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Appendix 1. Search Strategy

Combine box A and box B using AND

BOX A
Deming.ti,ab, 6 sigma.mp. , (Six adj1 sigma).mp Lean adj1 sigma).mp. , Measurement for improvement.ti,ab, (quality adj2 improv$).ti,ab., (quality adj1 management).ti,ab., (improv$ adj2 science).ti,ab., (process adj2 improv$).ti,ab, (Plan and do and study).ti,ab., PDCA.ti,ab, pdsa.ti,ab., plan do check.ti,ab, (method adj2 improv$).ti,ab, health.mp. and behavioural economics.ti,ab, operations research.ti,ab, decision science.ti,ab, Shewhart.ti,ab., Pareto chart.ti,Ab, Statistical process control.mp., Statistical quality control.mp, Toyota.mp., Paretochart$.mp, Control chart.mp.

BOX B
preoperative.mp., Per-operative.mp., surg$.ti,ab, exp General Surgery/, exp Surgical Procedures, Operative/, Operative Time/ , Peri-operative.ti,ab., Perioperative.ti,ab., Pre-operative.ti,ab, Operative.ti,ab. Cancer$.mp., enhanced recovery.ti,ab., eras.ti,ab., rapid recovery.ti,ab., fast.mp. and track.ti,ab., Operating theatre.mp, Operating room.mp, Operating room$.mp, Anesthe$.mp, Anaesthe$.mp, Trauma.mp.

Combine using AND to either BOX C or BOX D

BOX C: Quantitative terms
Radnomized.ti,ab, Randomi?ed controlled trial.pt., Randomized controlled trial.pt, controlled clinical trial.pt., Randomized controlled trials.sh., random allocation.sh., double blind method.sh., single-blind method.sh., Single?blind method.sh, clinical trial.pt., exp clinical trial/, (clinic$ adj25 trial$).ti,ab., ((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).ti,ab., placebos.sh., placebo$.ti,ab., comparative study.sh., exp evaluation studies/, prospective studies.sh., (control$ or prospective$ or volunteer$ or retrospective$).ti,ab., interrupted time?series, Time-series.ti,ab, Repeated measure$ .mp. , Cohort.mp., "Case?control".mp., "case control".mp. , (assess$ adj3 process quality).mp, (evaluat$ adj3 process quality).mp., compliance.ti,ab., quality control.mp, Process control.ti,ab, Control chart*.ti,ab, Adherence OR adherance.ti,ab, group adj3 compar*.mp, Control.ti,ab, Before adj2 after.mp., eval.$.ti,ab, Variability OR variation OR variable.mp., Checklist$.mp.

BOX D: Qualitative terms
Qualitative.ti,ab. , Focus Groups.mp. or exp Focus Groups/ , exp Interview/ or interview.mp. , Interviews as Topic.mp. or exp Interviews as Topic/ , ethnograph$.mp. , content analysis.mp. , grounded theory.mp, grounded approach.mp. , exp Qualitative Research/ or qualitative.mp. , Phenomenolog$.mp. , discourse analysis.mp. , constant comparison.mp., observational method.mp , theoretical sampl$.mp. , thematic analys?s.mp. , improvement report$.mp.

The search strategy was designed to capture terms relating to (1) surgery, (2) quality improvement, and (3) methodology.

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Appendix 2. Study Design and Country of Publication Frequency for the 100 Perioperative Quality Improvement Articles

Study Design	No. of Articles
Uncontrolled before and after (including statistical process control studies)	85
Nonrandomized controlled interventional study	4
Cluster randomized trial	4
Randomized controlled trial	2
Case series	2
Time series or segmented time series	2
Cohort	1
Country of Publication	**No. of Articles**
United States	67
Netherlands	7
United Kingdom	5
Germany	4
Australia	3
Norway	3
Finland	1
Taiwan	1
Iran	1
Africa	1
Turkey	1
Colombia	1
China	1
India	1
Switzerland	1
France	1
Italy	1

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Appendix 3. The 100 Perioperative Quality Improvement Articles, Classified According to Targeted Clinical Issue*

Intended Clinical Outcome	No. of Articles
Reduce postoperative complications—VTE	1
Improve postoperative process—organizational (e.g., discharge process, complication reporting)	3
Improve self-management/patient and family satisfaction	3
Reduce postoperative error (e.g., medication errors, unnecessary tests)	4
Reduce postoperative complications—pain and sedation	5
Improve preoperative process (e.g., fasting, admissions documentation)	9
Improve intraoperative process—organizational (e.g., start time, waiting time between cases)	12
Reduce postoperative complications—general (e.g., hyponatremia, leak rate, lengthy intubation)	15
Improve intraoperative process—clinical (e.g., operative technique, never event)	18
Reduce postoperative complications—infection	30

VTE, venous thromboembolism.

* Each article was assigned to the category that represents the targeted clinical issue; some articles may also have addressed one or more of the other listed issues.

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Appendix 4. References				
Author	**Year/ID**	**Country**	**Journal**	**Title**
Adams R, et al.	2004;34:140–148	United States	*J Nurs Adm.*	Decreasing turnaround time between general surgery cases: A Six Sigma initiative.
Aletti GD, et al.	2009;208:614–620	United States	*J Am Coll Surg.*	Quality improvement in the surgical approach to advanced ovarian cancer: The Mayo Clinic experience.
Arbour R.	2003;34:64-71	United States	*J Contin Educ Nurs.*	A continuous quality improvement approach to improving clinical practice in the areas of sedation, analgesia, and neuromuscular blockade.
Baker RA, Newland RF.	2008;23:7–16	Australia	*Perfusion.*	Continous quality improvement of perfusion practice: The role of electronic data collection and statistical control charts.
Berenholtz SM, et al.	2004;32:2014–2020	United States	*Crit Care Med.*	Eliminating catheter-related bloodstream infections in the intensive care unit.
Berry SA, et al.	2009;18:360–368	United States	*Qual Saf Health Care.*	ProvenCare: Quality improvement model for designing highly reliable care in cardiac surgery.
Bertolaccini L, et al.	2011;39:e128–132	Italy	*Eur J Cardithorac Surg.*	'Six sigma approach'—An objective strategy in digital assessment of postoperative air leaks: A prospective randomised study.
Blackmore CC, et al.	2013;39:99–105	United States	*Jt Comm J Qual Patient Saf.*	Applying Lean methods to improve quality and safety in surgical sterile instrument processing.
Bloos F, et al.	2009;103:232–237	Germany	*Br J Anaesth.*	Effects of staff training on the care of mechanically ventilated patients: A prospective cohort study.
Bosse G, et al.	2013;8(6):e65428	Africa (Tanzania)	*PLoS One.*	Immediate outcome indicators in perioperative care: A controlled intervention study on quality improvement in hospitals in Tanzania.
Brackbill ML, et al.	2010;16:329–336	United States	*J Manag Care Pharm.*	Intervention to increase the proportion of acute myocardial infarction or coronary artery bypass graft patients receiving an order for aspirin at hospital discharge.
Brattebø G, et al.	2004;13:203–205	Norway	*Qual Saf Health Care.*	Effect of a scoring system and protocol for sedation on duration of patients' need for ventilator support in a surgical intensive care unit.
Brush JE Jr, et al.	2006;152:379–385	United States	*Am Heart J.*	Implementation of a continuous quality improvement program for percutaneous coronary intervention and cardiac surgery at a large community hospital.
Burkitt KH, et al.	2009;15:633–642	United States	*Am J Manag Care.*	Toyota production system quality improvement initiative improves perioperative antibiotic therapy.
Camp SL, et al.	2009;24:414–423	United States	*J Card Surg.*	Quality improvement program increases early tracheal extubation rate and decreases pulmonary complications and resource utilization after cardiac surgery.
Celik J.	2003;77:737–741	United States	*AORN J.*	Decreasing preoperative delays—A rapid process improvement project.
Ceppa EP, et al.	2013;15:384–391	United States	*HPB (Oxford).*	Reducing surgical site infections in hepatopancreatobiliary surgery.

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Appendix 4. References (continued)

Author	Year/ID	Country	Journal	Title
Cima RR, et al.	2013;216: 23–133	United States	*J Am Coll Surg.*	Colorectal surgery surgical site infection reduction program: A national surgical quality improvement program–driven multidisciplinary single-institution experience.
Cima RR, et al.	2011;213:83–92	United States	*J Am Coll Surg.*	Use of Lean and Six Sigma methodology to improve operating room efficiency in a high-volume tertiary-care academic medical center.
Cima RR, et al.	2009;35:123–132	United States	*Jt Comm J Qual Patient Saf.*	A multidisciplinary team approach to retained foreign objects.
Collar RM, et al.	2012;214:928–936	United States	*J Am Coll Surg.*	Lean management in academic surgery
Crolla RM, et al.	2012;7(9):e44599	The Netherlands	*PLoS One.*	Reduction of surgical site infections after implementation of a bundle of care.
Cronin J, et al.	2011;77:1305–1308	United States	*Am Surg.*	Quality improvement pilot program for vulnerable elderly surgical patients.
Does RJM, et al.	2009;41:95–109	The Netherlands	*J Qual Technol.*	Reducing start time delays in operating rooms
Duclos A, et al.	2009;96:171–174	France	*Br J Surg.*	Quality monitoring in thyroid surgery using the Shewhart control chart.
Duncan F, Haigh C.	2013;22:2748–2757	United Kingdom	*J Clin Nurs.*	Measuring and improving the quality of postoperative epidural analgesia for major abdominal surgery using statistical process control charts.
Dyrkorn OA, Kristoffersen M, Walberg M.	2012;21:206–210	Norway	*BMJ Qual Saf.*	Reducing post-caesarean surgical wound infection rate: An improvement project in a Norwegian maternity clinic.
Edel, EM.	2012;95:228–238	United States	*AORN J.*	Surgical count practice variability and the potential for retained surgical items.
Erdek MA, Pronovost PJ	2004;16:59–64	United States	*Int J Qual Health Care.*	Improving assessment and treatment of pain in the critically ill.
Ferguson TB Jr, et al.	2003;290:49–56	United States	*JAMA.*	Use of continuous quality improvement to increase use of process measures in patients undergoing coronary artery bypass graft surgery: A randomized controlled trial.
Forster DH, et al.	2000;45:302–310	Germany	*J Hosp Infect.*	Can quality circles improve hospital-acquired infection control?
Frankel HL, et al.	2005;201:349–358	United States	*J Am Coll Surg.*	Use of corporate Six Sigma performance-improvement strategies to reduce incidence of catheter-related bloodstream infections in a surgical ICU.
Goodney PP, Chang RW, Cronenwett JL.	2008;48:1481–1488	United States	*J Vasc Surg.*	A percutaneous arterial closure protocol can decrease complications after endovascular interventions in vascular surgery patients.
Gray JR, et al.	2010;25:248–254	United States	*J Nurs Care Qual.*	Elimination of excess preoperative wait time and its impact on immediate clinical outcomes among patients undergoing spinal surgery.

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Appendix 4. References (continued)

Author	Year/ID	Country	Journal	Title
Haessler S, et al.	2010;110:1044–1048	United States	*Anesth Analg.*	A surgical site infection cluster: The process and outcome of an investigation—The impact of an alcohol-based surgical antisepsis product and human behavior.
Holman WL, et al.	2001;285:3003–3010	United States	*JAMA.*	Alabama coronary artery bypass grafting project: Results of a statewide quality improvement initiative.
Houston S, et al.	2003;12:28–41	United States	*Qual Manag Health Care.*	Reducing the incidence of nosocomial pneumonia in cardiovascular surgery patients.
Huffines M, et al.	2013;33:56–69	United States	*Crit Care Nurse.*	Improving family satisfaction and participation in decision making in an intensive care unit.
Iannettoni MD, et al.	2011;91:1011–1017	United States	*Ann Thorac Surg.*	Kaizen method for esophagectomy patients: Improved quality control, outcomes, and decreased costs.
Jatla KK, Enzenauer RW.	2007;14:149–154	United States	*J Clin Outcomes Manag.*	The application of statistical process control to cataract surgery.
Kanter G, Connelly NR, Fitzgereld J.	2006;103:1517–1521	United States	*Anesth Analg.*	A system and process redesign to improve perioperative antibiotic administration.
Kreckler S, et al.	2013;22:916–922	United Kingdom	*BMJ Qual Saf.*	Effective prevention of thromboembolic complications in emergency surgery patients using a quality improvement approach.
Kritchevsky SB, et al.	2008;149:472–480	United States	*Ann Intern Med.*	The effect of a quality improvement collaborative to improve antimicrobial prophylaxis in surgical patients: A randomized trial.
Larochelle M, et al.	2011;54:394–400	United States	*Dis Colon Rectum.*	Diminishing surgical site infections after colorectal surgery with Surgical Care Improvement Project: Is it time to move on?
Leaphart CL, et al.	2012;177:7–13	United States	*J Surg Res.*	Formal quality improvement curriculum and DMAIC method results in interdisciplinary collaboration and process improvement in renal transplant patients.
Lee KK, et al.	2013;56:1298–1303	United States	*Dis Colon Rectum.*	Building a business case for colorectal surgery quality improvement.
Loor G, et al.	2013;146:1028–1032	United States	*J Thorac Cardiovasc Surg.*	Process improvement in cardiac surgery: Development and implementation of a reoperation for bleeding checklist.
Lu Y, et al.	2013;53:3080–3087	China	*Transfusion.*	Failure mode and effect analysis in blood transfusion: A proactive tool to reduce risks.
Lutfiyya W, Parsons D, Breen J.	2012;16(3):10–16	United States	*Perm J.*	A colorectal "care bundle" to reduce surgical site infections in colorectal surgeries: A single-center experience.
Marang-van de Mheen PJ, Stadlander MC, Kievit J.	2006;15:320–324	The Netherlands	*Qual Saf Health Care.*	Adverse outcomes in surgical patients: Implementation of a nationwide reporting system.
Mazaleski A.	2011;30:361–364	United States	*Orthop Nurs.*	Postoperative total joint replacement class for support persons: Enhancing patient and family centered care using a quality improvement model.

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Appendix 4. References (continued)

Author	Year/ID	Country	Journal	Title
McCahill LE, et al.	2007;142:355–361	United States	*Arch Surg.*	Enhancing compliance with Medicare guidelines for surgical infection prevention: Experience with a cross-disciplinary quality improvement team.
McCulloch P, et al.	2010;341:c5469	United Kingdom	*BMJ.*	Effect of a "Lean" intervention to improve safety processes and outcomes on a surgical emergency unit.
Meissner W, Ullrich K, Zwacka S.	2006;23:142–148	Germany	*Eur J Anaesthesiol.*	Benchmarking as a tool of continuous quality improvement in postoperative pain management.
Merlani P, et al.	2001;323:620–624	Switzerland	*BMJ.*	Quality improvement report: Linking guideline to regular feedback to increase appropriate requests for clinical tests: Blood gas analysis in intensive care. [Erratum in *BMJ* 2001;323:993.]
Navipour H, et al.	2011;49:38–43	Iran	*Acta Med Iran.*	An investigation into the effects of quality improvement method on patients' satisfaction: A semi experimental research in Iran.
Newland RF, Baker RA, Stanley R.	2006;38:139–143	Australia	*J Extra Corpor Technol.*	Electronic data processing: The pathway to automated quality control of cardiopulmonary bypass. [Erratum in *J Extra Corpor Technol*. 2006;38:370.]
Niemeijer GC, et al.	2010;69:614–618	The Netherlands	*J Trauma.*	Quality in trauma care: Improving the discharge procedure of patients by means of Lean Six Sigma.
Parker BM, et al.	2007;104:140–146	United States	*Anesth Analg.*	Six Sigma methodology can be used to improve adherence for antibiotic prophylaxis in patients undergoing noncardiac surgery.
Parks JK, et al.	2008;65:1098–1104	United States	*J Trauma.*	Dissecting delays in trauma care using corporate Lean Six Sigma methodology.
Pronovost PJ, et al.	2002;28:595–604	United States	*Jt Comm J Qual Improv.*	Reducing failed extubations in the intensive care unit.
Ramsey C, Ormsby S, Marsh T.	2001;Suppl:2–6	United States	*Healthc Financ Manage.*	Performance-improvement strategies can reduce costs.
Rao N, et al.	2004;26:22–27	United States	*J Healthc Qual.*	Prevention of postoperative mediastinitis: A clinical process improvement model.
Robarts S, et al.	2008;11;67–75	United States	*Healthc Q.*	A framework for the development and implementation of an advanced practice role for physiotherapists that improves access and quality of care for patients.
Rycroft-Malone J, et al.	2012;7 2012 Aug 30;7:80	United Kingdom	*Implement Sci.*	A pragmatic cluster randomised trial evaluating three implementation interventions.
Sandberg WS, et al.	2008;106:192–201	United States	*Anesth Analg.*	Real-time checking of electronic anesthesia records for documentation errors and automatically text messaging clinicians improves quality of documentation.
Sedlack JD.	2010;32:18–26	United States	*J Healthc Qual.*	The utilization of Six Sigma and statistical process control techniques in surgical quality improvement.
Shukla PJ, Barreto SG, Nadkarni MS.	2008;55:311–314	India	*Hepatogastroenterology.*	Application of Six Sigma towards improving surgical outcomes.

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Appendix 4. References (continued)

Author	Year/ID	Country	Journal	Title
Simunovic M, et al.	2010;182:1301–1306	United States	*CMAJ.*	The cluster-randomized Quality Initiative in Rectal Cancer trial: Evaluating a quality-improvement strategy in surgery.
Sinanan M, et al.	2000;179:417–421	United States	*Am J Surg.*	Formula for surgical practice resuscitation in an academic medical center.
Skledar SJ, Goss PR.	2000;35:53–64	United States	*Formulary.*	Using a CQI process to change surgical antimicrobial prophylaxis practices.
Smith CD, et al.	2013;216:559–568	United States	*J Am Coll Surg.*	Re-engineering the operating room using variability methodology to improve health care value.
Smith IR, et al.	2013;22:634–641	Australia	*Heart Lung Circ.*	Performance monitoring in cardiac surgery: Application of statistical process control to a single-site database.
Smith MP, et al.	2008;109:25–35	United States	*Anesthesiology.*	High-throughput operating room system for joint arthroplasties durably outperforms routine processes.
Stamou SC, et al.	2008;102:772–777	United States	*Am J Cardiol.*	Continuous quality improvement program and major morbidity after cardiac surgery.
Stamou SC, et al.	2008;136:494–499	United States	*J Thorac Cardiovasc Surg.*	Quality improvement program decreases mortality after cardiac surgery.
Stanford J, et al.	2009;16:405–409	United States	*J Clin Outcomes Manag.*	Improved cardiac surgical outcomes with use of total quality management.
Stevenson KS, et al.	2007;94:376–381	United Kingdom	*Br J Surg.*	Measurement of process as quality control in the management of acute surgical emergencies.
Styer KA, et al.	2011;94:590–598	United States	*AORN J.*	Implementing the World Health Organization Surgical Safety Checklist: A model for future perioperative initiatives.
Sun TB, et al.	2011;167: 329–335	Taiwan	*J Surg Res.*	Quality improvements of antimicrobial prophylaxis in coronary artery bypass grafting.
Taber DJ, et al.	2013;28:103–112	United States	*Am J Med Qual.*	Improved patient safety and outcomes with a comprehensive interdisciplinary improvement initiative in kidney transplant recipients.
Taner MT.	2013;26:768–785	Turkey	*Int J Health Care Qual Assur.*	Application of Six Sigma methodology to a cataract surgery unit.
Thomas RJ, et al.	2013;33:212–219	United States	*J Cardiopulm Rehabil Prev.*	Short- and long-term impact of an inpatient quality improvement initiative: Results of the CABG-GAP Practice Improvement Project.
Thomassen Ø, et al.	2010;54:1179–1184	Norway	*Acta Anaesthesiol. Scand.*	The effect of a simple checklist on frequent pre-induction deficiencies.
Tillman M, et al.	2013;184:150–156	United States	*J Surg Res.*	Surgical Care Improvement Project and surgical site infections: Can integration in the Surgical Safety Checklist improve quality performance and clinical outcomes?
Toledo AH, et al.	2013;23:350–364	United States	*Prog Transplant.*	Reducing liver transplant length of stay: A Lean Six Sigma approach.

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Appendix 4. References (continued)				
Author	**Year/ID**	**Country**	**Journal**	**Title**
Torkki PM, et al.	2006;22:255–260	Finland	*Int J Technol Assess Health Care.*	Managing urgent surgery as a process: Case study of a trauma center.
Touijer K, et al.	2006;49:853–858	United States	*Eur Urol.*	Impact of a multidisciplinary continuous quality improvement program on the positive surgical margin rate after laparoscopic radical prostatectomy.
van der Slegt J, et al.	2013;8(8):e71566	The Netherlands	*PLoS One.*	Implementation of a bundle of care to reduce surgical site infections in patients undergoing vascular surgery.
van Kasteren ME, et al.	2005;56:1094–1102	The Netherlands	*J Antimicrob Chemother.*	Quality improvement of surgical prophylaxis in Dutch hospitals: Evaluation of a multi-site intervention by time series analysis.
van Tiel FH, et al.	2006;62:64–70	The Netherlands	*J Hosp Infect.*	Plan-do-study-act cycles as an instrument for improvement of compliance with infection control measures in care of patients after cardiothoracic surgery.
Vetter TR, Ali NM, Boudreaux AM.	2012;38:490–496	United States	*Jt Comm J Qual Patient Saf.*	A case-control study of an intraoperative corneal abrasion prevention program: Holding the gains made with a continuous quality improvement effort.
Vogel P, et al.	2011;396:1009–1015	Germany	*Langenbecks Arch Surg.*	Morbidity and Mortality conference as part of PDCA cycle to decrease anastomotic failure in colorectal surgery.
Warner CJ, et al.	2013;58:1417–1422	United States	*J Vasc Surg.*	Lean principles optimize on-time vascular surgery operating room starts and decrease resident work hours.
Warren CS, et al.	2011;43:58–63	United States	*J Extra Corpor Technol.*	Variation in arterial inflow temperature: A regional quality improvement project.
Weinberg M, et al.	2001;161:2357–2365	Colombia	*Arch Intern Med.*	Reducing infections among women undergoing cesarean section in Colombia by means of continuous quality improvement methods.
Wick EC, et al.	2012;215:193–200	United States	*J Am Coll Surg.*	Implementation of a surgical comprehensive unit-based safety program to reduce surgical site infections.
Windle PE, et al.	2001;6:38–46	United States	*Lippincotts Case Manag.*	A COMIT model utilization to improve first-case start time.
Wren SM, et al.	2010;210:491–495	United States	*J Am Coll Surg.*	Postoperative pneumonia-prevention program for the inpatient surgical ward.
Zack J.	2008;36:S176.e1–2	United States	*Am J Infect Control.*	Zeroing in on zero tolerance for central line-associated bacteremia.

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Appendix 5. Example of Fully Complete Template for Intervention Description and Replication (TIDieR) Checklist Items*

1	2	3	4	5	6
Brief Name	**WHY: Rationale**	**WHAT: Materials**	**WHAT: Procedures**	**WHO: Staff Group, Level of Training & Expertise**	**HOW: Mode of Delivery**
"multifaceted systems intervention" (p. 2014).	To determine whether a multifaceted systems intervention would eliminate catheter-related bloodstream infections	Web-based training module (http://www .hopkins-medicine .org.heic/), a standardized checklist to be used during central venous catheter insertion, a daily goals form, a central catheter insertion cart with four drawers and partitions to organize the contents, which can be rolled to the patient's room	Five interventions, including "empowering nurses to stop the procedure if guidelines were not followed" (p. 2016). An example of reporting item 4 (procedure) for this intervention is: "we discussed with both residents and nurses that the nurse should page the SICU attending physician if the resident, after the nurse identifies a violation, fails to corrrect the violation" (p. 2016).	"An interdisciplinary team including the SICU codirectors, ICU physicians, nurses, and infection control practitioners" (p. 2015). Additional information about how the QI team worked together included: "The SICU leadership met with both groups of providers and emphasized our focus on patient safety and teamwork" (p. 2018).	"All physicians or physician extenders who insert central catheters were required to complete a Web-based training module and successfully complete a ten-question test before they were allowed to insert a central venous catheter" (p. 2016).
7	**8**	**9**	**10**	**11**	
WHERE: Setting + Infrastructure	**WHEN & HOW MUCH: Dose/Duration**	**Modifications**	**HOW WELL: (Planned)**	**HOW WELL: (Actual)**	
The surgical ICU is a 16-bed unit for adult patients undergoing general, orthopedic, transplant, trauma, and vascular surgery. Extra features of the setting relevant to the intervention included "Hospital Epidemiology and Infection Control (HEIC) required leaders from hopsital administration to . . . provide the SICU with the additional resources required" (p. 2018).	From January 1, 1998, through December 31, 2002, ALL those who insert central catheters were required to complete a Web-based training module (URL provided) and successfully complete a 10-question test. The checklist was implemented in two phases, which inlcluded a 2-week observation period.	The management of central venous catheters once they are inserted did not change during the study period, with the exception of the change in daily patient visits in the study SICU to ask whether catheters could be removed. Following a pilot test, the checklist was modified based on feedback received.	Residents were informed that a checklist was being used. This strategy allowed nurses to feel more comfortable intervening if they observed a violation, because they felt that an expectation had been set and as a result, they were less likely to have an uncomfortable encounter with a physician and they could stop the procedure if they saw a violation of evidence-based practice.	An example of actual compliance with one of the five interventions: "During the first month, nursing completed the checklist for 38 procedures: eight (24%) for new central venous access, 30 (79%) for catheter exchanges over a wire, and three (8%) were emergent. A nursing intervention was required in 32% (12/38) of central venous catheter insertions" (p. 2017).	

SICU, surgical ICU; QI, quality improvement.

* Adapted from Berenholtz SM, et al. Eliminating catheter-related bloodstream infections in the intensive care unit. *Crit Care Med*. 2004;32:2014–2020 (reference 60, page 206).