inadvertent durotomy.\(^8\) Outside of immediate perioperative complications, obese patients have been found to have a higher rate of persistent and new symptoms (specifically, radiculopathy, and spinal neurologic deficits) following surgery as compared to a non-obese population.\(^8,10\) Additionally, reoperation rate is higher in patients with BMI greater than 30.\(^9\)
In summary, obesity has also been shown to influence incidence of spinal disorders and also outcomes after spinal procedures. Effective co-management of obesity is integral to appropriate treatment of many of most spinal conditions.

REFERENCES:

N²QOD Spine Care Measure #20
Unhealthy Alcohol Use Assessment Coincident With Spine Care

National Quality Strategy (NQS) Domain: Community and Population Health

PQRS # / NQF #: Non-PQRS; PQRS 173 Modification

Measure Type (Process/Outcome): Process

DESCRIPTION: Percentage of patients aged 18 years and older being treated for spine-related disorders who were assessed for unhealthy alcohol use prior to index therapy(s) for treatment of spine related pain symptoms

DENOMINATOR: N²QOD QCDR Patients, See Appendix 1

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1
NUMERATOR:
Number of patients aged 18 years and older being treated for spine-related disorders who were assessed for unhealthy alcohol use prior to index therapy(s) for treatment of spine related pain symptoms

RATIONALE
Alcohol consumption is ubiquitous in the United States, and variability in the quantity of consumption is significant. The lifetime prevalence of any type of alcohol use disorder is in the range of 8% to 18%.\(^1\) Alcohol abuse has been associated with increased of postoperative complications across most major surgical procedures. These complications include postoperative wound complications (including bleeding and infections) and various cardiopulmonary complications.\(^2\)\(^7\) Preoperative intervention in those consuming excessive alcohol on a daily basis and abstinence before surgery has been shown to abate some of these risks.\(^4\)\(^7\)

Although few analyses point to a direct association between outcomes of spine care and alcohol consumption, a negative correlation between of chronic heavy alcohol consumption on bone mineral density (including that of the spine) has been identified.\(^8\) This evidence indirectly supports the benefit of screening for alcohol use prior to prescribing spine surgery.

Screening for unhealthy alcohol use can identify patients whose habits may put them at risk for adverse health outcomes due to their alcohol use. While this measure does not require counseling for those patients to be found at risk, brief counseling interventions for unhealthy alcohol use have shown to be effective in reducing alcohol use. It would be expected that if a provider found their patient to be at risk after screening that intervention would be provided.

A systematic method of assessing for unhealthy alcohol use should be utilized. Please refer to the National Institute on Alcohol Abuse and Alcoholism publication: Helping Patients Who Drink Too Much: A Clinician’s Guide for additional information regarding systematic screening methods.\(^9\)

REFERENCES:
NQOD QCDR Non-PQRS Measure Specifications
March 2015 Revision v3.2

NQOD Spine Care Measure #21
Participation in a Systematic National Database for Spine Care Interventions

National Quality Strategy (NQS) Domain: Community and Population Health

PQRS # / NQF #: Non-PQRS; modification NQF 0456

Measure Type (Process/Outcome): Process

DESCRIPTION: Participation in a multi-center spine care data collection and feedback program that provides benchmarking of the physician’s data relative to national programs and uses structural, process, and outcome measures.

DENOMINATOR: Participant in the QCDR with submission of 1 or more cases.

DENOMINATOR EXCLUSIONS/EXCEPTIONS: See Appendix 1

NUMERATOR:
Participation in the NQOD QCDR with submission of 20 or more cases in at least one multi-center spine-care data collection and feedback program that provides benchmarking of the physician’s data relative to national programs and uses structural, process, and outcome measures (Met = 1 else 0).

RATIONALE:
Participation in a clinical database registry allows physicians to monitor clinical performance, detect infrequent complications and build the robust clinical research infrastructure necessary to advance the science surrounding quality in managing spinal conditions. In this latter capacity, this registry will serve as a tool for conducting research in areas of comparative effectiveness, cost effectiveness and appropriate use criteria. In addition, participation science has shown this important structure measure to allow practitioners to benchmark themselves to the aggregate population of similar clinical scenarios to improve individual and site performance. There exist numerous other national and local registries in surgery as well as various surgical specialties including thoracic, trauma, transplant, oncology, etc. Interestingly, a systematic review has identified that up to eight of these programs have identified decrease in risk-adjusted mortality associated with registry participation.

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1. Strey, Anne M. MD, MSc; Russell, Marcia M. MD FACS; Ko, Clifford Y MD, MS MSHS FACS; Sacks, Greg D. MD MPH; Dawes, Aaron J. MD; Gibbons, Melinda M. MD MSHS FACS, Clinical registries and quality measurement in surgery: A systematic review. Surgery: February 2015 – Volume 157 – Issue 2 – p 381-395.
Appendix 1: N²QOD QCDR Patients Denominator

N²QOD QCDR Patients Denominator: The patient population includes patients aged 18 years and older eligible for, enrolled, and engaged in the Qualified Clinical Data Registry (QCDR). For the N²QOD QCDR, the measures apply to patients undergoing either lumbar or cervical spine surgery and the surgeon’s selection of either lumbar or cervical or both lumbar and cervical registry participation. Lumbar surgery includes patients with symptomatic lumbar disc herniation, symptomatic recurrent lumbar disc herniation, lumbar spondylolisthesis, lumbar stenosis, lumbar adjacent segment disease, single level symptomatic mechanical disc collapse. Cervical spine surgery includes patients with radiculopathy, myelopathy, or mechanical neck pain. CPT codes listed are consistent with, and applicable to, these clinical inclusion criteria.

CPT codes consistent with the Lumbar N²QOD Registry include: 20930, 20931, 20932, 20936, 20937, 20938, 22558, 22585, 22612, 22614, 22840, 22842, 63005, 63012, 63030, 63035, 63042, 63044, 63047, 63048, 63056, 63087, 63088, 63102, 63103, 63267.

CPT codes consistent with the Cervical N²QOD Registry include: 20930, 20931, 20936, 20937, 20938, 22551, 22552, 22554, 22585, 22600, 22614, 22840, 22842, 22843, 22845, 22846, 63001, 63015, 63020, 63035, 63040, 63043, 63045, 63081, 63082.

Denominator Exclusions
Excluded are patients with circumstances that interfere with or prevent data collection or patients with conditions that confound interpretation of patient outcomes.

General Exclusions
- Spinal infection (including osteomyelitis, TB, discitis)
- Tumor (malignant, cancer)
- Fracture (or Kyphoplasty)
- Traumatic dislocation
- Incarceration (prisoner)
- Hospital/Facility/Surgeon is not a participant
- Refused Informed Consent: if informed consent is required by the local IRB, then refusal of consent
- Medical records or documentation are not available, cannot be accessed
- Age < 18yrs
- Neurological paralysis due to pre-existing spinal disease or injury (such as traumatic brain injury resulting in lower limb weakness)
- Surgical procedure/device on exclusion list
  - Excluded procedures include laser disc ablation, AxiaLIF.
  - Patients who have a history of or whose current surgery includes an excluded device. Excluded devices are interspinous distraction device, spinal cord stimulator.
- Severe Peripheral Neuropathy or Primary Neuropathy. Severe peripheral neuropathy indicates that the patient has objective sensory loss or weakness that might interfere with daily activities. We are trying to exclude those patients as this will affect the patient-reported quality of life surveys and our interpretation of patient outcomes. The question, however, raises the issue of having the symptoms documented as present but without the degree of severity. For example if the documentations states only diabetic neuropathy or peripheral neuropathy without the designation of severe or primary neuropathy, then the case is included and not excluded. If the documentation fails to specify that the neuropathy is severe or primary, include the patient. Only “severe or primary” neuropathy is excluded.
Exclusions specific to Lumbar Diagnostic Categories

- Deformity (including scoliosis that is documented as > 20 degrees, moderate, large, or severe)
- Spondylolisthesis grade 2, 3, 4, or 5 (>25%-100% spondylolisthesis)
- Pseudoarthrosis
- Ossified Posterior Longitudinal Ligament (OPLL)
- Same-level recurrent multi-level stenosis
- Previous or current sacroiliac (SI) joint fusion
- Surgical procedure (such as laminectomy, laminotomy, or decompression) of > 4 levels (e.g., L2-S1 laminectomy)
- Fusion of >3 motion segments (L2-S1): inclusive of current and prior surgeries
  It is important to understand the difference between the number of motion segments and number of levels operated on. The number of levels is the number of lamina of the vertebrae that are operated on for laminectomy/laminotomy or foraminotomy or decompression. The number of motion segment refers to one motion segment between two vertebrae. For instance, L2-L3 is one motion segment but the number of levels operated on can be one (either L2 or L3) or two (that is both L2 and L3).
- Myasthenia gravis
- Arnold Chiari Malformation Type II

Exclusions specific to Cervical Categories

- Deformity (including thoracic and/or lumbar kyphosis. Or, scoliosis that is documented as > 20 degrees, moderate, large, or severe)
- Spondylolisthesis grade 2, 3, 4, or 5 (>25%-100% spondylolisthesis)
- Pseudoarthrosis
- Thoracic Outlet Syndrome
- Klippel-Fiel Anomaly
- Prior cervical surgery at the same level
- Revision Adjacent Segment Pathology: in the cervical module, when the surgeries (past and present) link up together that is a revision adjacent segment disease which should be excluded
- Patients with the presence of any neurologic condition or deficit that would cause the interpretation of outcome to be unclear; for instance: hand weakness, atrophy and numbness from a chronic ulnar neuropathy or end stage carpal tunnel syndrome with numbness, atrophy and weakness or severe peripheral neuropathy with sensory loss or weakness.
- Central nervous system disorders, including:
  - Huntington’s Disease
  - Advanced dementia
  - Alzheimer’s Disease
  - Cerebral Palsy
  - Locked-in Syndrome
  - Arachnoid Cysts
  - Brain tumor affecting movement (parietal lobe, cerebellum)
  - Encephalitis
- Myasthenia gravis
- Arnold Chiari Malformation Type II
Patients whose surgery involves Occiput, C1, or any segment of the thoracic spine below T2.

Patients undergoing surgery for neck pain, arm pain, or weakness that do not have documentation of one of the four underlying pathologies (i.e. ACDF for neck pain without MRI/CT/Xrays documenting disc herniation, stenosis, or instability).

**Administrative Exclusions.**

- Unable to collect baseline patient-reported outcome data