



Evidence Brief: Use of Performance Measures as Criteria for Selecting Community Cardiac and Orthopedic Surgical Providers for the Veterans Choice Program

Supplemental Materials

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Prepared for:

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APPENDIX A: EXISTING PERFORMANCE MEASURE SETS

Organization	Clinical Area	Number of Measures	Measure Development Process
NQF ¹⁻³	All Includes surgery specific measures – cardiac, orthopedic	NQF: · 50 - Search of cardiac surgery, orthopedic surgery, hip/pelvic fracture surgery, thoracic surgery CMS Core Measure Sets: · CABG – 4 · Ortho - 9	Expert consensus
VASQIP ^{4,5}	Surgery - all	97	National VA Surgical Risk Study (NVASRS) 1991-1993. Prospective study on surgical measures and outcomes aimed at developing risk prediction models.
NSQIP ⁶⁻⁸	Surgery – all	135 from Shiloach 2010 75 cardiac specific, reported in Dixon 2015 - 46 preoperative - 4 intraoperative - 25 postoperative	Model taken from VASQIP and now managed by ACS
SCIP ⁹	Surgery – all	15 Infection – 7 Cardiac – 2 VTE – 4 Global – 2	Expert consensus
STS ⁶	Cardiac	27 counted on website - 1 composite - 18 outcome - 7 process - 1 structure 121 reported from Dixon 2015 - 59 preoperative - 45 intraoperative - 17 postoperative	Endorsed or considered for endorsement by NQF

APPENDIX B: SEARCH STRATEGIES

1. Readmissions	
A. Required sources:	Evidence:
Medline Date: 3/15/17	Database: Ovid MEDLINE(R) <1946 to March Week 2 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <March 15, 2017> Search Strategy: ----- 1 exp Patient Readmission/ (11478) 2 Readmission*.ti,ab,kw. (16316) 3 1 or 2 (21425) 4 exp Quality Indicators, Health Care/ (16977) 5 exp "Outcome and Process Assessment (Health Care)"/ (908342) 6 (Quality or ACS NSQIP).ti,ab. (739312) 7 4 or 5 or 6 (1577404) 8 exp Thoracic Surgery/ (11984) 9 Thorax/su [Surgery] (2527) 10 exp Cardiovascular Surgical Procedures/ (337795) 11 exp Thoracic Surgical Procedures/ (297945) 12 Orthopedics/su [Surgery] (152) 13 exp Orthopedic Procedures/ (251138) 14 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1933243) 15 8 or 9 or 10 or 11 or 12 or 13 or 14 (2369834) 16 3 and 7 and 15 (2241) 17 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (7133227) 18 surg*.ti,ab. (1581744) 19 16 and 18 (1059) 20 17 and 19 (601) 21 (surg* and measure* and quality and readmission*).ti. (9) 22 20 or 21 (605) 23 limit 22 to english language (588) 24 remove duplicates from 23 (560) *****
Cochrane Database of Systematic Reviews & Methodology Register Date: 3/15/17	Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to March 15, 2017> Search Strategy: ----- 1 [exp Patient Readmission/] (0) 2 Readmission*.ti,ab,kw. (39) 3 1 or 2 (39) 4 [exp Quality Indicators, Health Care/] (0) 5 [exp "Outcome and Process Assessment (Health Care)"/] (0) 6 (Quality or ACS NSQIP).ti,ab. (5026) 7 4 or 5 or 6 (5026) 8 [exp Thoracic Surgery/] (0) 9 [Thorax/su [Surgery]] (0) 10 [exp Cardiovascular Surgical Procedures/] (0) 11 [exp Thoracic Surgical Procedures/] (0) 12 [Orthopedics/su [Surgery]] (0) 13 [exp Orthopedic Procedures/] (0) 14 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1077) 15 8 or 9 or 10 or 11 or 12 or 13 or 14 (1077) 16 3 and 7 and 15 (4)

	17 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (3124) 18 surg*.ti,ab. (1518) 19 16 and 18 (1) 20 17 and 19 (0) 21 (surg* and measure* and quality and readmission*).ti. (0) 22 20 or 21 (0) 23 limit 22 to english language [Limit not valid; records were retained] (0) 24 remove duplicates from 23 (0) *****
CCRCT Date: 3/15/17	Database: EBM Reviews - Cochrane Central Register of Controlled Trials <February 2017> Search Strategy: ----- 1 exp Patient Readmission/ (727) 2 Readmission*.ti,ab,kw. (2312) 3 1 or 2 (2670) 4 exp Quality Indicators, Health Care/ (295) 5 exp "Outcome and Process Assessment (Health Care)"/ (113624) 6 (Quality or ACS NSQIP).ti,ab. (63313) 7 4 or 5 or 6 (164168) 8 exp Thoracic Surgery/ (151) 9 Thorax/su [Surgery] (2) 10 exp Cardiovascular Surgical Procedures/ (16505) 11 exp Thoracic Surgical Procedures/ (13683) 12 Orthopedics/su [Surgery] (0) 13 exp Orthopedic Procedures/ (9539) 14 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (118774) 15 8 or 9 or 10 or 11 or 12 or 13 or 14 (131844) 16 3 and 7 and 15 (295) 17 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (355878) 18 surg*.ti,ab. (103574) 19 16 and 18 (75) 20 17 and 19 (40) 21 (surg* and measure* and quality and readmission*).ti. (0) 22 20 or 21 (40) 23 limit 22 to english language (39) 24 remove duplicates from 23 (38) *****
NHS Economic Evaluation Date: 3/15/17	Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> Search Strategy: ----- 1 exp Patient Readmission/ (161) 2 Readmission*.ti,ab,kw. (20) 3 1 or 2 (164) 4 exp Quality Indicators, Health Care/ (27) 5 exp "Outcome and Process Assessment (Health Care)"/ (4159) 6 (Quality or ACS NSQIP).ti,ab. (302) 7 4 or 5 or 6 (4372) 8 exp Thoracic Surgery/ (10) 9 Thorax/su [Surgery] (0) 10 exp Cardiovascular Surgical Procedures/ (710) 11 exp Thoracic Surgical Procedures/ (629) 12 Orthopedics/su [Surgery] (0) 13 exp Orthopedic Procedures/ (547) 14 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab.

	(1026) 15 8 or 9 or 10 or 11 or 12 or 13 or 14 (2004) 16 3 and 7 and 15 (22) 17 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (263) 18 surg*.ti,ab. (1088) 19 16 and 18 (10) 20 17 and 19 (0) 21 (surg* and measure* and quality and readmission*).ti. (0) 22 20 or 21 (0) 23 limit 22 to english language (0) 24 remove duplicates from 23 (0) *****
CINAHL Date: 3/15/17	Database: EBSCOhost CINAHL Plus with Full Text Search Strategy: ----- S1 (MH "Readmission") (7499) S2 TI Readmission\$ OR AB Readmission\$ OR MW Readmission\$ (10419) S3 S1 OR S2 (10419) S4 (MH "Clinical Indicators") (9413) S5 (MH "Outcome Assessment") OR (MH "Process Assessment (Health Care)+") (34719) S6 TI (Quality OR ACS NSQIP) OR AB (Quality OR ACS NSQIP) (200910) S7 S4 OR S5 OR S6 (234270) S8 (MH "Thoracic Surgery+") (44891) S9 (MH "Surgery, Cardiovascular+") (46637) S10 (MH "Orthopedic Surgery+") (74399) S11 (MH "Orthopedics") (8756) S12 TI (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) OR AB (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) (125150) S13 S8 OR S9 OR S10 OR S11 OR S12 (231496) S14 S3 and S7 and S13 (279) S15 TI (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) OR AB (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) (503422) S16 TI surg* OR AB surg* (220124) S17 S14 AND S16 (191) S18 S15 AND S17 (117) S19 TI (surg\$ AND measure\$ AND quality AND readmission\$) OR AB (surg\$ AND measure\$ AND quality AND readmission\$) (0) S20 S18 AND S19 (117) S21 limit S20 to english language (115) *****

2. Mortality Rates

A. Required sources:	Evidence:
Medline Date: 3/22/17 Updated: 4/4/17	Database: Ovid MEDLINE(R) <1946 to March Week 4 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <April 03, 2017> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (17040) 2 exp "Outcome and Process Assessment (Health Care)"/ (911588) 3 (Quality or ACS NSQIP).ti,ab. (743554) 4 1 or 2 or 3 (1584625) 5 exp Thoracic Surgery/ (11990)

	6 Thorax/su [Surgery] (2527) 7 exp Cardiovascular Surgical Procedures/ (338850) 8 exp Thoracic Surgical Procedures/ (298602) 9 Orthopedics/su [Surgery] (152) 10 exp Orthopedic Procedures/ (251714) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1939359) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (2376877) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (7160734) 14 surg*.ti,ab. (1586814) 15 (surg* and measure* and quality and mortality).ti. (3) 16 (30 day mortality or 60 day mortality or 90 day mortality).ti,ab,kw. (11751) 17 Postoperative Mortality.mp. (6323) 18 16 or 17 (17701) 19 4 and 12 and 18 (4124) 20 13 and 19 (1858) 21 14 and 20 (1244) 22 15 or 21 (1247) 23 remove duplicates from 22 (1205) 24 limit 23 to english language (1137) *****
Cochrane Database of Systematic Reviews & Methodology Register Date: 3/24/17	Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to March 22, 2017> Search Strategy: ----- 1 (Quality or ACS NSQIP).ti,ab. (5034) 2 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1077) 3 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (3135) 4 surg*.ti,ab. (1519) 5 (surg* and measure* and quality and mortality).ti. (0) 6 (30 day mortality or 60 day mortality or 90 day mortality).ti,ab,kw. (21) 7 Postoperative Mortality.mp. (73) 8 6 or 7 (89) 9 1 and 2 and 8 (17) 10 4 and 9 (16) 11 3 and 10 (7) *****
CCRCT Date: 4/4/17	Database: EBM Reviews - Cochrane Central Register of Controlled Trials <February 2017> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (295) 2 exp "Outcome and Process Assessment (Health Care)"/ (113624) 3 (Quality or ACS NSQIP).ti,ab. (63313) 4 1 or 2 or 3 (164168) 5 exp Thoracic Surgery/ (151) 6 Thorax/su [Surgery] (2) 7 exp Cardiovascular Surgical Procedures/ (16505) 8 exp Thoracic Surgical Procedures/ (13683) 9 Orthopedics/su [Surgery] (0) 10 exp Orthopedic Procedures/ (9539) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (118774) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (131844) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (355878) 14 surg*.ti,ab. (103574)

	15 (surg* and measure* and quality and mortality).ti. (0) 16 (30 day mortality or 60 day mortality or 90 day mortality).ti,ab,kw. (1289) 17 Postoperative Mortality.mp. (316) 18 16 or 17 (1586) 19 4 and 12 and 18 (267) 20 13 and 19 (123) 21 14 and 20 (70) 22 15 or 21 (70) 23 remove duplicates from 22 (68) 24 limit 23 to english language (67) *****
NHS Economic Evaluation Date: 4/4/17	Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (27) 2 exp "Outcome and Process Assessment (Health Care)"/ (4159) 3 (Quality or ACS NSQIP).ti,ab. (302) 4 1 or 2 or 3 (4372) 5 exp Thoracic Surgery/ (10) 6 Thorax/su [Surgery] (0) 7 exp Cardiovascular Surgical Procedures/ (710) 8 exp Thoracic Surgical Procedures/ (629) 9 Orthopedics/su [Surgery] (0) 10 exp Orthopedic Procedures/ (547) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1026) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (2004) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (263) 14 surg*.ti,ab. (1088) 15 (surg* and measure* and quality and mortality).ti. (0) 16 (30 day mortality or 60 day mortality or 90 day mortality).ti,ab,kw. (0) 17 Postoperative Mortality.mp. (5) 18 16 or 17 (5) 19 4 and 12 and 18 (0) 20 13 and 19 (0) 21 14 and 20 (0) 22 15 or 21 (0) 23 remove duplicates from 22 (0) 24 limit 23 to english language (0) *****
CINAHL Date: 4/4/17	Database: EBSCOhost CINAHL Plus with Full Text Search Strategy: ----- S1 (MH "Clinical Indicators") (9431) S2 (MH "Outcome Assessment") OR (MH "Process Assessment (Health Care)+") (34859) S3 TI (Quality OR ACS NSQIP) OR AB (Quality OR ACS NSQIP) (201663) S4 S1 OR S2 OR S3 (235154) S5 (MH "Thoracic Surgery+") (45131) S6 (MH "Surgery, Cardiovascular+") (46846) S7 (MH "Orthopedic Surgery+") (74809) S8 (MH "Orthopedics") (8797) S9 TI (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) OR AB (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) (126064) S10 S5 OR S6 OR S7 OR S8 OR S9 (232937)

	S11 TI (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) OR AB (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) (505470) S12 TI surg* OR AB surg* (221304) S13 TI (surg\$ AND measure\$ AND quality AND readmission\$) OR AB (surg\$ AND measure\$ AND quality AND mortality) (3) S14 TI ((30 day mortality OR 60 day mortality OR 90 day mortality)) OR AB ((30 day mortality OR 60 day mortality OR 90 day mortality)) (2466) S15 (MH "Mortality") (19322) S16 Postoperative Mortality (512) S17 S14 OR S15 OR S16 (22018) S18 S4 AND S10 AND S17 (234) S19 S11 AND S18 (93) S20 S12 AND S19 (69) S21 S13 OR S20 (72) *****
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3. Post-op Care Plan

A. Required sources:	Evidence:
Medline Date: 3/22/17 Updated: 4/4/17	Database: Ovid MEDLINE(R) <1946 to March Week 4 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <April 03, 2017> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (17040) 2 exp "Outcome and Process Assessment (Health Care)"/ (911588) 3 (Quality or ACS NSQIP).ti,ab. (743554) 4 1 or 2 or 3 (1584625) 5 exp Thoracic Surgery/ (11990) 6 Thorax/su [Surgery] (2527) 7 exp Cardiovascular Surgical Procedures/ (338850) 8 exp Thoracic Surgical Procedures/ (298602) 9 Orthopedics/su [Surgery] (152) 10 exp Orthopedic Procedures/ (251714) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1939359) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (2376877) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (7160734) 14 surg*.ti,ab. (1586814) 15 (surg* and measure* and quality and mortality).ti. (3) 16 patient care planning.mp. or exp Patient Care Planning/ (59227) 17 (care pathway* or clinical pathway*).ti,ab,kw. (5171) 18 16 or 17 (62380) 19 (home care or nursing home or assisted living).ti,ab. (34207) 20 18 and 19 (1255) 21 4 and 12 and 20 (32) *****
Cochrane Database of Systematic Reviews & Methodology Register Date: 3/24/17	Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to March 22, 2017> Search Strategy: ----- 1 (Quality or ACS NSQIP).ti,ab. (5034) 2 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1077) 3 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (3135) 4 surg*.ti,ab. (1519)

	5 (surg* and measure* and quality and care).ti. (0) 6 patient care planning.mp. (33) 7 (care pathway* or clinical pathway*).ti,ab,kw. (14) 8 (home care or nursing home or assisted living).ti,ab. (26) 9 6 or 7 or 8 (70) 10 1 and 2 and 9 (5) 11 3 and 10 (4) 12 4 and 11 (0) *****
CCRCT Date: 4/4/17	Database: EBM Reviews - Cochrane Central Register of Controlled Trials <February 2017> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (295) 2 exp "Outcome and Process Assessment (Health Care)"/ (113624) 3 (Quality or ACS NSQIP).ti,ab. (63313) 4 1 or 2 or 3 (164168) 5 exp Thoracic Surgery/ (151) 6 Thorax/su [Surgery] (2) 7 exp Cardiovascular Surgical Procedures/ (16505) 8 exp Thoracic Surgical Procedures/ (13683) 9 Orthopedics/su [Surgery] (0) 10 exp Orthopedic Procedures/ (9539) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (118774) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (131844) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (355878) 14 surg*.ti,ab. (103574) 15 (surg* and measure* and quality and mortality).ti. (0) 16 patient care planning.mp. or exp Patient Care Planning/ (1361) 17 (care pathway* or clinical pathway*).ti,ab,kw. (429) 18 16 or 17 (1697) 19 (home care or nursing home or assisted living).ti,ab. (2423) 20 18 and 19 (55) 21 4 and 12 and 20 (1) *****
NHS Economic Evaluation Date: 4/4/17	Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (27) 2 exp "Outcome and Process Assessment (Health Care)"/ (4159) 3 (Quality or ACS NSQIP).ti,ab. (302) 4 1 or 2 or 3 (4372) 5 exp Thoracic Surgery/ (10) 6 Thorax/su [Surgery] (0) 7 exp Cardiovascular Surgical Procedures/ (710) 8 exp Thoracic Surgical Procedures/ (629) 9 Orthopedics/su [Surgery] (0) 10 exp Orthopedic Procedures/ (547) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1026) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (2004) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (263) 14 surg*.ti,ab. (1088) 15 (surg* and measure* and quality and mortality).ti. (0) 16 patient care planning.mp. or exp Patient Care Planning/ (212)

	17 (care pathway* or clinical pathway*).ti,ab,kw. (66) 18 16 or 17 (219) 19 (home care or nursing home or assisted living).ti,ab. (49) 20 18 and 19 (2) 21 4 and 12 and 20 (0) *****
CINAHL Date: 4/4/17	Database: EBSCOhost CINAHL Plus with Full Text Search Strategy: ----- S1 (MH "Clinical Indicators") (9431) S2 (MH "Outcome Assessment") OR (MH "Process Assessment (Health Care)+") (34859) S3 TI (Quality OR ACS NSQIP) OR AB (Quality OR ACS NSQIP) (201663) S4 S1 OR S2 OR S3 (235154) S5 (MH "Thoracic Surgery+") (45131) S6 (MH "Surgery, Cardiovascular+") (46846) S7 (MH "Orthopedic Surgery+") (74809) S8 (MH "Orthopedics") (8797) S9 TI (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) OR AB (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) (126064) S10 S5 OR S6 OR S7 OR S8 OR S9 (232937) S11 TI (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) OR AB (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) (505470) S12 TI surg* OR AB surg* (221304) S13 TI (surg\$ AND measure\$ AND quality AND readmission\$) OR AB (surg\$ AND measure\$ AND quality AND readmission\$) (0) S14 (MH "Patient Care Plans+") (8763) S15 patient care plan\$ (4730) S16 TI (care pathway\$ OR clinical pathway\$) OR AB (care pathway\$ OR clinical pathway\$) (2546) S17 TI (home care OR nursing home OR assisted living) OR AB (home care OR nursing home OR assisted living) (26014) S18 S14 OR S15 OR S16 OR S17 (37049) S19 S4 AND S10 AND S18 (196) S20 S11 AND S19 (65) S21 S12 AND S20 (21) *****

4. Wait Times

A. Required sources:	Evidence:
Medline Date: 4/4/17 Updated: 6/13/17	Database: Ovid MEDLINE(R) <1946 to June Week 1 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <June 12, 2017> Search Strategy: ----- 1 exp Thoracic Surgery/ (12160) 2 Thorax/su [Surgery] (2531) 3 exp Cardiovascular Surgical Procedures/ (345848) 4 exp Thoracic Surgical Procedures/ (303795) 5 Orthopedics/su [Surgery] (153) 6 exp Orthopedic Procedures/ (256205) 7 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1982456) 8 1 or 2 or 3 or 4 or 5 or 6 or 7 (2426823) 9 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (7306744)

	10 surg*.ti,ab. (1617175) 11 (target time* or waiting time or Waiting List).mp. or exp Waiting Lists/ (19131) 12 8 and 9 and 10 and 11 (540) 13 limit 12 to english language (486) 14 remove duplicates from 13 (469) *****
Cochrane Database of Systematic Reviews & Methodology Register Date: 3/24/17 Updated: 6/13/17	Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to June 9, 2017> Search Strategy: ----- 1 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1087) 2 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (3168) 3 surg*.ti,ab. (1535) 4 (target time* or waiting time or Waiting List).mp. or exp Waiting Lists/ (381) 5 1 and 4 (29) 6 2 and 4 (173) 7 5 or 6 (182) *****
CCRCT Date: 4/4/17 Updated: 6/13/17	Database: EBM Reviews - Cochrane Central Register of Controlled Trials <April 2017> Search Strategy: ----- 1 exp Thoracic Surgery/ (151) 2 Thorax/su [Surgery] (2) 3 exp Cardiovascular Surgical Procedures/ (16674) 4 exp Thoracic Surgical Procedures/ (13799) 5 Orthopedics/su [Surgery] (0) 6 exp Orthopedic Procedures/ (9656) 7 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (122041) 8 1 or 2 or 3 or 4 or 5 or 6 or 7 (135244) 9 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (365411) 10 surg*.ti,ab. (106681) 11 (target time* or waiting time or Waiting List).mp. or exp Waiting Lists/ (2398) 12 8 and 9 and 10 and 11 (47) 13 limit 12 to english language (41) 14 remove duplicates from 13 (41) *****
NHS Economic Evaluation Date: 4/4/17 Updated: 6/13/17	Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> Search Strategy: ----- 1 exp Thoracic Surgery/ (10) 2 Thorax/su [Surgery] (0) 3 exp Cardiovascular Surgical Procedures/ (710) 4 exp Thoracic Surgical Procedures/ (629) 5 Orthopedics/su [Surgery] (0) 6 exp Orthopedic Procedures/ (547) 7 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1026) 8 1 or 2 or 3 or 4 or 5 or 6 or 7 (2004) 9 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (263) 10 surg*.ti,ab. (1088)

	11 (target time* or waiting time or Waiting List).mp. or exp Waiting Lists/ (133) 12 8 and 11 (32) *****
CINAHL Date: 4/4/17 Updated: 6/13/17	Database: EBSCOhost CINAHL Plus with Full Text Search Strategy: ----- S1 (MH "Thoracic Surgery+") (45864) S2 (MH "Surgery, Cardiovascular+") (47712) S3 (MH "Orthopedic Surgery+") (76552) S4 (MH "Orthopedics") (8891) S5 TI (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) OR AB (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) (137985) S6 S1 OR S2 OR S3 OR S4 OR S5 (244533) S7 TI (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) OR AB (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) (572399) S8 TI surg* OR AB surg* (245763) S9 (MH "Waiting Lists") (4169) S10 TX wait\$ list\$ (2222) S11 TX target time\$ (245) S12 S9 OR S10 OR S11 (6453) S13 S6 AND S7 AND S8 AND S12 (52) *****

5. Guideline Compliance

A. Required sources:	Evidence:
Medline Date: 3/22/17 Updated 6/19/17	Database: Ovid MEDLINE(R) <1946 to June Week 2 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <June 16, 2017> Search Strategy: ----- 1 exp Thoracic Surgery/ (12160) 2 Thorax/su [Surgery] (2531) 3 exp Cardiovascular Surgical Procedures/ (346098) 4 exp Thoracic Surgical Procedures/ (303967) 5 Orthopedics/su [Surgery] (153) 6 exp Orthopedic Procedures/ (256401) 7 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1984057) 8 1 or 2 or 3 or 4 or 5 or 6 or 7 (2428677) 9 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (7313030) 10 surg*.ti,ab. (1618459) 11 exp Guideline Adherence/ (27274) 12 (guidleine Compliance or policy Compliance or protocol Compliance or institutional Compliance).ti,ab,kw. (380) 13 (guidleine Adherence or policy Adherence or protocol Adherence or institutional Adherence).ti,ab,kw. (352) 14 11 or 12 or 13 (27847) 15 ((guideline or policy or protocol or institutional) adj3 (compliance or adherence)).mp. (29858) 16 14 or 15 (29858) 17 8 and 9 and 10 and 16 (397) 18 limit 17 to english language (363) 19 remove duplicates from 18 (346)

Cochrane Database of Systematic Reviews & Methodology Register Date: 3/24/17 Updated 6/19/17	Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to June 14, 2017> Search Strategy: ----- 1 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1089) 2 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (3172) 3 surg*.ti,ab. (1536) 4 [exp Guideline Adherence/] (0) 5 (guideline Compliance or policy Compliance or protocol Compliance or institutional Compliance).ti,ab,kw. (1) 6 (guideline Adherence or policy Adherence or protocol Adherence or institutional Adherence).ti,ab,kw. (1) 7 4 or 5 or 6 (2) 8 ((guideline or policy or protocol or institutional) adj3 (compliance or adherence)).mp. (289) 9 7 or 8 (289) 10 1 and 2 and 3 and 9 (1) *****
CCRCT Date: 4/4/17 Updated 6/19/17	Database: EBM Reviews - Cochrane Central Register of Controlled Trials <May 2017> Search Strategy: ----- 1 exp Thoracic Surgery/ (151) 2 Thorax/su [Surgery] (2) 3 exp Cardiovascular Surgical Procedures/ (16764) 4 exp Thoracic Surgical Procedures/ (13835) 5 Orthopedics/su [Surgery] (0) 6 exp Orthopedic Procedures/ (9715) 7 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (123336) 8 1 or 2 or 3 or 4 or 5 or 6 or 7 (136599) 9 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (370114) 10 surg*.ti,ab. (108072) 11 exp Guideline Adherence/ (830) 12 (guideline Compliance or policy Compliance or protocol Compliance or institutional Compliance).ti,ab,kw. (334) 13 (guideline Adherence or policy Adherence or protocol Adherence or institutional Adherence).ti,ab,kw. (149) 14 11 or 12 or 13 (1252) 15 ((guideline or policy or protocol or institutional) adj3 (compliance or adherence)).mp. (2166) 16 14 or 15 (2166) 17 8 and 9 and 10 and 16 (31) 18 limit 17 to english language (24) 19 remove duplicates from 18 (24) *****
NHS Economic Evaluation Date: 4/4/17 Updated 6/19/17	Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> Search Strategy: ----- 1 exp Thoracic Surgery/ (10) 2 Thorax/su [Surgery] (0) 3 exp Cardiovascular Surgical Procedures/ (710)

	4 exp Thoracic Surgical Procedures/ (629) 5 Orthopedics/su [Surgery] (0) 6 exp Orthopedic Procedures/ (547) 7 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1026) 8 1 or 2 or 3 or 4 or 5 or 6 or 7 (2004) 9 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (263) 10 surg*.ti,ab. (1088) 11 exp Guideline Adherence/ (75) 12 (guideline Compliance or policy Compliance or protocol Compliance or institutional Compliance).ti,ab,kw. (0) 13 (guideline Adherence or policy Adherence or protocol Adherence or institutional Adherence).ti,ab,kw. (0) 14 11 or 12 or 13 (75) 15 ((guideline or policy or protocol or institutional) adj3 (compliance or adherence)).mp. (94) 16 14 or 15 (94) 17 8 and 9 and 10 and 16 (1) 18 limit 17 to english language (1) 19 remove duplicates from 18 (1) *****
CINAHL Date: 4/4/17 Updated 6/19/17	Database: EBSCOhost CINAHL Plus with Full Text Search Strategy: ----- S1 (MH "Thoracic Surgery+") (45900) S2 (MH "Surgery, Cardiovascular+") (47756) S3 (MH "Orthopedic Surgery+") (76677) S4 (MH "Orthopedics") (8896) S5 TI (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) OR AB (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) (138274) S16 S1 OR S2 OR S3 OR S4 OR S5 (232937) S7 TI (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) OR AB (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) (574043) S8 TI surg* OR AB surg* (246392) S9 (MH "Guideline Adherence") (9724) S10 TI ((guideline Adherence OR policy Adherence OR protocol Adherence OR institutional Adherence)) OR AB ((guideline Adherence OR policy Adherence OR protocol Adherence OR institutional Adherence)) (662) S11 TI ((guideline Compliance OR policy Compliance OR protocol Compliance OR institutional Compliance)) OR AB ((guideline Compliance OR policy Compliance OR protocol Compliance OR institutional Compliance)) (293) S12 TI ((guideline or policy or protocol or institutional) N3 (compliance or adherence)) OR AB ((guideline or policy or protocol or institutional) N3 (compliance or adherence)) (4404) S13 S9 OR S10 OR S11 OR S12 (13179) S14 S6 AND S7 AND S8 AND S13 (52) *****

6. Infections

A. Required sources:	Evidence:
Medline Date: 3/22/17	Database: Ovid MEDLINE(R) <1946 to March Week 4 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <April 03, 2017> Search Strategy:

Updated: 4/4/17	----- 1 exp Quality Indicators, Health Care/ (17040) 2 exp "Outcome and Process Assessment (Health Care)"/ (911588) 3 (Quality or ACS NSQIP).ti,ab. (743554) 4 1 or 2 or 3 (1584625) 5 exp Thoracic Surgery/ (11990) 6 Thorax/su [Surgery] (2527) 7 exp Cardiovascular Surgical Procedures/ (338850) 8 exp Thoracic Surgical Procedures/ (298602) 9 Orthopedics/su [Surgery] (152) 10 exp Orthopedic Procedures/ (251714) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1939359) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (2376877) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (7160734) 14 surg*.ti,ab. (1586814) 15 (surg* and measure* and quality and infection).ti. (6) 16 Surgical Wound Infection.mp. or exp Surgical Wound Infection/ (32402) 17 Prophyla* Antibiotic*.ti,ab. (5418) 18 16 or 17 (36555) 19 4 and 12 and 18 (2310) 20 13 and 19 (914) 21 14 and 20 (749) 22 15 or 21 (754) 23 remove duplicates from 22 (732) 24 limit 23 to english language (682) *****
Cochrane Database of Systematic Reviews & Methodology Register Date: 3/24/17	Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to March 22, 2017> Search Strategy: ----- 1 (Quality or ACS NSQIP).ti,ab. (5034) 2 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1077) 3 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (3135) 4 surg*.ti,ab. (1519) 5 (surg* and measure* and quality and infection*).ti. (0) 6 (surgical site infection* or Surgical Wound Infection*).mp. (136) 7 Prophyla* Antibiotic*.ti,ab. (61) 8 6 or 7 (181) 9 1 and 2 and 8 (15) 10 4 and 9 (14) 11 3 and 10 (8) *****
CCRCT Date: 4/4/17	Database: EBM Reviews - Cochrane Central Register of Controlled Trials <February 2017> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (295) 2 exp "Outcome and Process Assessment (Health Care)"/ (113624) 3 (Quality or ACS NSQIP).ti,ab. (63313) 4 1 or 2 or 3 (164168) 5 exp Thoracic Surgery/ (151) 6 Thorax/su [Surgery] (2) 7 exp Cardiovascular Surgical Procedures/ (16505) 8 exp Thoracic Surgical Procedures/ (13683) 9 Orthopedics/su [Surgery] (0)

	10 exp Orthopedic Procedures/ (9539) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (118774) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (131844) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (355878) 14 surg*.ti,ab. (103574) 15 (surg* and measure* and quality and infection).ti. (0) 16 Surgical Wound Infection.mp. or exp Surgical Wound Infection/ (2784) 17 Prophyla* Antibiotic*.ti,ab. (1083) 18 16 or 17 (3585) 19 4 and 12 and 18 (173) 20 13 and 19 (68) 21 14 and 20 (54) 22 15 or 21 (54) 23 remove duplicates from 22 (54) 24 limit 23 to english language (51) *****
NHS Economic Evaluation Date: 4/4/17	Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> Search Strategy: ----- 1 exp Quality Indicators, Health Care/ (27) 2 exp "Outcome and Process Assessment (Health Care)"/ (4159) 3 (Quality or ACS NSQIP).ti,ab. (302) 4 1 or 2 or 3 (4372) 5 exp Thoracic Surgery/ (10) 6 Thorax/su [Surgery] (0) 7 exp Cardiovascular Surgical Procedures/ (710) 8 exp Thoracic Surgical Procedures/ (629) 9 Orthopedics/su [Surgery] (0) 10 exp Orthopedic Procedures/ (547) 11 (cardi* or ortho* or arthroplasty or vascular or aortic or hip or knee).ti,ab. (1026) 12 5 or 6 or 7 or 8 or 9 or 10 or 11 (2004) 13 (measure* or factor* or indicat* or marker* or metric*).ti,ab. (263) 14 surg*.ti,ab. (1088) 15 (surg* and measure* and quality and infection).ti. (0) 16 Surgical Wound Infection.mp. or exp Surgical Wound Infection/ (121) 17 Prophyla* Antibiotic*.ti,ab. (14) 18 16 or 17 (128) 19 4 and 12 and 18 (9) 20 13 and 19 (0) 21 14 and 20 (0) 22 15 or 21 (0) 23 remove duplicates from 22 (0) 24 limit 23 to english language (0) *****
CINAHL Date: 4/4/17	Database: EBSCOhost CINAHL Plus with Full Text Search Strategy: ----- S1 (MH "Clinical Indicators") (9431) S2 (MH "Outcome Assessment") OR (MH "Process Assessment (Health Care)+")/ (34859) S3 TI (Quality OR ACS NSQIP) OR AB (Quality OR ACS NSQIP) (201663) S4 S1 OR S2 OR S3 (235154) S5 (MH "Thoracic Surgery+") (45131) S6 (MH "Surgery, Cardiovascular+") (46846)

	S7 (MH "Orthopedic Surgery+") (74809) S8 (MH "Orthopedics") (8797) S9 TI (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) OR AB (cardi\$ OR ortho\$ OR arthroplasty OR vascular OR aortic OR hip OR knee) (126064) S10 S5 OR S6 OR S7 OR S8 OR S9 (232937) S11 TI (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) OR AB (measure\$ OR factor\$ OR indicat\$ OR marker\$ OR metric\$) (505470) S12 TI surg* OR AB surg* (221304) S13 TI (surg\$ AND measure\$ AND quality AND infection\$) OR AB (surg\$ AND measure\$ AND quality AND infection\$) (0) S14 Surgical Wound Infection\$ (7342) S15 TI Prophyla\$ Antibiotic\$ OR AB Prophyla\$ Antibiotic\$ (0) S16 (MH "Surgical Wound Infection") (7282) S17 S14 OR S15 OR S16 (7342) S18 S4 AND S10 AND S17 (154) S19 S11 AND S18 (57) S20 S12 AND S19 (55) *****
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7. Grey Literature	
A. Required sources:	Evidence:
AHRQ: evidence reports, technology assessments, U.S Preventative Services Task Force Evidence Synthesis Date: 3/20/17 Updated: 3/28/17	http://www.ahrq.gov/research/findings/evidence-based-reports/search.html Search: readmission; readmit; mortality; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: <i>None</i>
CADTH Date: 3/20/17 Updated: 3/28/17	https://www.cadth.ca Search: readmission; readmit; mortality; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: Post-Operative Follow-Up for Elderly Hip Fracture Surgery Patients: Clinical Effectiveness and Guidelines - <i>Abstract-based rapid review product; specific to follow-up care</i> Post-operative Pain Management for Patients After Elective Knee or Hip Replacement Surgery: Guidelines - <i>Specific to pain management, not related to quality measure</i> Timing of Hip Fracture Surgery for Non-Elderly Adults: Clinical Effectiveness and Guidelines - <i>Abstract-based rapid review product; potentially relevant</i> Cancellation of Hip and Knee Replacement Surgeries: Guidelines - <i>Specific to comorbidities associated with surgery cancellation</i> Preoperative Skin Antiseptic Preparations and Application Techniques for Preventing Surgical Site Infections: A Systematic Review of the Clinical Evidence and Guidelines - <i>SSI prevention specific to antiseptic application—peripheral information in the review is possibly useful for background on SSI; appendix 11 provides data by surgery type</i>
ECRI Institute	https://www.ecri.org/Pages/default.aspx

Date: 3/20/17 Updated: 3/28/17	Search: readmission; readmit; mortality and surgery; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: <i>None</i>
NHS Evidence Date: 3/20/17	http://www.evidence.nhs.uk/default.aspx Search: readmission; readmit; mortality; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: Thirty-day readmission rates in spine surgery: systematic review and meta-analysis - <i>KQ2 is relevant - What study factors impact the rate of 30-day readmissions? Includes time from enrollment as a factor</i> Effect of early surgery after hip fracture on mortality and complications: systematic review and meta-analysis - <i>KQ1-Supports wait time as a valid quality metric – relevant</i> Meta-analysis of studies on mortality of early surgery vs delayed surgery for patients with femoral neck fractures - <i>Chinese language only</i> Pre-operative indicators for mortality following hip fracture surgery: a systematic review and meta-analysis - <i>Background- patient-level characteristics only – may be useful as citation for number of studies looking at patient level characteristics</i> Morbidity and mortality related to odontoid fracture surgery in the elderly population - <i>Outcomes after fracture surgery. Study supports discussion on outcomes based on factors other than hospital/physician performance.</i> Timing matters in hip fracture surgery: patients operated within 48 hours have better outcomes - a meta-analysis and meta-regression of over 190,000 patients - <i>Relevant KQ1-Supports wait times as valid quality metric.</i> Timing of surgery for hip fractures: a systematic review of 52 published studies involving 291,413 patients - <i>Relevant KQ1-Supports wait times as valid quality metric.</i>
NQF Date: 3/23/17	http://www.qualityforum.org/ProjectListing.aspx Search: readmission; readmit; mortality and surgery; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: Surgery <i>These refer to ongoing projects, not complete data. See comments below for potentially relevant projects.</i> All-Cause Admissions and Readmissions Project 2015-2017 - Relevant measures: #1789, #2879, #2514, #2502, #2504 - Relevant for discussion of NQF activities All-Cause Admissions & Readmissions Project 2017 - Relevant measures: #2515 - Relevant for discussion of NQF activities – not sure how it differs from above Care Coordination Endorsement Maintenance Project 2016-2017 - Relevant measures: #0326, #0646, #0647, #0648, #0649 - Relevant for discussion of NQF activities Surgery Project 2015-2017 - Relevant measures: #1550, #1551, #2998, #3030, #3031, #3032 - Relevant for discussion of NQF activities
VA Products - VATAP, PBM and HSR&D publications	A. http://www.hsrd.research.va.gov/research/default.cfm Search: readmission; readmit; mortality and surgery; post-operative care; wait time; delay; guideline compliance; infection

Date: 3/29/17	Relevant Results: Differences in Quality, Cost, and Access between VA and Fee Basis CABG and PCI - Background of potential effects of outsourced, non-VA care identified by annual volume of procedures and hospital performance reported to Medicare-- performance measured in 30-day risk-adjusted mortality following acute myocardial infarction in the Hospital Compare database Improving Surgical Quality: Risks and Impact of Readmission - Background-On-going study-considers multiple patient-, procedure- and complication-based factors in 30-day readmission for the purposes of validating a risk prediction tool- specifically aimed at exposing data not currently reflected in VASQIP B. http://www.research.va.gov/research_topics/ Relevant Results: Access and Quality Tool www.accesstocare.va.gov - Background - provide Veterans with useful information related to such things as new and established patient wait times, satisfaction scores for access to primary and specialty care, and timeliness of urgent appointments. C. https://www.hsrd.research.va.gov/publications/esp Relevant Results: Joint replacement disparities https://www.hsrd.research.va.gov/publications/esp/joint-replacement.cfm - <u>Focuses on racial disparities – VA and non-VA</u> Public reporting of quality and safety data https://www.hsrd.research.va.gov/publications/esp/transparency.cfm - Background - Focuses on best way to present performance data to the public and if public reporting influences quality improvement programs or clinical measures. May be relevant context for discussion around KQ2. Readmission risk prediction https://www.hsrd.research.va.gov/publications/esp/readmission.cfm - Background-Useful to cite in discussion about existing models. The review finds risk prediction models for hospital readmission still not validated in the evidence. VA vs non-VA quality https://www.hsrd.research.va.gov/publications/esp/quality.cfm - <u>Background – VA vs non-VA quality of care</u>
CMS Policies Date: 3/29/17	https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityMeasures/CMS-Measures-Inventory.html Search: quality measures Relevant Results: Cardiovascular Measures - Background - Useful for background discussion of CMS measures. Orthopedic Measures - Background - Useful for background discussion of CMS measures. Statistical Issues In Assessing Hospital Performance - Background- CMS statistical guidance
Google scholar	http://scholar.google.com/

Date: 3/29/17	Search: readmission; readmit; mortality and surgery; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: Lucas, Donald J., and Timothy M. Pawlik. "Readmission after surgery." <i>Advances in surgery</i> 48 (2013): 185-199. - <i>Background Focuses on problems with the 30-day standard. Data on rates of readmission after surgery by surgery type</i> Karhade, Aditya V., et al. "Thirty-day readmission and reoperation after surgery for spinal tumors: a National Surgical Quality Improvement Program analysis." <i>Neurosurgical Focus</i> 41.2 (2016): E5. - <i>Rate of and reasons for readmission after surgery, focus on determining incidence for readmittance post-spinal tumor surgery, mortality and predictors of complications</i> Li, Zhongmin, et al. "Hospital variation in readmission after coronary artery bypass surgery in California." <i>Circulation: Cardiovascular Quality and Outcomes</i> (2012): CIRCOUTCOMES-112. - <i>Background- Focuses on disparity between hospital readmission rates, evidence for patient characteristics and hospital practices as key indicators of readmission risk (top 2 reasons for readmission failure or infection)</i>
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8. Search for systematic reviews currently under development (includes forthcoming reviews & protocols)

Date Searched:

A. Required sources:	Evidence:
PROSPERO (SR registry) Date: 3/29/17	http://www.crd.york.ac.uk/PROSPERO/ Search: readmission; readmit; mortality; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: Stein Ove Danielsen, Irene Lie, Philip Moons, Iren Sandven. Incidence and causes of thirty-day readmission after surgical aortic valve replacement and transcatheter aortic valve implantation: a systematic review and meta-analysis. PROSPERO 2016:CRD42016032670 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42016032670 - <i>Discussion – review in progress - Rate of and reasons for readmission after surgery, focus on determining incidence for readmittance, mortality and predictors of complications, unclear if patient level factors only</i> James Bernatz. Thirty-day readmission rates in orthopedic and neurosurgical spinal surgeries: a systematic review and meta-analysis. PROSPERO 2014:CRD42014015319 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42014015319 - <i>KQ1 -identifies patient level causes for and rate of 30-day readmission for spinal surgery (focused on cost-reduction).</i> James Bernatz, Paul Anderson. Thirty-day readmission rates in orthopedics: a systematic review. PROSPERO 2014:CRD42014010293 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42014010293 - <i>KQ1-identifies rate of and 22 risk factors for 30-day readmission; focused on reducing rate of 30-day readmission. Patient level only</i> Maria Peer, Andrea Bailey, Peter Gallacher, Fiona Coutts, Nigel Gleeson. The effect of waiting time on physical function in patients undergoing total knee arthroplasty surgery: a systematic review of the literature. PROSPERO 2016:CRD42016037093 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42016037093 - <i>NA-focused on functionality during wait time before knee surgery</i>

	Christoph Röder, Thomas Klestil, Birgit Winkler, Christoph Stotter, Martin Lutz, Stefan Nehrer, Gerald Gartlehner, Barbara Nussbaumer-Streit, Gernot Wagner, Irma Klerings. Immediate versus delayed surgery for hip fractures in the geriatric population. PROSPERO 2017:CRD42017058216 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42017058216 - Completion 28 February 2018- focused on geriatric hip surgery and wait times James Masters. A systematic review of the epidemiology of surgical site infection in hip fracture surgery. PROSPERO 2017:CRD42017050685 Available from http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42017050685 - Completion 30 September 2017- focused on SSI in hip fracture surgery
DoPHER (SR Protocols) Date: 3/29/17	http://eppi.ioe.ac.uk/webdatabases4/Intro.aspx?ID=9 Search: readmission; readmit; mortality and surgery; post-operative care; wait time; delay; guideline compliance; infection Relevant Results: None
Cochrane Database of Systematic Reviews: Protocols Date: 3/29/17	Database: EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012> Search Strategy: ----- 1 quality measure*.mp. [mp=title, abstract, subject heading word] (22) 2 performance measure*.mp. [mp=title, abstract, subject heading word] (13) 3 outcome measure*.mp. [mp=title, abstract, subject heading word] (766) 4 quality indicator*.mp. [mp=title, abstract, subject heading word] (25) 5 performance indicator*.mp. [mp=title, abstract, subject heading word] (6) 6 outcome indicator*.mp. [mp=title, abstract, subject heading word] (2) 7 1 or 2 or 3 or 4 or 5 or 6 (825) 8 surg*.mp. [mp=title, abstract, subject heading word] (805) 9 7 and 8 (65) ***** Relevant Results: None

APPENDIX C: LIST OF EXCLUDED STUDIES

Exclude reasons: B=Relevant for background information only, 1=Ineligible population, 2=Ineligible intervention, 3=Ineligible comparator, 4=Ineligible outcome, 5=Ineligible timing, 6=Ineligible study design, 7=Ineligible publication type 8=Outdated or ineligible systematic review, 9=Non-English language

#	Citation	Exclude reason
1	Agabiti N, Cesaroni G, Picciotto S, et al. The association of socioeconomic disadvantage with postoperative complications after major elective cardiovascular surgery. <i>J Epidemiol Community Health</i> . Oct 2008;62(10):882-889.	B
2	Agha R. Towards national surgical surveillance in the UK--a pilot study. <i>PLoS ONE [Electronic Resource]</i> . 2012;7(12):e47969.	1
3	Albright JM, Panzer RJ, Black ER, Mays RA, Lush-Ehmann CM. Reporting tools for clinical quality improvement. <i>Clinical Performance & Quality Health Care</i> . 1993;1(4):227-232.	4
4	Al-Khatib SM, Hellkamp A, Curtis J, et al. Non-evidence-based ICD implantations in the United States. <i>JAMA</i> . Jan 05 2011;305(1):43-49.	4
5	Al-Momany NH, Al-Bakri AG, Makahleh ZM, Wazaify MM. Adherence to international antimicrobial prophylaxis guidelines in cardiac surgery: a Jordanian study demonstrates need for quality improvement. <i>J Manage Care Pharm</i> . Apr 2009;15(3):262-271.	4
6	Alverson BK, O'Callaghan J. Hospital readmission: quality indicator or statistical inevitability? <i>Pediatrics</i> . Sep 2013;132(3):569-570.	1
7	Amato L, Colais P, Davoli M, et al. [Volume and health outcomes: evidence from systematic reviews and from evaluation of Italian hospital data]. <i>Epidemiologia e Prevenzione</i> . 2013;37(2-3 Suppl 2):1-100.	9
8	Anderson DJ, Chen LF, Sexton DJ, Kaye KS. Complex surgical site infections and the devilish details of risk adjustment: important implications for public reporting. <i>Infection Control & Hospital Epidemiology</i> . Oct 2008;29(10):941-946.	4
9	Andreasen JJ, Korsager B, Alstrup P, Jepsen OB. Postoperative wound infection: indicator of clinical quality? <i>Dan Med Bull</i> . Aug 2002;49(3):242-244.	4
10	Andruszkow H, Scharff B, Zapf A, et al. [Influence of comorbidities and delay in surgical treatment on mortality following femoral neck fracture]. <i>Z Orthop Unfall</i> . Aug 2013;151(4):338-342.	9
11	Angus DC. Grappling with intensive care unit quality--does the readmission rate tell us anything? <i>Critical Care Medicine</i> . Nov 1998;26(11):1779-1780.	1
12	Anonymous. Rewarding quality--the highest- and lowest-scored hospitals. Combined penalty/reward based on FY 2016 readmissions penalty, value-based purchasing reward/penalty and hospital-acquired conditions (HAC) score. <i>Mod Healthc</i> . Dec 21-28 2015;45(51):34.	7
13	Ashby E, Haddad FS, O'Donnell E, Wilson AP. How will surgical site infection be measured to ensure "high quality care for all"? <i>Journal of Bone & Joint Surgery - British Volume</i> . Sep 2010;92(9):1294-1299.	B
14	Ashton CM, Del Junco DJ, Soucek J, Wray NP, Mansyur CL. The association between the quality of inpatient care and early readmission: a meta-analysis of the evidence. <i>Medical Care</i> . Oct 1997;35(10):1044-1059.	B
15	Ashton CM, Wray NP. A conceptual framework for the study of early readmission as an indicator of quality of care. <i>Soc Sci Med</i> . Dec 1996;43(11):1533-1541.	B
16	Ashton HA, Buxton MJ, Day NE, et al. The Multicentre Aneurysm	B

	Screening Study (MASS) into the effect of abdominal aortic aneurysm screening on mortality in men: a randomised controlled trial. <i>Lancet</i> . Nov 16 2002;360(9345):1531-1539.	
17	Atkinson G, Giovanis T. Conceptual errors in the CMS refusal to make socioeconomic adjustments in readmission and other quality measures. <i>J Ambulatory Care Manage</i> . Jul-Sep 2014;37(3):269-272.	7
18	Awad N, Caputo FJ, Carpenter JP, Alexander JB, Trani JL, Lombardi JV. Relative value unit-based compensation incentivization in an academic vascular practice improves productivity with no early adverse impact on quality. <i>Journal of Vascular Surgery</i> . 2017;65(2):579-582.	2
19	Axon RN, Cole L, Moonan A, et al. Evolution and Initial Experience of a Statewide Care Transitions Quality Improvement Collaborative: Preventing Avoidable Readmissions Together. <i>Popul Health Manag</i> . Feb 2016;19(1):4-10.	1
20	Babaev A, Frederick PD, Pasta DJ, et al. Trends in management and outcomes of patients with acute myocardial infarction complicated by cardiogenic shock. <i>JAMA: Journal of the American Medical Association</i> . 2005;294(4):448-454.	2
21	Balla U, Malnick S, Schattner A. Early readmissions to the department of medicine as a screening tool for monitoring quality of care problems. <i>Medicine (Baltimore)</i> . Sep 2008;87(5):294-300.	1
22	Basta MN, Bauder AR, Kovach SJ, Fischer JP. Assessing the predictive accuracy of the American College of Surgeons National Surgical Quality Improvement Project Surgical Risk Calculator in open ventral hernia repair. <i>American Journal of Surgery</i> . Aug 2016;212(2):272-281.	1
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APPENDIX D: EVIDENCE TABLES

Table Abbreviations: CABG=coronary artery bypass grafting; CMS=Centers for Medicare & Medicaid Services; DRG=diagnosis-related group; DVT=deep vein thrombosis; EUROSCORE= European system for cardiac operative risk evaluation; HQA=Hospital Quality Alliance; HCFA=Health Care Financing Administration; HIQR=Hospital Inpatient Quality Reporting Program; LOS=length of stay; MI=myocardial infarction; MRSA=methicillin-resistant *Staphylococcus aureus*; NQF=National Quality Forum; NR=not reported; O/E=observed to expected; SCIP=Surgical Care Improvement Project; SSI=surgical site infection; STS=Society of Thoracic Surgeons; TJA=total joint arthroplasty; TKR=total knee replacement; THR=total hip replacement; VASQIP=Veterans Affairs Surgical Quality Improvement Program; VHA=Veterans Health Administration; VTE=venous thromboembolism

DATA ABSTRACTION: WAIT TIME (SYSTEMATIC REVIEWS)

Author Year Study Design	Population	Measure Details	Analytic Details	Findings	Setting; Timeframe
<i>Hip fractures (elderly)</i>					
Leung 2010 ¹⁰ Systematic Review	Hip fracture in the elderly N= 42 observational studies	Comparison between no-delay vs delay to surgery (cut-off for wait time, mortality, and complications varied by study)	Adjustment between studies varied	<i>Mortality:</i> Mixed conclusions between studies <i>Complications:</i> Most studies show an association between increased wait time and complications <i>Readmissions:</i> NR	1984-2009
Moja 2012 ¹¹ Systematic Review	Hip fracture in the elderly N= 191,873 within 35 observational studies	Comparison between no-delay vs surgical delay (cut-off for wait time and mortality varied by study)	Adjusted for age, sex, year, study design, data source, study quality, location, baseline risk	<i>Mortality:</i> Association between decreased wait time and decreased all-cause mortality rate (combined unadjusted and adjusted) OR 0.74 (95% CI 0.67 to 0.81) Stratified by surgical delay (combined unadjusted and adjusted): ≤12 hours: OR 0.84 (95% CI 0.57 to 1.23) ≤24 hours: OR 0.74 (95% CI 0.62 to 0.87) ≤48 hours: OR 0.75 (95% CI 0.68 to 0.81) >96 hours: OR 0.67 (95% CI 0.39 to 1.13) <i>Complications:</i> NR <i>Readmissions:</i> NR	1986-2011
Shiga 2008 ¹² Systematic Review	Hip fracture in the elderly N= 257,367 within 16	Comparison between wait time of ≤48-hours vs >48-hours	Adjustment between studies varied	<i>Mortality:</i> Association between increased wait time and increased 30-day mortality (unadjusted) OR 1.41 (95% CI 1.29 to 1.54) Association between increased wait time and	NR

	observational studies			increased 1-year mortality (unadjusted) OR 1.32 (95% CI 1.21 to 1.43) <i>Complications:</i> NR <i>Readmissions:</i> NR	
Simunovic 2010 ¹³ Systematic Review	Hip fracture in the elderly N= 13,478 within 16 observational studies	Comparison between no-delay vs surgical delay (cut-off for wait time and complications varied by study)	Adjustment between studies was varied	<i>Mortality:</i> Association between decreased wait time and decreased all-cause mortality (adjusted) RR 0.81 (95% CI 0.68 to 0.96) Stratified by mortality cut-off point: 30-day mortality (unadjusted) RR 0.90 (95% CI 0.71 to 1.13) 3 to 6-month mortality (unadjusted) RR 0.87 (95% CI 0.44 to 1.72) 1-year mortality (unadjusted) RR 0.55 (95% CI 0.40 to 0.75) <i>Complications:</i> Pneumonia (unadjusted) RR 0.59 (95% CI 0.37 to 0.93) Pressure sores (unadjusted) RR 0.48 (95% CI 0.34 to 0.69) Deep vein thrombosis (unadjusted) RR 0.97 (95% CI 0.56 to 1.68) Pulmonary embolism (unadjusted) RR 0.66 (95% CI 0.17 to 2.58) <i>Readmissions:</i> NR	NR
<i>Hip fracture (non-elderly)</i>					
Khan 2009 ¹⁴ Systematic Review	Hip fracture N= 291,413 within 52 observational studies	Comparison between no-delay vs delay to surgery (cut-off for wait time, mortality, and complications varied by study)	Adjustment between studies varied	<i>Mortality:</i> 10/24 studies showed an association between decreased wait time and decreased mortality (adjusted) 14/24 studies showed no association (adjusted) <i>Complications:</i> 6/11 studies showed an association between decreased wait time and decreased complications (adjusted) 5/11 studies showed no association (adjusted) <i>Readmissions:</i> NR	1970-2007
<i>Ankle fracture</i>					

Schepers 2013 ¹⁵	Ankle fracture	Comparison between no-delay vs surgical delay (cut-off for wait time and complications varied by study)	None	<i>Mortality:</i> NR <i>Complications:</i> Association between increased wait time and increased complications (unadjusted) OR 1.60 (95% CI 1.44 to 1.77) <i>Readmissions:</i> NR	1988-2013
Systematic Review	N= 11 observational studies				

DATA ABSTRACTION: WAIT TIME (PRIMARY STUDIES)

Author Year Study Design	Population	Measure Details	Analytic Details	Findings	Setting; Timeframe
<i>Cardiovascular surgery</i>					
Légaré 2005 ¹⁶	CABG among patients with stenosis of the left main coronary artery	Comparison between wait time within standard time or longer than standard time established for each triage level (emergent=0 days, in-hospital urgent=7 days, out-of-hospital semi-urgent A=21 days, out-of-hospital semi-urgent B=56 days)	Adjusted for propensity score, myocardial infarction within 7 days before surgery, preoperative renal failure, ejection fraction <40%, age >70 years, stenosis of left main coronary artery >70%	No statistically significant association between waiting longer than standard waiting time and composite score of in-hospital mortality, mechanical ventilation ≥ 24 hours postoperatively and postoperative length of stay > 9 days (adjusted) OR 0.7 (95% CI 0.4 to 1.2) No statistically significant association between queue assignment and out-of-hospital semi-urgent B for composite score Emergent: OR 2.5 (95% CI 0.95 to 6.5) In-hospital urgent: OR 0.9 (95% CI 0.4 to 1.9) Out-of-hospital semi-urgent A: OR 0.7 (95% 0.3 to 1.6) <i>Complications:</i> NR <i>Readmissions:</i> NR	1 hospital in Halifax, Nova Scotia 1999-2003
Prospective Cohort	N= 561				
Sobolev 2012 ¹⁷	CABG	Comparison between wait time of short delay**, prolonged delay***, and excessive delay****	Adjusted for risk score algorithm considering patient, clinical and surgical factors	<i>Mortality:</i> Statistically significant association between short delay and excessive delay for in-hospital mortality, but no association between prolonged delay and excessive delay (adjusted) Excessive delay (Reference) Prolonged delay OR 0.78 (95% CI 0.38 to 1.63) Short delay OR 0.32 (95% CI 0.20 to 0.51) <i>Complications:</i> NR <i>Readmissions:</i> NR	4 cardiac centers in British Columbia 1992-2006
Retrospective Cohort	N= 9,593				
<i>Hip fractures (elderly)</i>					

Meessen 2014 ¹⁸ Retrospective Cohort	Hip fracture in the elderly N= 828	Comparison between wait time of ≤ 48 hours vs > 48 hours	Adjusted for sex, age, Charlson comorbidity index	<i>Mortality:</i> No statistically significant association between wait time and 2-year all-cause mortality rate (Cox hazards analysis, adjusted) P >0.05 <i>Complications:</i> NR <i>Readmissions:</i> NR	Varese, Italy 2009
Holvik 2010 ¹⁹ Retrospective Cohort	Hip fracture in the elderly N= 567	Comparison between wait time of ≤ 24 hours vs > 24 hours	Adjusted for age, gender, pre-fracture residence (community or institution), number of comorbid conditions, severity of comorbidity, and number of medical complications observed during the stay	<i>Mortality:</i> No statistically significant association between wait time and 1-year all-cause mortality rate (adjusted) RR= 0.48 (95% CI 0.21 to 1.10) <i>Complications:</i> NR <i>Readmissions:</i> NR	Oslo, Norway 2007-2008
Karademir 2015 ²⁰ Retrospective Cohort	Hip fracture in the elderly N= 115	Comparison between wait time of ≤ 5 days vs > 5 days	None	<i>Mortality:</i> No statistically significant association between wait time and 1-year all-cause mortality rate (unadjusted) P=0.5 <i>Complications:</i> NR <i>Readmissions:</i> NR	Istanbul, Turkey Timeframe NR
<i>Hip fracture (non-elderly)</i>					
Clague 2002 ²¹ Retrospective Cohort	Hip fracture N= 462	Comparison between wait time of ≤ 24 -hours vs > 24 -hours	None	<i>Mortality:</i> No statistically significant association between wait time and in-hospital mortality rate (unadjusted) P >0.05 No statistically significant association between wait time and 90-day mortality rate (unadjusted) P > 0.05 <i>Complications:</i> NR <i>Readmissions:</i> NR	1 UK hospital, 1996-1999
Griffiths 2013 ²² Retrospective Cohort	Hip fracture N= 60	Comparison between wait time of ≤ 72 -hours vs > 72 -hours	None	<i>Mortality:</i> No statistically significant association between wait time and 30-day mortality (unadjusted) P=0.2 <i>Complications:</i>	1 UK hospital Timeframe NR

				Association between increased wait time and increased 30-day complications (unadjusted) P=0.008 <i>Readmissions: NR</i>	
Lund 2014 ²³	Hip fracture	Stratified by wait time	None	<i>Mortality:</i> No statistically significant association between wait time and 1-year all-cause mortality rate (unadjusted) 0-12h: HR 1.00 (Reference) 12-24 hours: HR 0.89 (95% CI 0.78 to 1.01) 24-48 hours: HR 1.03 (95% CI 0.91 to 1.17) 48-72 hours: HR 1.02 (95% CI 0.84 to 1.24) 72-96 hours: HR 1.10 (95% CI 0.83 to 1.44) >96 hours: HR 1.05 (95% CI 0.81 to 1.36) <i>Complications: NR</i> <i>Readmissions: NR</i>	Danish Anaesthesia Database 2005-2007
Retrospective Cohort	N= 6,143				
Lurati-Buse 2014 ²⁴	Hip fracture	Comparison between accelerated care (medical clearance within 2 hrs of diagnosis) and standard care	None	<i>Mortality:</i> No statistically significant association between increased wait time and increased 30-day mortality (unadjusted) OR 0.22 (95% CI 0.02 to 2.14)* <i>Complications: NR</i> <i>Readmissions: NR</i>	2 hospitals in Canada and 1 in India 2011-2012
RCT	N= 60				
Ryan 2015 ²⁵	Hip fracture	Stratified by wait time	Adjusted for age, gender, race, comorbidity burden, insurance status, day of admission, hospital factors size, teaching status, and region	<i>Mortality:</i> Association between increased wait time and increased in-hospital mortality (adjusted) 0-day: OR 1 (reference) 2-day: OR 1.14 (95% CI 1.06 to 1.23) ≥3-days: OR 1.34 (95% CI 1.23 to 1.46) <i>Complications:</i> Association between increased wait time and increased in-hospital complications (adjusted) 0-day: OR 1 (reference) 1-day: OR 1.09 (95% CI 1.06 to 1.12) 2-day: OR 1.33 (95% CI 1.29 to 1.39) ≥3-days: OR 2.08 (95% CI 2.00 to 2.16) <i>Readmissions: NR</i>	US National Inpatient Sample, 2000-2009
Retrospective Cohort	N= 2,121,215				
<i>Ankle fracture</i>					
Tennent 2001 ²⁶	Ankle fracture	Comparison between wait time of ≤14-days vs >14-days	None	<i>Mortality: NR</i> <i>Complications:</i> Association between increased wait time and increased infection rate (unadjusted)	2 UK hospitals
Retrospective Cohort	N= 47				

				≤14-days < 50%	
				>14-days = 50%	
				Readmissions: NR	
<i>Other fractures</i>					
Vallier 2013 ²⁷	Pelvis, acetabulum, femur, or spine fractures	Comparison between wait time of ≤24-hours vs >24-hours	Adjusted for age, injury severity, and the presence/severity of chest and/or abdominal injury	Mortality: NR Complications: Association between decreased wait time and decreased complication rate (adjusted) OR 0.731 (95% CI 0.546 to 0.986) Readmissions: NR	1 US hospital, 2005-2013
Retrospective Cohort	N= 1005				
Abbreviations: *= ESP Calculated; **= within 2 weeks for semiurgent and 6 weeks for nonurgent procedures; ***= within 6 for semi-urgent and 12 weeks for non-urgent procedures; ****= longer than 6 weeks for semi-urgent and 12 weeks for non-urgent procedures; CCS= Canadian Cardiac Society					

DATA ABSTRACTION: READMISSIONS

Author Year Study Design	Population	Measure Details	Analytic Details	Findings	Setting; Timeframe
Hannan 2011 ²⁸ Retrospective Cohort	CABG N= 33,936	Risk-adjusted hospital 30-day readmissions	Stepwise logistic regression, adjusted for patient, procedure, and hospital factors.	Process Measures: NR Mortality: Association with risk-adjusted 30-day hospital mortality rates (r=0.32, P=0.047), and with hospital risk-adjusted mortality rate in highest tertile (r=0.38, P=0.03) Complications: NR	NY State Cardiac Surgery Reporting System, 2005-2007
Hannan 2003 ²⁹ Retrospective Cohort	CABG N= 16,325	Risk adjusted hospital 30-day readmissions	Stepwise logistic regression, adjusted for patient, procedure, and hospital factors.	Process Measures: NR Mortality: No statistically significant association with overall hospital risk-adjusted mortality rate (r=0.09, P=0.64), but association with hospital RAMR in highest tertile, OR 1.14 (95% CI 1.03 to 1.25) Complications: NR	NY State Cardiac Surgery Reporting System, 1999
Parina 2015 ³⁰ Retrospective Cohort	CABG N= 296,063	Risk-adjusted 30-day readmission Considered high or low outliers if 95% CIs of O/E ratio excluded 1; classified 'discordant' if readmission and	Risk-adjustment for age, race, sex, LOS, Charlson index	Process Measures: NR Mortality: No association with overall mortality, among outliers 85% were discordant (CABG discordance rate: 78.3%) Complications: NR	299 hospitals in CA, 1995-2009

Author Year Study Design	Population	Measure Details	Analytic Details	Findings	Setting; Timeframe
		mortality rates were not both high or both low.			
Stefan 2013 ³¹ Retrospective Cohort	Cardiac and Vascular N= 73,573 Orthopedic N= 205,526	30-day risk standardized readmission rate	Predicted/expected ratio, standardized by overall mean; predicted calculated using hierarchical generalized linear models, adjusted for patient-level factors	<i>Process Measures:</i> Orthopedic: association for overall measure ($r=-0.06$; $P=0.003$) and appropriate care measure ($r=-0.05$, $P=0.03$) (care measures made up of SCIP measures) Cardiac + vascular: no association with overall or appropriate care measure <i>Mortality:</i> NR <i>Complications:</i> NR	CMS HIQR program, 2007
Thomas 1996 ³² Retrospective Cohort	CABG N= 4,261	Risk-adjusted, O/E unplanned, 30-, 60-, and 90-day readmissions	Stepwise logistic regression adjusted for patient age, sex, severity, complexity, LOS, and clinical variables	<i>Process Measures:</i> No relationship between CABG 30-day O/E readmissions and poor quality; Charts peer-reviewed based on set of HCFA-specified generic quality screens to evaluate care provided as acceptable or problematic <i>Mortality:</i> NR <i>Complications:</i> NR	Medicare data from Michigan hospitals, 1989-1991
Tsai 2013 ³³ Retrospective Cohort	CABG N= 153,496 Hip replacement N= 206,175	Hospital-level Composite of procedure-specific risk- adjusted 30-day readmission rates	Multivariate adjustment for patient and hospital characteristics	<i>Mortality:</i> CABG: Readmission rate in highest mortality quartile=18.1% vs the group of lowest quartile-third quartile=17.3%-17.4% ($P=0.013$) Hip replacement: Readmission rate in highest mortality quartile=11.7% vs the group of lowest quartile-third quartile=10.2-10.9% ($P<0.001$) <i>Process Measures:</i> HQA surgical score - based on SCIP process measures CABG: No statistically significant difference in readmission with HQA surgical score quartile ($P=0.751$) Hip replacement: No statistically significant difference in readmission with HQA surgical score quartile ($P=0.193$) <i>Complications:</i> NR	National Medicare data, 2009-2010
Zitser- Gurevich	CABG	First readmission within 100 days of CABG	Hospital mortality rank based on risk-adjusted 30-	<i>Process Measures:</i> NR <i>Mortality:</i>	National study of 14 hospitals: Israel 1994

Author Year Study Design	Population	Measure Details	Analytic Details	Findings	Setting; Timeframe
1999 ³⁴ Prospective Cohort	N=4,835	operation	day mortality rates. Logistic modeling with 61 explanatory variables including patient characteristics, operative factors, and post-operative variables	High mortality ranked hospitals had higher rates of readmission (OR=1.34, P=0.003) <i>Complications:</i> NR	

DATA ABSTRACTION: ADHERENCE TO SURGICAL STANDARDS

Author Year Study Design	Population	Measure Details	Analytic Details	Findings	Setting; Timeframe
Auerbach 2009 ³⁵ Retrospective Cohort	CABG N= 81,289	Proportion of patients who failed to receive recommended SCIP measures (# of missed measures).	30-day mortality adjusted for age, gender, DRG, comorbidities, hospital volume).	<i>Mortality:</i> 3 missed measures vs none missed OR 1.54 (95% CI 1.20 to 1.98), 4 or more missed measures vs none missed OR 1.63 (95% CI 1.24 to 2.15). <i>Complications:</i> NR <i>Readmissions:</i> No statistically significant association between # of missed measures and adjusted readmission (4 or more missed vs none OR 1.02 (95% CI 0.93 to 1.13).	164 US hospitals participating in Perspective database, 2003- 2005
Bhattacharyya 2009 ³⁶ Retrospective Cohort	Hip or knee replacement N= NR	Composite score of 3 measures of surgical process quality and 3 measures of surgical outcome per CMS guidelines (based on NQF). Performance tiers calculated by deciles of hospital performance.	Inpatient mortality (no information on risk adjustment). Iatrogenic complications and urinary tract infection risk- adjusted. Readmissions (no information on risk adjustment)	<i>Mortality:</i> No statistically significant difference in mortality across hospital tiers, but trend toward higher rate of mortality in tier 4 (lowest quality) hospitals (r=0.116, P=0.088) <i>Complications:</i> No significant association of complications with hospital tier (data NR). <i>Readmissions:</i> Readmission avoidance index did not differ between top 20% hospitals and other hospitals (P=0.488).	CMS Hospital Quality Initiative Demonstration, 2003
Brinkman 2014 ³⁷ Retrospective	CABG N= 506,110	Adherence to use of preoperative beta- blocker within 24 hours preceding surgery	Operative mortality (during procedure or within 30 days of procedure) adjusted for	<i>Mortality:</i> No statistically significant association with operative mortality: OR 0.96 (95% CI 0.88 to 1.04). <i>Complications:</i>	1,107 centers from STS database, 2008-2012

Cohort		(NQF).	age, body surface area, race, sex, comorbidities, prior operations, year of surgery, hospital effects.	Association of beta-blocker use with increased atrial fibrillation: OR 1.09 (95% CI 1.06 to 1.12). No association with other complications (stroke, prolonged ventilation, reoperation, renal failure). <i>Readmissions:</i> NR	
Cotogni 2017 ³⁸	Cardiac surgery	Adherence to prophylactic vancomycin administration timing protocol	Operative mortality or infection (during procedure or within 30 days of procedure) adjusted for age, EuroSCORE logistic, intensive care unit LOS, mechanical ventilation timing	<i>Mortality:</i> Association of increased mortality with protocol violation: OR 10.16 (95% CI 2.48 to 41.58) <i>Complications:</i> Association of increased SSI with protocol violation: OR 7.03 (95% CI 3.41 to 14.52) <i>Readmissions:</i> NR	1 hospital in Turin, Italy, Time NR
Prospective Cohort	N= 741				
Kim 2012 ³⁹	Hip or knee arthroplasty N= 356	Adherence to national guideline recommended surgical antibiotic prophylaxis (SAP) (antibiotic selection, timing and duration).	Before after implementation (2007 - 2nd phase) of national hospital evaluation program. No information on adjustment for confounders.	<i>Mortality:</i> NR <i>Complications:</i> Improved adherence to SAP guidelines (P<0.01) but no statistically significant changes in SSI rate, arthroplasty (P=0.44), spine surgery (P=0.28). <i>Readmissions:</i> NR	6 hospitals in Korea, 2006-2008
Retrospective Cohort	Spine surgery N= 537				
Kurlansky 2012 ⁴⁰	CABG N= 2,218	Total quality score (0 to 5) based on number of NQF process measures achieved. A score of 5=high-quality care.	Major morbidity (stroke, renal failure, reoperation, sternal infection, and prolonged ventilation) adjusted for hospital volume and STS risk score.	<i>Mortality:</i> NR <i>Complications:</i> Low quality score associated with increased stroke OR 1.51 (95% CI 1.18 to 1.93), reoperation OR 1.65 (95% CI 1.25 to 2.16), prolonged ventilation OR 1.54 (95% CI 1.21 to 1.96), and renal failure OR 1.91 (95% CI 1.09 to 3.35). No association with sternal infection. <i>Readmissions:</i> NR	5 cardiac surgery programs associated with Columbia University, 2007-2009
Retrospective Cohort					
LaPar 2014 ⁴¹	Cardiac N= 1,703	Adherence to SCIP measure of maintenance of 6am blood glucose levels on post-operative days 1 and 2	STS risk-adjusted operative mortality (during procedure or within 30 days of procedure), composite major morbidity and complications.	<i>Mortality:</i> No statistically significant association with SCIP measure failure vs no failure: OR 1.49 (95% CI 0.54 to 4.09). <i>Complications:</i> No statistically significant association with SCIP measure failure vs no failure for major morbidity (OR 1.51, 95% CI 0.86 to 2.67), and major sternal complications (OR 1.58, 95% CI 0.18 to 13.7). <i>Readmissions:</i> NR	University of Virginia Hospital, 2010-2012
Retrospective Cohort					
McDonnell 2013 ⁴²	Cardiac	SCIP outliers (non-control of blood glucose	30-day mortality, complications (MI,	<i>Mortality:</i> SCIP measure failure=1.8% vs compliant=1.7%;	Boston University Medical Center,

Retrospective Cohort	N= 832 66% CABG	at 6am on post-operative days 1 and 2)	infections), adjusted for serum creatinine level	P=0.55 <i>Complications:</i> No statistically significant association with SCIP measure failure and complications: MI (1.8% vs 1.4%, p=0.52), stroke (1.8% vs 0.9%, p=0.39), deep sternal infection (0% vs 0.4%, p=1.00), multisystem failure (1.8% vs 0.9%, p=0.43), atrial fibrillation (16.3% vs 30.3%, p=0.05). <i>Readmissions:</i> NR	2008-2011
Rasouli 2013 ⁴³ Retrospective Cohort	TJA N= 23,907	Before and after implementation of SCIP (adherence > 98% post implementation)	SSI rates within 1 year of index surgery. Adjusted for type of surgery, location, SCIP measures.	<i>Mortality:</i> NR <i>Complications:</i> After implementation, superficial SSI increased (P=0.05) and rate of deep SSI decreased (P=0.46). No change in DVT (P=0.51) and rate of PE increased (P=0.002). <i>Readmissions:</i> NR	Rothman Institute of Orthopedics, 2000-2009
Schelenz 2005 ⁴⁴ Retrospective Cohort	Cardiac N= 3,988	Before and after implementation of the 1998 UK national guidelines for the control of MRSA in hospitals and US guidelines on the control of SSI and infections in theatres.	MRSA rates 16 months before and after the intervention. Unadjusted.	<i>Mortality:</i> NR <i>Complications:</i> After implementation, there was a decrease in patients acquiring MRSA on ward (RR 0.41, 95% CI 0.23 to 0.76) <i>Readmissions:</i> NR	1 London hospital, 1999-2002
Wang 2012 ⁴⁵ Retrospective Cohort	Hip arthroplasty N= 17,714	Highly compliant hospitals (> median level of compliance) vs less compliant hospitals ($\leq$ median level of compliance) to SCIP measures	Hospital-level SS rates and patient level postoperative infection. Adjusted for patient, hospital and surgery variables	<i>Mortality:</i> NR <i>Complications:</i> Increased post-operative infection rates (OR 1.50, 95% CI 1.07 to 2.12) and hospital-level SSIs (OR 1.91, 95%CI 1.31 to 2.79) with higher adherence to SCIP VTE-2 prevention measure. No association with other SCIP adherence measures <i>Readmissions:</i> NR	128 New York state hospitals, 2008

DATA ABSTRACTION: MORTALITY

Author Year Study Design	Population	Measure Details	Findings	Setting; Timeframe
Guru	CABG	All-cause, risk-adjusted,	No statistically significant correlation between all-cause-risk	Cardiac Care Network

2008 ⁴⁶	N= 347	in-hospital mortality and proportion of preventable deaths	adjusted mortality rates and proportion of preventable deaths at hospital level (Spearman coefficient=-0.42, P=0.26)	of Ontario, 1998-2003
Retrospective Cohort				
Smith 2016 ⁴⁷	Multiple N= 236,125	Risk-adjusted 30-day mortality risk deciles	Distinct early survival risk pattern in highest risk decile for cardiac and orthopedic surgery with separation from all other deciles (eFigure, data NR)	VASQIP, 2011-2013
Retrospective Cohort				

DATA ABSTRACTION: MEASUREMENT BURDEN AND UNINTENDED EFFECTS

Author Year	Performance Measure	Measurement Burden	Unintended Effects
Auerbach 2009 ³⁵	Adherence to surgical standard	Lack of documentation of measures may be a concern. Electronic billing systems have not been validated for measure collection. Mortality and readmissions only at index hospital. Measures inpatient adherence only and cannot account for post-discharge factors	NR
Bhattacharyya 2009 ³⁶	Adherence to surgical standard	Limited distribution of the composite measure scores required calculation to 4th decimal place to separate hospitals into deciles Numerous steps in performance of surgery difficult to evaluate and centrally report Administrative costs of collecting, analyzing and reporting these measures have not been reported Some deviation from standards may be clinically appropriate - not captured in measure Unknown whether individual measures have good distribution and ceiling effects to be able to distinguish between high and low performance	NR
Brinkman 2014 ³⁷	Adherence to surgical standard	STS database collects perioperative beta-blocker use as "yes/no" field - cannot ascertain timing, dose, or other related covariates Adherence is low - some surgeons disagree with use in specific patients (<i>ie</i> , some cases of off-pump revascularization) May only be clinically beneficially in specific patients - measure does not specify which patients	Giving beta-blockers to patients who might not benefit, might have harms
Clague 2002 ²¹	Wait time	Presumably easily modifiable process measure Shorter and longer admission time may be beneficial to different subgroups - different measures would need to be applied to different subgroups of patients	NR
Griffiths 2013 ²²	Wait time	Difficult to determine whether delay to surgery was due to necessary medical optimization or due to non-patient factors such as surgeon or implant availability	NR

Guru 2008 ⁴⁶	Mortality	Reporting all-cause mortality does not account for the proportion that were not preventable Preventable deaths identified by chart reviews and adverse event audits - not a normally publicly reported measure (all-cause mortality reported on quality report card) All-cause mortality does not provide the level of detail required for quality improvement Preventable deaths measure is subjective - made by experts or hospital reviewers	NR
Hannan 2011 ²⁸	Readmission	Patient vs system measures are more predictive of 30-day readmissions. Comorbidities, preoperative and other risk factors should be considered in readmission predictors - ie, BMI was not previously considered, but is significant in this study – indicates rise in obesity.	NR
Hannan 2003 ²⁹	Readmission	Insufficient investigation of 30-day readmission outcome measure in the CABG literature, mortality is most commonly researched measure. Readmission=delayed complication, therefore risk-adjusted complication measure would complement, risk-adjusted mortality	Insurers may not reimburse early readmissions Hospitals may game the system and delay readmittance beyond 30 days.
Kim 2012 ³⁹	Adherence to surgical standard	NR	NR
Khan 2009 ¹⁴	Wait time	Frailer patients may be more likely to be delayed (more time for assessment, correction of physiologic imbalances, etc) and may induce confounding which is difficult to account for (centrally collected database may have limited information on confounding variables) There may be different definitions of "delayed surgery" - substandard care not well defined	NR
Kurlansky 2012 ⁴⁰	Adherence to surgical standard	Surgical standards need to be surgery-specific (CABG)	NR
LaPar 2014 ⁴¹	Adherence to surgical standard	SCIP measures fail to identify patients for whom improved outcomes and surgical quality might be achieved	NR
Leung 2010 ¹⁰	Wait time	Can be difficult to ascertain cause of delay - which can influence outcomes	NR
Lund 2014 ²³	Wait time	Databases may lack information on guidelines and reasons for surgical delay Cut-off definitions of "early" or "late" surgery are variable	Requiring short surgical delay may influence timing of surgery (towards other shifts with less experienced surgeons and staff)
McDonnell 2013 ⁴²	Adherence to surgical standard	Single SCIP glucose measure not accurate depiction of glucose over time Hospital or program level committee required to implement and track SCIP measures Measure (blood glucose) is only a factor in outcomes for specific patients (with diabetes)	NR
Meessen 2014 ¹⁸	Wait time	NR	NR
Moja	Wait time	Using administrative databases may not be able to account for important	NR

2012 ¹¹		confounding factors (comorbidities, etc) Difficult to ascertain reasons for surgical delay Different cut-off times used	
Parina 2015 ³⁰	Readmission	Quality indicators, like 30-day readmissions, are not well-defined or validated; no consensus on the definition of "quality". 30-day readmission rates do not correlate closely with mortality and are therefore poor indicators of quality. New quality metric should be validated against a "gold standard", hospital mortality rate. May be important to compare 30-day readmission to other quality outcomes (length of stay, patient safety indicators, various process measures).	NR
Rasouli 2013 ⁴³	Adherence to surgical standard	NR	NR
Ryan 2015 ²⁵	Wait time	Database may only have dates of admission and surgery - not possible to determine timing by hour	NR
Schepers 2013 ¹⁵	Wait time	No information on reasons for postponing surgery	NR
Shiga 2008 ¹²	Wait time	Causes of delay can be system or medically related - can't distinguish between them	NR
Simunovic 2010 ¹³	Wait time	NR	NR
Smith 2016 ⁴⁷	Mortality	NR	Delay of intensive care management and end-of-life care to delay death beyond 30 days but not improving life expectancy or quality of care - unfounded claim in this study
Stefan 2013 ³¹	Readmission	Statistically significant differences in risk-standardized 30-day readmission rate measures do not correspond to meaningful differences between high- and low-performing hospitals.	NR
Tennent 2001	Wait time	NR	NR
Thomas 1996 ³²	Readmission	Readmission rate information is easily obtainable--bias toward using this as a quality measure. Readmission as a quality measure relies on assumptions: patients receiving good care will be stable before being discharged and patients who are not stabilized are more likely to be readmitted.	NR
Tsai 2013 ³³	Readmission	Readmission rates generally uncorrelated with other measures of hospital quality (ie, volume, mortality) Administrative data used to capture readmission may not capture other factors - need to do risk-adjustment	NR
Vallier 2013	Wait time	Other injuries may influence timing or surgery	NR
Zitser-	Readmission	Readmission can be difficult to predict in models - making it difficult to	NR

Gurevich 1999 ³⁴	identify high-risk patients and risk-adjust May be difficult to determine related and unrelated readmissions to index operation
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QUALITY ASSESSMENT: PRIMARY STUDIES

Author Year	Risk of selection bias? (yes/no/unclear)	Risk of performance bias? (yes/no/unclear)	Risk of detection bias? (yes/no/unclear)	Risk of bias due to confounding? (yes/no/unclear)	Risk of Attrition bias? (yes/no/ unclear)	Risk of reporting bias? (yes/no/unclear)	Overall Quality (Good/Fair/Poor)
Auerbach 2009 ³⁵	No Perspective database. Regular auditing. Included all patients undergoing CABG during timeframe	No	No Regularly collected and maintained hospital data	No Analyses adjusted for patient and hospital level confounders	Unclear No comment on any missing data, but well- maintained database	No	Good
Bhattacharyya 2009 ³⁶	Unclear Data from CMS demonstration project, voluntary database; lacking data from lower 50% of hospitals	No	No Hospital collected and reported data	Unclear UTI risk- adjusted. Hematoma and readmissions not severity adjusted.	Unclear Hospitals in lowest tier were more likely to have missing data	No	Fair
Brinkman 2014 ³⁷	No Participation in STS database voluntary but covers almost all CABGs in US. Regular auditing.	No	No STS database	No Analysis adjusted for patient and hospital level confounders	No Excluded 0.08% for missing variables	No	Good
Cotogni 2017 ³⁸	No Eligibility criteria applied to all consecutive patients undergoing cardiac surgery for 1-year period	No	Unclear No information on how information was collected or outcome assessment	No Analyses adjusted for patient and surgical confounders	Unclear No patients lost to follow-up but no comment on any missing data	No	Fair

Guru 2008 ⁴⁶	No	No	Unclear	Unclear	Unclear	No	Fair
	Randomly sampled deaths for 8 hospitals plus consecutive deaths for new hospital		Blinded reviewers, subjective outcome assessed by surgeon	Adjusted for patient characteristics only	No information on missing data or completeness of database		
Hannan 2011 ²⁸	No	No	No	No	Unclear	No	Good
	New York administrative database (SPARCS). Regular auditing.		Reasons for readmission were determined by ICD-9-CM	Risk-adjusted for patient, surgical and hospital level variables	No comment on any missing data, but well-maintained database		
Hannan 2003 ²⁹	No	No	No	No	Unclear	No	Good
	New York administrative database (SPARCS). Regular auditing.		Reasons for readmission were determined by ICD-9-CM	Risk-adjusted for patient, surgical and hospital level variables	No comment on any missing data, but well-maintained database		
Kim 2012 ³⁹	Yes	No	No	Yes	Unclear	No	Poor
	Mandatory reporting database for hospitals with more than 100 beds. Only 6 hospitals included, no data on #s or reasons for exclusions for lack of reliable data or for infections other than SSI		Nationally recorded hospital database	No adjustment for confounding variables	Patients with missing data excluded, no information on number excluded		
Kurlansky 2012 ⁴⁰	No	No	No	No	No	No	Good
	All surgical cases at 5 centers in program with validated data – STS compliant – validated data.			Adjustment by predicted risk score	Imputation guidelines from STS followed for any missing data		

LaPar 2014 ⁴¹	No	No	No	No	No	No	Good
	STS institutional database. included all patients undergoing cardiac surgery during timeframe		STS institutional data	Propensity score matching and STS risk-adjusted variables	No information on missing data but well-maintained database		
Légaré 2005 ¹⁶	Yes	No	No	No	No	No	Fair
	Convenience sample of consecutive patients			Adjusted for propensity score, myocardial infarction within 7 days before surgery, preoperative renal failure, ejection fraction <40%, age >70 years, stenosis of left main coronary artery >70%			
McDonnell 2013 ⁴²	No	No	No	Yes	Unclear	No	Poor
	Hospital database, no info on auditing/validation. All patients undergoing cardiac surgery during timeframe		Institutional database	Only discuss controlling for serum creatinine level, but no other confounding factors	No information on missing data or completeness of database		
Parina 2015 ³⁰	Unclear	No	No	No	Unclear	No	Fair
	California (OSHPD) database, excluded data from low-volume hospitals		Outcomes were objective	Risk-adjusted for patient, surgical and hospital level variables	Some patients missing sex and ethnoracial data. No information on other missing data.		

Rasouli 2013 ⁴³	No	No	No	Unclear	Unclear	No	Poor
	Institutional database, no info on auditing/ validation. All patients with primary or revision TJA		Institutional database	Only adjusted for SCIP and surgery factors	No information on missing data or completeness of database		
Schelenz 2005 ⁴⁴	No	No	Unclear	Yes	Unclear	No	Poor
	All patients undergoing elective cardiac surgery during pre and post time periods		Minimal information on how data was collected and outcome assessors	No adjustment for any patient factors which may have differed between time periods and no data on patient characteristics	No comment on missing data		
Smith 2016 ⁴⁷	No	No	No	No	No	No	Good
	VASQIP validated and maintained database			VASQIP risk-adjustment models	Missing data limited, SAS macro used for imputation of missing information		
Sobolev 2012 ¹⁷	No	No	No	No	Unclear	No	Fair
	Population-based patient registry. Inclusion/exclusion criteria applied uniformly			Adjusted for patient, clinical, and surgical factors	Unclear handling missing data. Excluded 8.5% for missing data or "other reasons"		
Stefan 2013 ³¹	No	No	No	No	Unclear	No	Good
	QIO CDW database		Reasons for readmission were determined by ICD-9-CM	Risk-adjusted for patient, surgical, and hospital level variables	No mention of the proportion with missing data		

Thomas 1996 ³²	No Medicare UB-82 claims data	No	No Reasons for readmission were determined by ICD-9-CM	Unclear Risk-adjusted for patient level factors only	Unclear No mention of missing of data	No	Fair
Tsai 2013 ³³	No Medicare Inpatient 100% file and 2010 MEDPAR File	No	No Measures were objective	No Risk-adjusted using validated tool	Unclear No mention of missing of data	No	Good
Wang 2012 ⁴⁵	Unclear No information on patient-level eligibility criteria for selection. Data from state-level linked databases	No	No Regularly collected and maintained hospital data	No Adjusted for patient, hospital, and surgical confounders	Unclear Missing data excluded, varying numbers of missing data for covariates	No	Fair
Zitser-Gurevich 1999 ³⁴	No National Hospital Admission Registry	No	No Measures were objective	No Risk-adjusted for patient, surgical and hospital level variables	Unclear Mention missing values for left ventricular dysfunction but no mention of handling of missing data	No	Good

Abbreviations: SPARCS= Statewide Planning and Research Cooperative System; OSHPD= Office of Statewide Health Planning and Development; MEDPAR= Medicare Provider Analysis and Review; CDW=Clinical Data Warehouse; QIO=Quality Improvement Organization; VASQIP=VA surgical quality improvement program; SCIP=surgical care improvement program; TJA=total joint arthroplasty; STS=society of thoracic surgeons; SSI=surgical site infection; CABG=coronary artery bypass graft

APPENDIX E: PEER REVIEW

Comment #	Reviewer number	Comment	Author response
1. Are the objectives, scope, and methods for this review clearly described?			
1	1	Yes	NA
2	2	Yes	NA
3	3	No - I will confine my comments to cardiac surgery, which is my clinical and performance measurement area of expertise. The nominal objective of this paper is stated in its title: "Use of Performance Measures as Criteria for Selecting Community Cardiac and Orthopedic Surgical Providers for the Veterans Choice Program". In order to mitigate accessibility issues in the VA for cardiac and orthopedic services, the VA Choice program was established to contract for such services with selected community providers, when needed. These providers must "maintain the same or similar credentials and licenses as VA providers". The logical flow and inferences of this evidence paper are a mystery to me. The authors demean 30-day CABG mortality as a quality metric, seemingly because one study they identified showed poor correlation between this measure and clinician assessment of preventability. Yet the precedent for this metric is overwhelming. For nearly three decades, virtually every state (e.g., NY, MA, PA, NJ, CA) and national CABG quality assessment program of which I am aware has used this metric as the primary, and often sole method for assessing surgical quality. CABG surgery is actually one of the few procedures where both typical volumes and mortality rates are adequate to justify using risk adjusted mortality as a valid metric to differentiate quality (Dimick et al, JAMA 2004. 292:847). Short term perioperative morbidity and mortality have always been the mainstays of CABG performance measurement, and they are outcomes of great importance to patients. If you do not survive 30 days postop, preferably without serious short term complications such as stroke or renal failure, all other measures are irrelevant. These data are collected and available in state	<i>We appreciate these comments and below have organized our responses below into separate themes:</i> <i>1) 30-day mortality: We agree that we were coming across as dismissing 30-day mortality as a less valid performance metric than mortality. We clarified that our focus was to identify which measures meant as indirect indicators of health outcomes (eg, readmissions, process measures, etc.) are associated with health outcomes (e.g., mortality, quality of life, or function) and that our conclusion that readmission is the strongest measure of quality was relative to other indirect indicators. We agree that any performance measures that directly measure mortality, quality of life and function generally take precedence over other measures given their intrinsic importance to patients and have clarified this in the report. As for the studies that evaluate the association between 30-day mortality and preventable mortality and long-term mortality, we saw them as being in response to published criticisms about the singular use of 30-day mortality and have reframed them as such. We better emphasized that we are encouraged that the usefulness of 30-day mortality as a surrogate for long-term outcomes was reinforced in a recent VHA study, which also found no evidence of gaming to meet a 30-day metric. However, we do stand by our conclusion that the evidence linking readmission to 30-day mortality is stronger than the evidence linking process measures to 30-day mortality. The link between readmission and 30-day mortality is supported by multiple consistent studies; whereas, the link between each specific composite process measure and mortality is only supported by a single study.</i>

Comment #	Reviewer number	Comment	Author response
		(e.g., NY Cardiac Surgery Reporting System) and national clinical registries (e.g., STS National Database, discussed in response to the next question), and in claims data. Other measures discussed but dismissed by the authors are similarly perplexing. The main medication process measure described in this evidence paper is beta blocker use, whose efficacy is challenged by the particular study they cite. Yet use of this medication is an ACC/AHA Class 1 recommended practice (Circulation 2011; 124: 2610–2642) for CABG to reduce the occurrence of postoperative atrial fibrillation, based on dozens of studies (randomized and observational). Strikingly, in their discussion of process standards related to CABG, the authors do not specifically mention what is arguably the single most important CABG process measures—use of the internal mammary artery conduit—which has a well-documented association with short and long term survival, graft patency, freedom from recurrent angina, and freedom from reoperation. Ironically, at the same time the authors seem to dismiss 30-day mortality as a valid metric for selecting VA contractors for CABG, they repeatedly use this same measure as the reference upon which to establish the validity, or lack thereof, of other proposed quality metrics, such as readmissions or adherence to process of care measures. With regard to thirty day readmission, this would be low on my list of available CABG performance metrics. Thus, it was quite surprising for me to see this suddenly appear in the evidence document as the authors' most highly recommended quality measure. Readmissions are a problematic measure of CABG performance. While surgical readmissions often result from delayed occurrence or recognition of postoperative complications, the ability to risk adjust this endpoint is problematic. Typical readmission risk model c-indices are 0.60-0.65 rather than the 0.75-0.85 range of most mortality or morbidity risk models. Notably, one of the largest registry-based studies of CABG readmission showed minimal association	2) <i>Shahian 2014 Circulation study: We added this to the report: "Lower readmission rates were weakly correlated (Spearman rank correlation was -0.154) with higher composite scores (including mortality, major morbidity, internal mammary artery graft and NQF-endorsed perioperative meds) in a secondary subgroup analysis of 827 CMS CABG providers from the 2010 STS database.[Shahian 2014] However, we have insufficient information to determine the strength of this evidence as this finding was only very briefly noted in the Discussion section of the main study, which was devoted to the development of the readmission measure. No other information about the methodology were provided in the publication or via author request."</i> 3) <i>Beta Blocker: Yes, we are aware that the findings of Brinkman 2014 suggesting no significant association between preoperative beta blocker use and mortality may seem counterintuitive as preoperative beta blocker use is an ACC/AHA Class 1 recommended practice for CABG to reduce the occurrence of postoperative atrial fibrillation. However, it is not uncommon for studies of patient health outcomes to contradict studies of surrogate endpoints such as atrial fibrillation.</i> 4) <i>Internal mammary artery conduit: The only studies we identified that link internal mammary artery conduit use to survival, such as Boylan et. al. 1994 in the Journal of Thoracic and Cardiovascular Surgery v107, Issue 3, Pages 657-662, were those initial studies that led to its adoption as a quality standard. We did not find any studies in our search or in your list below that evaluated the link between satisfactory routine adherence to the internal mammary artery conduit use standard and health outcomes.</i> 5) <i>Limitations of readmission: We agree that use of readmission is potentially limited by lack of consensus about risk adjustment, including how to handle SES and</i>

Comment #	Reviewer number	Comment	Author response
		between readmission rates and performance on a robust, multidimensional, NQF-endorsed composite measure of CABG performance (Shahian et al, Circulation. 2014; 130: 399-409). Readmissions may also be highly influenced by local and patient level socioeconomic factors that are completely out of the control of the discharging hospital, especially for hospitals serving vulnerable populations. And finally, readmissions for cardiac surgery are often to hospitals other than the index hospital (D'Agostino et al, J Thorac Cardiovasc Surg 1999; 118: 823-32. Patient's operated upon at a regional tertiary center may be subsequently readmitted to their local community hospital, perhaps unnecessarily, for problems that could have been treated as an outpatient. The index hospital may not have even been notified that the patient was being considered for readmission to another hospital. In summary, I believe the authors have wrongly concluded that mortality, morbidity and process measures are less valid indicators of CABG quality than 30-day readmission; I regard the latter as a second or third tier indicator of quality for the purposes of VA Choice selective contracting.	<i>the potential for underestimating rates due to difficulties capturing readmissions to another hospital. We had already included in our Discussion a lengthy discussion of these and other limitations. We added to the Executive Summary and Conclusions a reminder of such limitations and that they must be considered in determining the usefulness of Readmissions.</i>
4	4	Yes	NA
2. Is there any indication of bias in our synthesis of the evidence?			
5	1	No	NA
6	2	No	NA
7	3	Yes - I believe the authors have systematically excluded from consideration the most widely used and respected source of clinical cardiothoracic surgery performance data in the US—the STS National Database, which is barely mentioned as an afterthought on page 7 (“...the Society for Thoracic Surgeons (STS) use NQF measures...”). The STS National Database (full disclosure—I have been a volunteer member of various STS Database working groups) was initiated in 1989 and today has over 6 million patient records. As of 2012, it had 90-95% national penetration among adult cardiac surgery programs, and that number is undoubtedly higher today. STS uses trained data managers to collect extremely granular clinical data on	<i>We have already recommended that VHA decision-makers require Choice community providers to participate in a public reporting program that involves periodic auditing. We state that this could ensure the reliability of Choice community providers' performance measures, and the participation in public reporting itself may also be a strong motivator for quality improvement. This recommendation encompasses STS participation.</i> <i>The fact that STS measures are “based on audited, clinically granular data, they incorporate robust risk models, they are reliable, they are used by virtually every cardiac program in the US, and they are all peer-review published and NQF-endorsed”</i>

Comment #	Reviewer number	Comment	Author response
		every patient, and case completeness rates near 100% have been demonstrated. Annual external audit by a Medicare QIN-QIO have consistently shown accuracy rates of 96-97%. The STS National Database serves as the basis of a robust portfolio of NQF-endorsed performance measures that are publicly reported by a majority of US cardiac programs and used by Consumer Reports and US News and World Report in their performance ratings. Benchmarked performance reports for a myriad of process and risk adjusted outcomes measures are provided quarterly to each participant, and beginning in 2010 a public reporting program was instituted. As of early 2017, 60% of all STS adult cardiac surgery database participants (and thus about the same percentage of all non-federal US cardiac surgery programs) are voluntarily publicly reporting their STS results on the STS or Consumer Reports websites. STS does have risk models for both 30-day all cause readmission and long-term survival. However, although components of the broad STS portfolio of performance metrics, in my opinion they are much less robust measures of CABG performance than the family of composite quality metrics that STS developed beginning a decade ago, all of which have been endorsed through the rigorous NQF process. For CABG, this composite measure encompasses four domains—risk adjusted mortality, risk adjusted morbidity (avoidance of all 5 of the most serious and common complications of CABG), use of the internal mammary artery (the demonstrably superior conduit for long-term graft patency, avoidance of recurrent angina and reoperation, and survival), and use of all 4 NQF endorsed perioperative medications. This is a much broader assessment of quality than could be provided by any individual performance measure, including mortality alone, and measure reliability and ability to discriminate performance are greatly enhanced because of the larger number of endpoints. Importantly, the STS mortality endpoint avoids the gaming issues noted by the authors of the VA study. It includes not only all deaths occurring	<i>is informative. But, as a formal comparison of the strengths and weaknesses of the various available performance improvement programs was outside of the scope of this report, we cannot recommend one over another at this time. Also, reliance on STS measures alone may exclude our national network of university hospitals that are often partnered with and an important source of referrals for VA hospitals, but which are participants of other performance improvement organizations. Therefore, leaving our recommendation open to participation in any public reporting program that involves periodic auditing may better ensure Choice network provider adequacy.</i> <i>We agree that use of a rigorously developed and validated and widely accepted and used composite measure of direct and indirect indicators of health outcomes may also be a highly feasible and comprehensive approach to determining eligibility of Choice providers - assuming its potential advantages outweighed identified potential challenges. We have added this recommendation and a paragraph to the 'Implications for Policy and Implementation' section of the Discussion that defines, provides rationale for, outlines potential challenges of and ideal characteristics of composite measures based on some of the reference material you provided.</i>

Comment #	Reviewer number	Comment	Author response
		in hospital, regardless of timing, but also all deaths within 30-days, regardless of where they occurred. Thus, there is no incentive for keeping a hopelessly ill patient alive till day 31 and then withdrawing support, as that patient's death would still be captured. It is extremely rare for a non-federal cardiac surgery provider in the US to not participate in the STS Database. I would personally be reluctant to allow a non-VA program to contract to provide VA CABG services if it did not participate in the STS Database and receive regular feedback reports. Given the near universal participation of US non-federal cardiac surgery programs in the STS Database, it would be exceptionally easy for the VA to use STS quality metrics to assess the quality of programs they are considering. STS composite CABG measures seem to optimally satisfy all the criteria one would want in a performance metric. These multidimensional, comprehensive measures are based on audited, clinically granular data, they incorporate robust risk models, they are reliable, they are used by virtually every cardiac program in the US, and they are all peer-review published and NQF-endorsed. That the possibility of using these measures to evaluate CABG performance for the VA Choice program is not even mentioned in this review is inexplicable to me. I have listed a sampling of the many peer reviewed papers describing these STS quality measurement activities in my answer to the next question.	
8	4	No	NA
3. Are there any published or unpublished studies that we may have overlooked?			
9	1	No	NA
10	2	No	NA
11	3	Yes - Selected peer-reviewed articles relevant to CABG performance measurement and the STS National Database 1. Shahian DM, Jacobs JP. Health services information: Lessons learned from the society of thoracic surgeons national database. In: Sobolev B, Levy A, Goring S, eds. Data and	<i>We thank the reviewer for this comprehensive list of papers that provide detailed information about the STS national database, development and validation of STS performance measure risk prediction models, linking of STS databases to social security and CMS data, and issues in quality measurement. After dual review, we did not identify any additional studies that evaluated</i>

Comment #	Reviewer number	Comment	Author response
		measures in health services research. Boston, MA: Springer US;2016: p. 1-24. 2. D'Agostino RS, Jacobs JP, Badhwar V et al. The society of thoracic surgeons adult cardiac surgery database: 2016 update on outcomes and quality. <i>Ann Thorac Surg</i> 2016;101(1):24-32. 3. Jacobs JP, Shahian DM, He X et al. Penetration, completeness, and representativeness of the society of thoracic surgeons adult cardiac surgery database. <i>Ann Thorac Surg</i> 2016;101(1):33-41. 4. D'Agostino RS, Jacobs JP, Badhwar V et al. The society of thoracic surgeons adult cardiac surgery database: 2017 update on outcomes and quality. <i>Ann Thorac Surg</i> 2016. 5. Afilalo J, Kim S, O'Brien S et al. Gait speed and operative mortality in older adults following cardiac surgery. <i>JAMA cardiology</i> 2016;1(3):314-321. 6. Edwards FH, Ferraris VA, Kurlansky PA et al. Failure to rescue rates after coronary artery bypass grafting: An analysis from the society of thoracic surgeons adult cardiac surgery database. <i>Ann Thorac Surg</i> 2016;102(2):458-464. 7. Shahian DM. The society of thoracic surgeons national database: "What's past is prologue". <i>Ann Thorac Surg</i> 2016;101(3):841-845. 8. Badhwar V, Rankin JS, He X et al. The society of thoracic surgeons mitral repair/replacement composite score: A report of the society of thoracic surgeons quality measurement task force. <i>Ann Thorac Surg</i> 2016;101(6):2265-2271. 9. Rankin JS, Badhwar V, He X et al. The society of thoracic surgeons mitral valve repair/replacement plus coronary artery bypass grafting composite score: A report of the society of thoracic surgeons quality measurement task force. <i>Ann Thorac Surg</i> 2016. 10. Bhatt DL, Drozda JP, Jr., Shahian DM et al. Acc/aha/sts statement on the future of registries and the performance measurement enterprise: A report of the american college of cardiology/american heart association task force on performance measures and the society of thoracic surgeons. <i>J Am Coll Cardiol</i> 2015;66(20):2230-2245. 11. Englum BR, Saha-Chaudhuri P, Shahian DM et al. The impact of high-risk cases on hospitals' risk-adjusted coronary	<i>the association between a performance measure meant as an indirect indicator of a health outcome and actual health outcomes. We did add the following articles to the Background section:</i> - <i>Shahian DM, Blackstone EH, Edwards FH et al. Cardiac surgery risk models: A position article. Ann Thorac Surg 2004;78(5):1868-1877.</i> - <i>Shahian DM, O'Brien SM, Filardo G et al. The society of thoracic surgeons 2008 cardiac surgery risk models: Part 3--valve plus coronary artery bypass grafting surgery. Ann Thorac Surg 2009;88(1 Suppl):S43-S62.</i> - <i>Shahian DM, O'Brien SM, Filardo G et al. The society of thoracic surgeons 2008 cardiac surgery risk models: Part 1--coronary artery bypass grafting surgery. Ann Thorac Surg 2009;88(1 Suppl):S2-22.</i> - <i>D'Agostino RS, Jacobs JP, Badhwar V et al. The society of thoracic surgeons adult cardiac surgery database: 2017 update on outcomes and quality. Ann Thorac Surg 2016.</i> - <i>Jacobs JP, Shahian DM, He X et al. Penetration, completeness, and representativeness of the society of thoracic surgeons adult cardiac surgery database. Ann Thorac Surg 2016;101(1):33-41.</i> - <i>Shahian DM, Jacobs JP, Edwards FH et al. The society of thoracic surgeons national database. Heart 2013;99(20):1494-1501.</i> - <i>Peterson ED, DeLong ER, Masoudi FA et al. Accf/aha 2010 position statement on composite measures for healthcare performance assessment: A report of american college of cardiology foundation/american heart association task force on performance measures (writing committee to develop a position statement on composite measures). J Am Coll Cardiol 2010;55(16):1755-1766.</i>

Comment #	Reviewer number	Comment	Author response
		artery bypass grafting mortality rankings. Ann Thorac Surg 2015. 12. Jacobs JP, Shahian DM, Prager RL et al. Introduction to the sts national database series: Outcomes analysis, quality improvement, and patient safety. Ann Thorac Surg 2015;100(6):1992-2000. 13. Shahian DM, Grover FL, Prager RL et al. The society of thoracic surgeons voluntary public reporting initiative: The first 4 years. Ann Surg 2015;262(3):526-535. 14. Shahian DM, He X, Jacobs JP et al. The society of thoracic surgeons composite measure of individual surgeon performance for adult cardiac surgery: A report of the society of thoracic surgeons quality measurement task force. Ann Thorac Surg 2015;100(4):1315-1325. 15. Winkley Shroyer AL, Bakaeen F, Shahian DM et al. The society of thoracic surgeons adult cardiac surgery database: The driving force for improvement in cardiac surgery. Seminars in thoracic and cardiovascular surgery 2015;27(2):144-151. 16. Grover FL, Shahian DM, Clark RE, Edwards FH. The sts national database. Ann Thorac Surg 2014;97(1 Suppl):S48-S54. 17. Shahian DM. Preoperative beta-blockade in coronary artery bypass grafting surgery. JAMA Intern Med 2014;174(8):1328-1329. 18. Shahian DM, He X, Jacobs JP et al. The sts avr + cabg composite score: A report of the sts quality measurement task force. Ann Thorac Surg 2014;97(5):1604-1609. 19. Shahian DM, He X, O'Brien SM et al. Development of a clinical registry-based 30-day readmission measure for coronary artery bypass grafting surgery. Circulation 2014;130(5):399-409. 20. Shahian DM, Jacobs JP, Edwards FH et al. The society of thoracic surgeons national database. Heart 2013;99(20):1494-1501. 21. Jacobs JP, O'Brien SM, Shahian DM et al. Successful linking of the society of thoracic surgeons database to social security data to examine the accuracy of society of thoracic surgeons mortality data. J Thorac Cardiovasc Surg 2013;145(4):976-983.	

Comment #	Reviewer number	Comment	Author response
		22. Overman DM, Jacobs JP, Prager RL et al. Report from the society of thoracic surgeons national database workforce: Clarifying the definition of operative mortality. World J Pediatr Congenit Heart Surg 2013;4(1):10-12. 23. Rankin JS, He X, O'Brien SM et al. The society of thoracic surgeons risk model for operative mortality after multiple valve surgery. Ann Thorac Surg 2013;95(4):1484-1490. 24. Afilalo J, Mottillo S, Eisenberg MJ et al. Addition of frailty and disability to cardiac surgery risk scores identifies elderly patients at high risk of mortality or major morbidity. Circ Cardiovasc Qual Outcomes 2012. 25. Shahian DM, O'Brien SM, Sheng S et al. Predictors of long-term survival following coronary artery bypass grafting surgery: Results from the society of thoracic surgeons adult cardiac surgery database (the ascert study). Circulation 2012. 26. Shahian DM, He X, Jacobs JP et al. The society of thoracic surgeons isolated aortic valve replacement (avr) composite score: A report of the sts quality measurement task force. Ann Thorac Surg 2012;94(6):2166-2171. 27. Shahian DM, Edwards FH, Jacobs JP et al. Public reporting of cardiac surgery performance: Part 1--history, rationale, consequences. Ann Thorac Surg 2011;92(3 Suppl):S2-11. 28. Shahian DM, Edwards FH, Jacobs JP et al. Public reporting of cardiac surgery performance: Part 2--implementation. Ann Thorac Surg 2011;92(3 Suppl):S12-S23. 29. Hillis LD, Smith PK, Anderson JL et al. 2011 accf/aha guideline for coronary artery bypass graft surgery: Executive summary: A report of the american college of cardiology foundation/american heart association task force on practice guidelines. Circulation 2011;124(23):2610-2642. 30. Jacobs JP, Edwards FH, Shahian DM et al. Successful linking of the society of thoracic surgeons database to social security data to examine survival after cardiac operations. Ann Thorac Surg 2011;92(1):32-37. 31. Bufalino VJ, Masoudi FA, Stranne SK et al. The american heart association's recommendations for expanding the applications of existing and future clinical registries: A policy statement from the american heart association. Circulation 2011;123(19):2167-2179.	

Comment #	Reviewer number	Comment	Author response
		32. Jacobs JP, Edwards FH, Shahian DM et al. Successful linking of the society of thoracic surgeons adult cardiac surgery database to centers for medicare and medicaid services medicare data. <i>Ann Thorac Surg</i> 2010;90(4):1150-1156. 33. Peterson ED, DeLong ER, Masoudi FA et al. Accf/aha 2010 position statement on composite measures for healthcare performance assessment: A report of american college of cardiology foundation/american heart association task force on performance measures (writing committee to develop a position statement on composite measures). <i>J Am Coll Cardiol</i> 2010;55(16):1755-1766. 34. Shahian DM, Edwards F, Grover FL et al. The society of thoracic surgeons national adult cardiac database: A continuing commitment to excellence. <i>J Thorac Cardiovasc Surg</i> 2010;140(5):955-959. 35. Shahian DM, O'Brien SM, Normand SL, Peterson ED, Edwards FH. Association of hospital coronary artery bypass volume with processes of care, mortality, morbidity, and the society of thoracic surgeons composite quality score. <i>J Thorac Cardiovasc Surg</i> 2010;139(2):273-282. 36. O'Brien SM, Shahian DM, Filardo G et al. The society of thoracic surgeons 2008 cardiac surgery risk models: Part 2--isolated valve surgery. <i>Ann Thorac Surg</i> 2009;88(1 Suppl):S23-S42. 37. Shahian DM, O'Brien SM, Filardo G et al. The society of thoracic surgeons 2008 cardiac surgery risk models: Part 3--valve plus coronary artery bypass grafting surgery. <i>Ann Thorac Surg</i> 2009;88(1 Suppl):S43-S62. 38. Shahian DM, O'Brien SM, Filardo G et al. The society of thoracic surgeons 2008 cardiac surgery risk models: Part 1--coronary artery bypass grafting surgery. <i>Ann Thorac Surg</i> 2009;88(1 Suppl):S2-22. 39. O'Brien SM, Shahian DM, DeLong ER et al. Quality measurement in adult cardiac surgery: Part 2--statistical considerations in composite measure scoring and provider rating. <i>Ann Thorac Surg</i> 2007;83(4 Suppl):S13-S26. 40. Shahian DM, Edwards FH, Ferraris VA et al. Quality measurement in adult cardiac surgery: Part 1--conceptual framework and measure selection. <i>Ann Thorac Surg</i> 2007;83(4	

Comment #	Reviewer number	Comment	Author response
		Suppl):S3-12. 41. Shahian D, Silverstein T, Lovett A, Wolf R, Normand S-L. Comparison of clinical and administrative data sources for hospital coronary artery bypass graft surgery report cards. <i>Circulation</i> 2007;115(12):1518-1527. 42. Shahian DM, Blackstone EH, Edwards FH et al. Cardiac surgery risk models: A position article. <i>Ann Thorac Surg</i> 2004;78(5):1868-1877. 43. Shahian DM, Normand SL, Torchiana DF et al. Cardiac surgery report cards: Comprehensive review and statistical critique. <i>Ann Thorac Surg</i> 2001;72(6):2155-2168. 44. D'Agostino RS, Jacobson J, Clarkson M, Svensson LG, Williamson C, Shahian DM. Readmission after cardiac operations: Prevalence, patterns, and predisposing factors. <i>J Thorac Cardiovasc Surg</i> 1999;118(5):823-832. 45. ElBardissi AW, Aranki SF, Sheng S, O'Brien SM, Greenberg CC, Gammie JS. Trends in isolated coronary artery bypass grafting: An analysis of the society of thoracic surgeons adult cardiac surgery database. <i>J Thorac Cardiovasc Surg</i> 2012;143(2):273-281. 46. Shahian DM, He X, Jacobs JP et al. Issues in quality measurement: Target population, risk adjustment, and ratings. <i>Ann Thorac Surg</i> 2013.	
12	4	No	NA
4. Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.			
13	1	Page 9, change VASQUIP to VASQIP	<i>Changed</i>
14	2	I think this review will be very useful. My principal comment is that it would be useful to provide a more extensive summary of the controversy over adjusting for socio-economic status. This is a key policy decision facing the nominator. Another concern is that the conclusion should mention the evidence supporting readmissions as a measure for orthopedics. These comments and more minor editorial notes are included in the attached document.	<i>Added a summary of these aspects of SES debate: (1) SES may be associated with inequalities in care that adjusted would obscure and (2) differences in outcomes by SES are due to social factors for which hospitals should not be accountable. Also added to the conclusion section the weaker evidence supporting readmissions for hip fracture.</i>
15	2	Executive Summary Table, Hip replacement: Higher risk of "remission" in highest vs...	<i>Changed to 'readmission'</i>
16	2	Executive Summary Table, I didn't see a reference to BB in the	<i>'BB' removed from abbreviations</i>

Comment #	Reviewer number	Comment	Author response
		table	
17	2	Line 182, ...using performance measures select and monitor...	<i>Changed to 'using performance measures to select and monitor'</i>
18	2	Line 248,9 ("After a period of time...") Re-phrase more neutrally?	<i>Changed to: "After a period of time in which the number of new performance measures adopted by the VA and non-VA organizations grew, we have begun to reduce the number and focus on the most important."</i>
19	2	Line 253... replace "taking into account with 'adjusting for'	<i>Wording revised</i>
20	2	Line 256... break into 2 sentences, "...proposed. Equitable performance measures should: (1) have..."	<i>Revised</i>
21	2	Line 256... (2) 'can' be collected...	<i>Removed 'can'</i>
22	2	Line 260... (8) 'and' have minimal...	<i>Removed the extra 'and'</i>
23	2	Line 264,5... "Evidence is lacking..." - This strikes me as extremely cautious. If performance measurement is good for anything it should be useful for this purpose.	<i>This Introductory statement is meant to provide rationale for conducting this review. As there is no literature on adapting performance measurement for contracting providers, the intent of our review is to address this information gap.</i>
24	2	Line 278... "feelings of over-control," Not sure what this is intended to mean. Feelings of loss of autonomy? Feelings of being mismanaged?	<i>Changed to "loss of autonomy"</i>
25	2	Line 308, VASQUIP-	<i>Changed to 'VASQIP'</i>
26	2	Line 449,50... "However, this result..." - This is the nature of systematic reviews, right? Do you really think the single controlled subsequent study outweighs the review? That's the impression you leave. Given the relationship with complications in emergent cases, this might be a useful metric.	<i>Changed to: "Results were consistent regardless of variation in adjustment, cut-off time for wait time, and cut-off time for mortality." No, we think the consistent findings from the subsequent study strengthen the findings of the systematic review and added this context.</i>
27	2	Line 584 "...the only study one which..."	<i>Revised wording</i>
28	2	Line 601, 'outlier'	<i>Changed to 'outliers'</i>
29	2	Line 788-90... " Also, although low socioeconomic status has been shown..." -Perhaps expand on this issue? There has been much discussion in the literature and at MedPAC. It might be important to summarize as a warning to policymakers.	<i>Added a summary of these aspects of SES debate: (1) SES may be associated with inequalities in care that adjusted would obscure and (2) differences in outcomes by SES are due to social factors for which hospitals should not be accountable.</i>
30	2	Line 867... (after first sentence, this paragraph) Add a qualified statement characterizing evidence supporting use of readmissions as a metric for orthopedic procedures too.	<i>Done.</i>
31	4	I generally agree with the approach and conclusions of the report. However, I was surprised to see that CABG volume was not included as a potential measure. There is reasonable	<i>We identified scope as one of the general limitations of our review. In order to meet our condensed timeframe we focused our scope to a subset of the highest-priority populations and</i>

Comment #	Reviewer number	Comment	Author response
		evidence that higher CABG volumes, both from a facility and provider point of view, correlates with better outcomes. It is a relatively easy measure to obtain. Thus, I would suggest that the group review volume evidence and include it in their recommendations, if the evidence review supports its inclusion.	<i>measures of the Office of Community Care. Volume was not included in this subset. We recognize this limits the applicability of our findings to broader populations and measures of interest, such as volume.</i>

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