



Quality Care in Surgery: ***Perioperative Standardization***

Presenter name

Title in 14 pt Verdana

Business or department

Date, 2014

Objectives

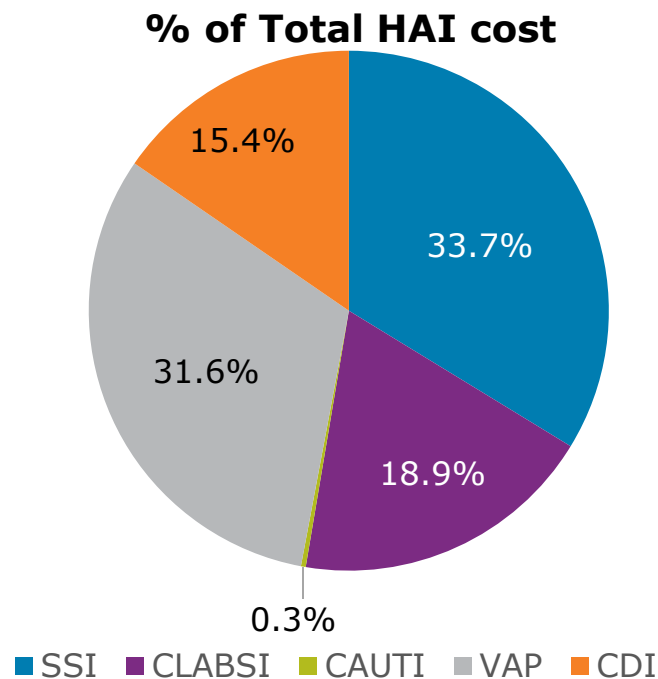
- Describe the impact of quality issues in healthcare
- Discuss the benefits of standardization to improve quality in healthcare
- Identify initiatives to manage risk factors in surgical care
- Focus on improving patient skin preparation in surgical care
- Illustrate the implementation process

Current Healthcare Quality Issue



Incidence and Cost of Healthcare-Associated Infections (HAIs)

- In 2012, the incidence of the 5 most common HAIs in the U.S. were estimated at **440,000 per year**, with an average attributable cost of **\$9.8 billion/year**



HAI	Incidence Rate	Cost/Patient	LOS
CAUTI	1.87 ^a	\$896	NR
CDI	3.85 ^b	\$11,285	3.3
CLABSI	1.27 ^a	\$45,814	10.4
SSI	1.98 ^c	\$20,785	11.2
VAP	1.33 ^a	\$40,144	13.1

^aPer 1000 device-days.

^bPer 1000 patient-days.

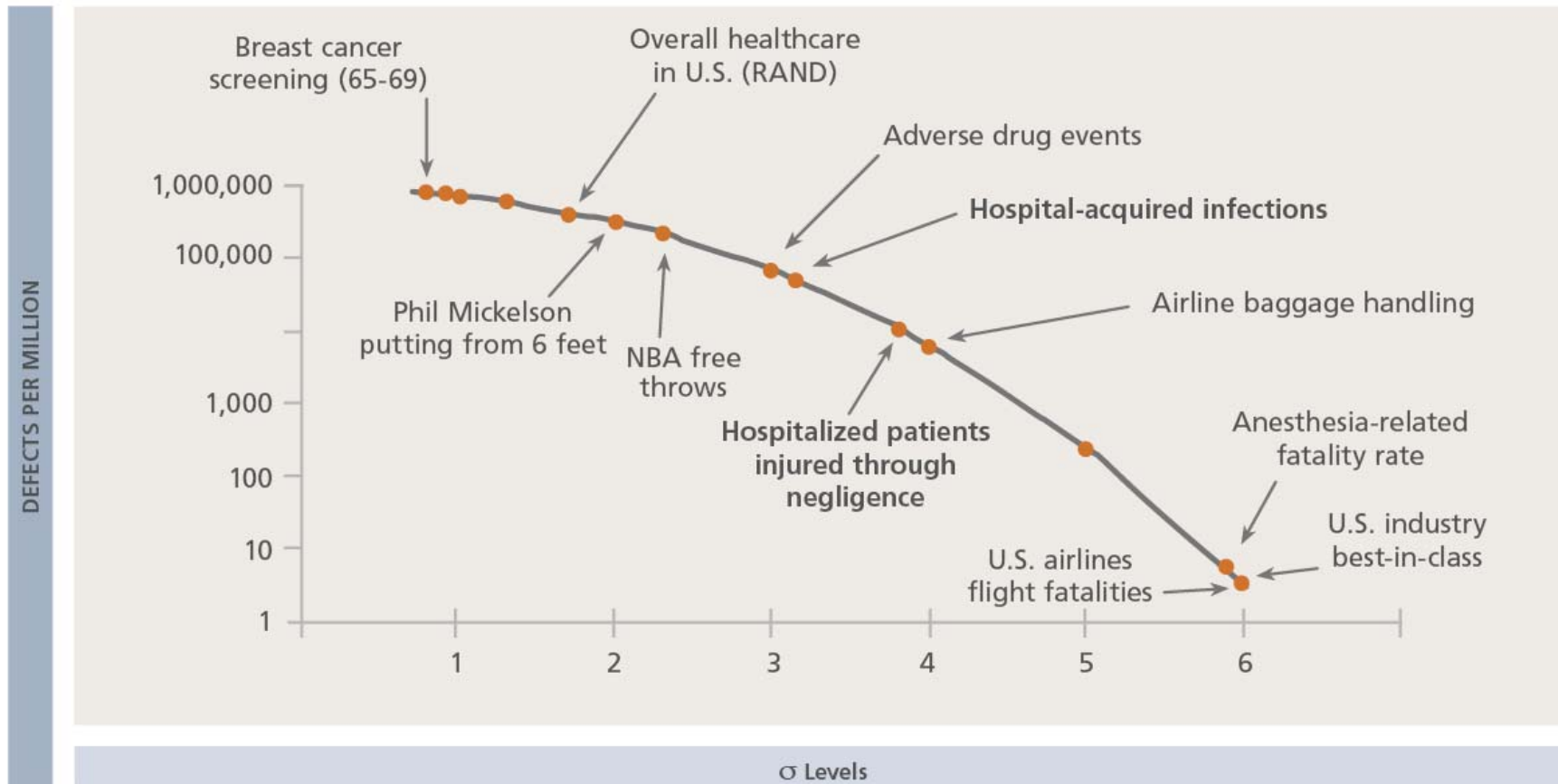
^cPer 100 patient procedures.

CAUTI = catheter-associated urinary tract infection; CDI = *Clostridium difficile* infection; CLABSI = central line-associated bloodstream infection; LOS = length of stay; NR = not reported; SSI = surgical site infection; VAP = ventilator-associated pneumonia.

Zimlichman E, et al. *JAMA Intern Med.* 2013;173:2039-46.

The U.S. Healthcare System Has a Serious Quality Problem

HAIs Approach 100,000 Defects per Million Patients



Buck CR. GE; 2003. Adapted by Dr. Sam Nussbaum, Wellpoint, and Mark Sollek, Premera; 2007.

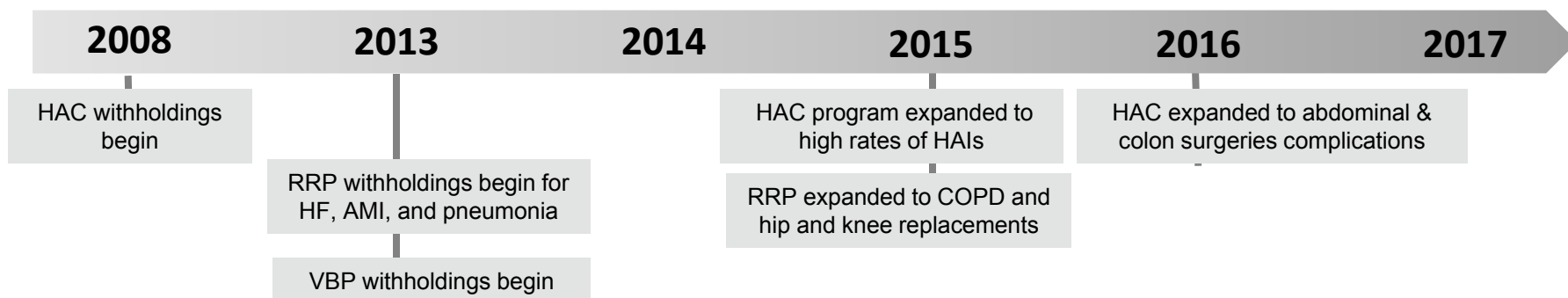
Increased Public Awareness and Reporting of HAI Rates

- CDC's National Health Safety Network¹
 - >12,500 institutions
 - Standardized infection ratio (SIR)
 - www.cdc.gov/hai/progress-report/index.html
- State level reporting²
 - www.healthcarereportcard.illinois.gov
- CMS reporting can be compared at the hospital level³
 - www.medicare.gov/hospitalcompare/

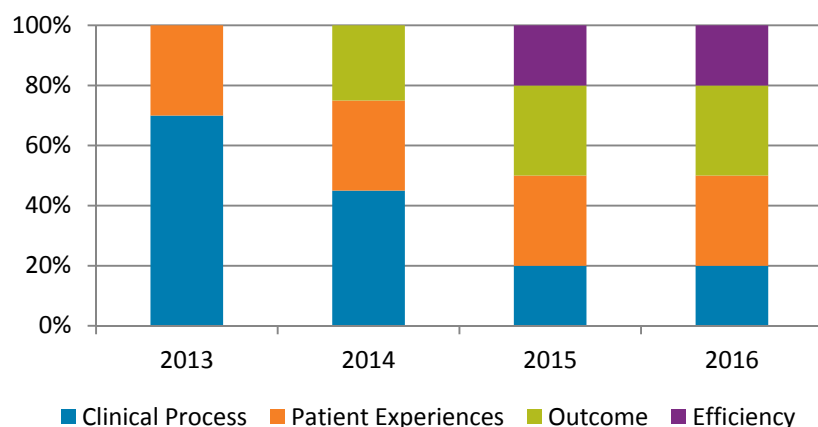


1. CDC. Healthcare-associated Infections (HAI) Progress Report. Available at: <http://www.cdc.gov/hai/progress-report/index.html>. Accessed July 17, 2014. 2. Illinois Department of Public Health. Illinois Hospital Report Card and Consumer Guide to Health Care. Available at: <http://www.healthcarereportcard.illinois.gov>. Accessed July 21, 2014. 3. CMS. Medicare.gov Hospital Compare. Available at: <http://www.medicare.gov/hospitalcompare/search.html>. Accessed July 17, 2014.

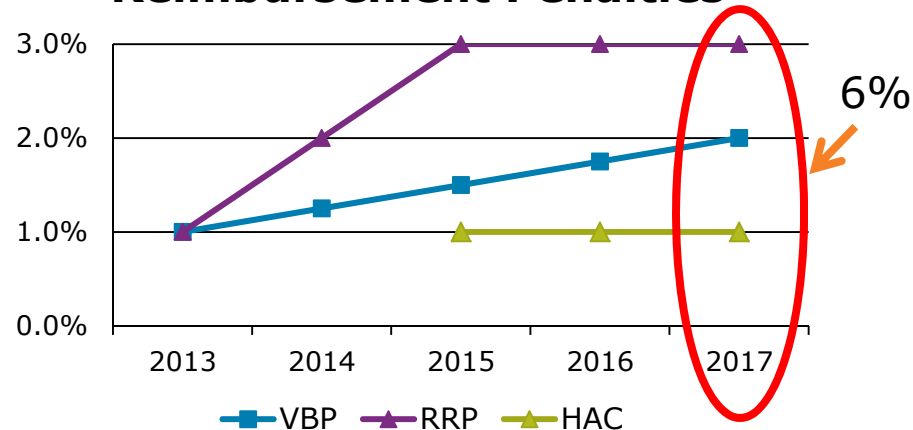
Increasing Financial Penalty for HAIs



VBP Domain Weights



Reimbursement Penalties



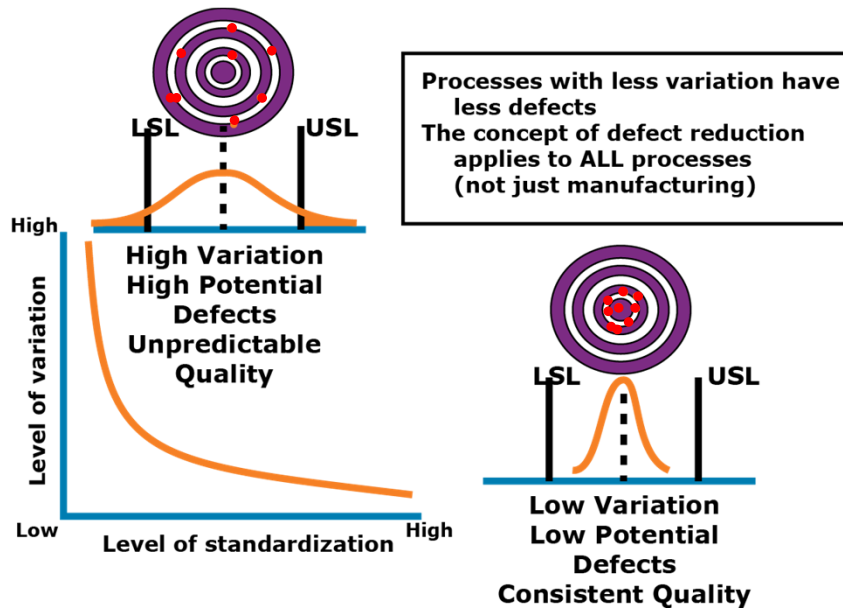
AMI = acute myocardial infarction; HAC = hospital-acquired condition; HF = heart failure; RRP = Readmission Reduction Program; VBP = Value-Based Purchasing Program.

1. CMS. Hospital-Acquired Conditions. Available at: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired_Conditions.html. Accessed July 21, 2014. 2. CMS. Hospital Value-Based Purchasing Program Fact Sheet. Available at: http://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/Hospital_VBPPurchasing_Fact_Sheet_ICN907664.pdf. Accessed August 4, 2014. 3. CMS. Readmissions Reduction Program. Available at: <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html>. Accessed August 4, 2014. 4. Arkansas Foundation for Medical Care, Quality Improvements Organization. Available at: <http://qio.afmc.org/LinkClick.aspx?fileticket=8PsE9YwcHy0%3D>. Accessed August 20, 2014.

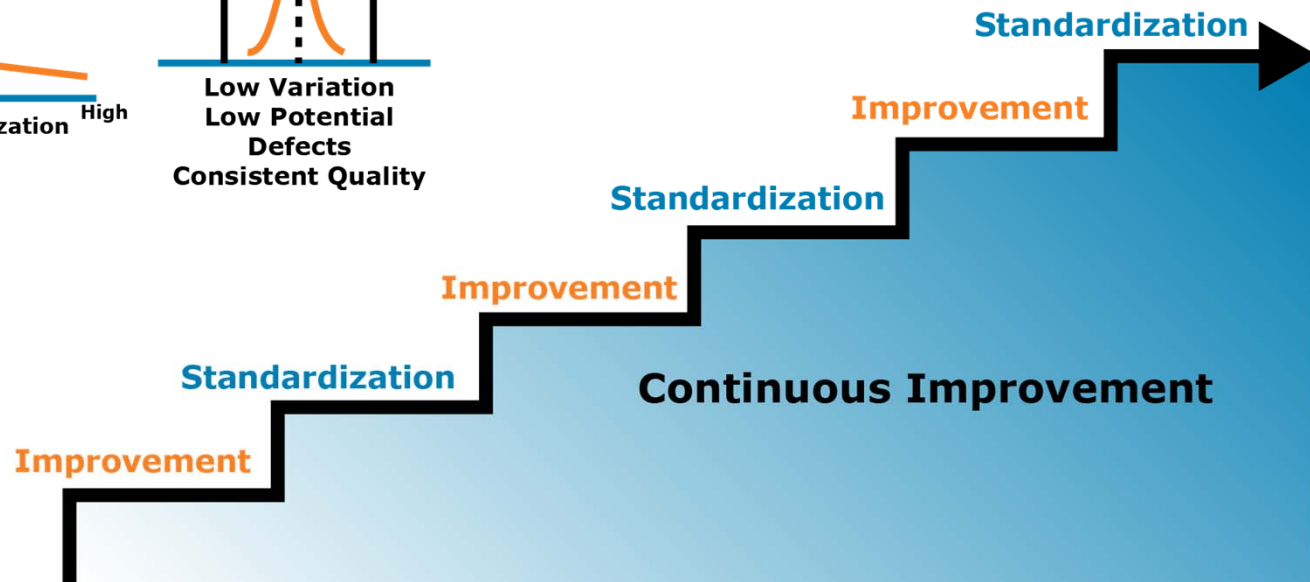
Quality Control and Standardization in Healthcare



Standardization Can Minimize Variability in Processes



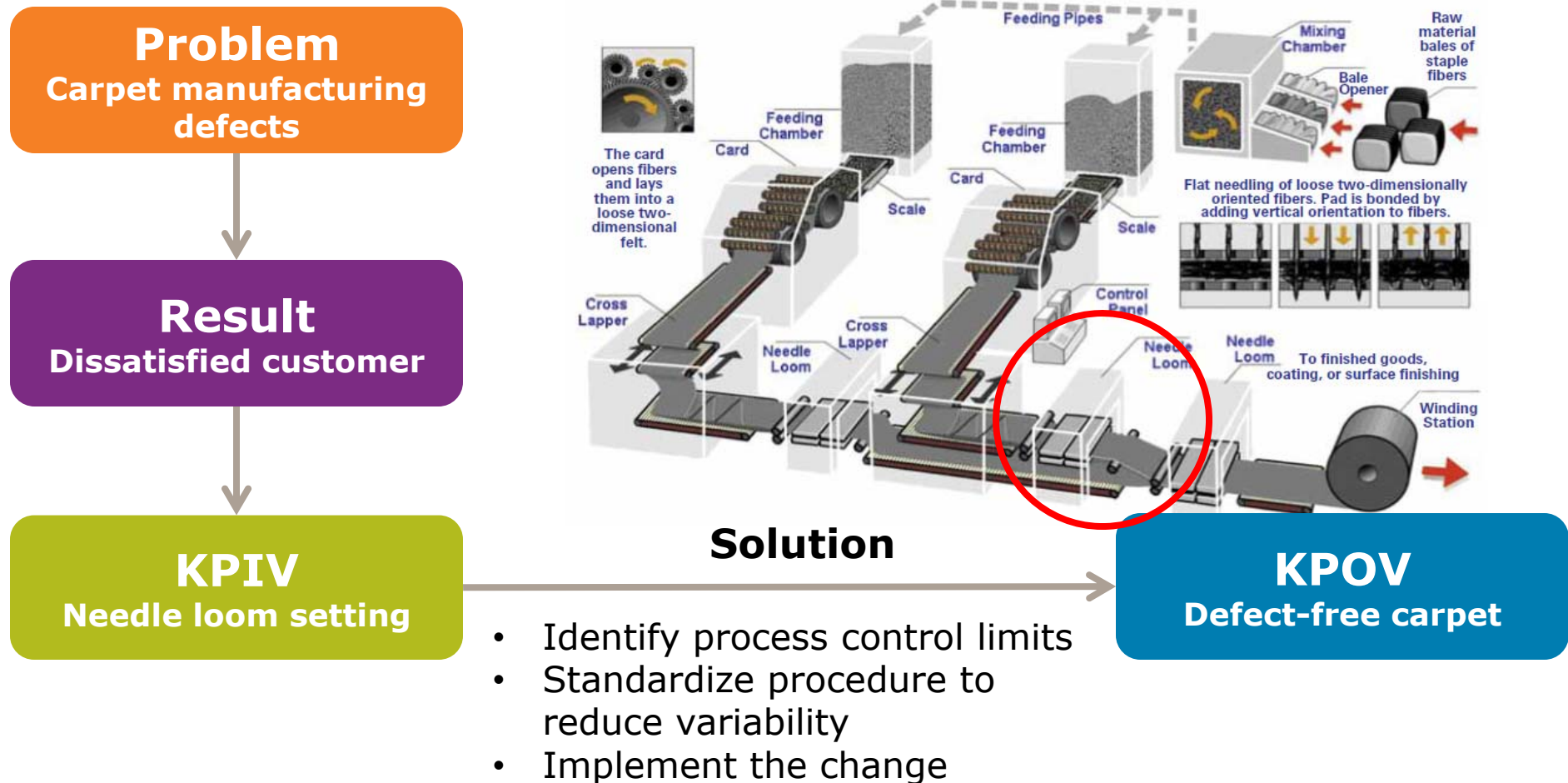
- The standardization process involves continuous improvement
- Innovation occurs amid a backdrop of standardization



LSL = lower specification limit; USL = upper specification limit.

Standardization to Solve Problems

Applications Across Industries



KPIV = key process input variable; KPOV = key process output variable.

ASQ: The Global Voice of Quality. Ford Team Project Builds Relationships, Improves Quality. Available at: <http://rube.asq.org/2011/09/design-of-experiments/ford-team-project-builds-relationships.pdf>. Accessed July 22, 2014.

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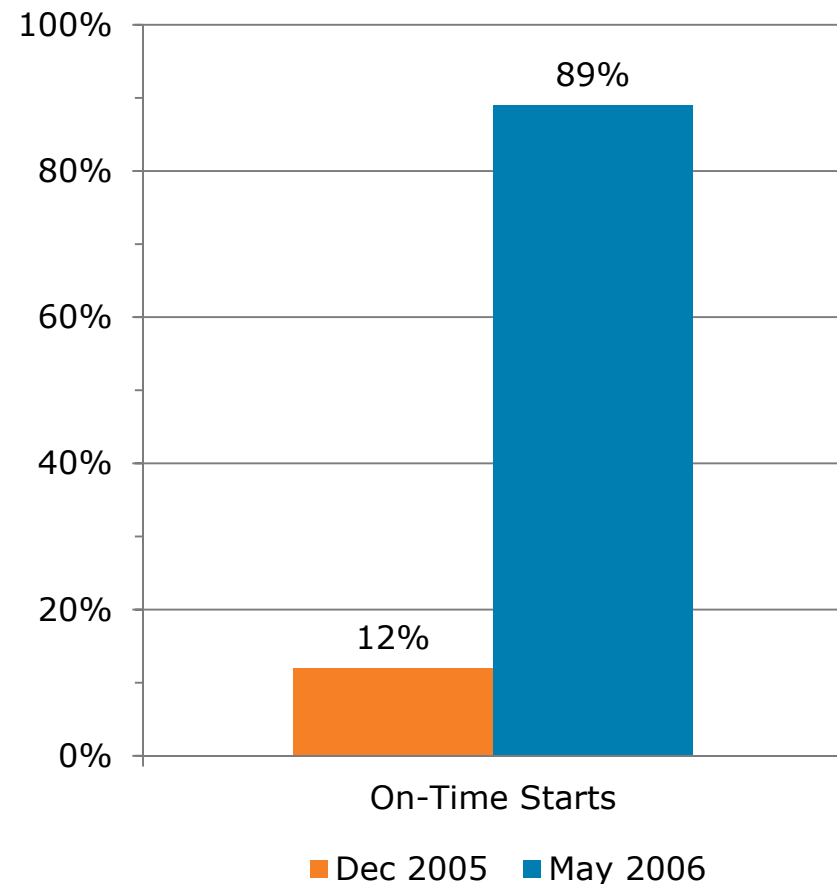
Quality Improvement Models Applied to Healthcare

Model	Description	Application in Healthcare
Six Sigma	<ul style="list-style-type: none"> Identifies/removes causes of defects (errors) Minimizes variability in processes Creates infrastructure and promotes culture of change (eg, Six Sigma Black Belt) 	<ul style="list-style-type: none"> Improve OR throughput at Southwestern Vermont Medical Center²
Toyota Production System (Lean)	<ul style="list-style-type: none"> Eliminates overburden, inconsistency, and waste Designs a process able to deliver required results smoothly 	<ul style="list-style-type: none"> Patient Safety Alert System at Virginia Mason Medical Center³
Quality by Design	<ul style="list-style-type: none"> Designs processes to be free of errors/defects Reduces variability through standardization of procedures 	<ul style="list-style-type: none"> Improved new pharmaceutical application process used by the FDA¹

1. Health Resources and Services Administration. Redesigning a System of Care to Promote QI. Available at: <http://www.hrsa.gov/quality/toolbox/methodology/redesigningasystemofcare/index.html>. Accessed July 21, 2014. 2. Fairbanks CB. *AORN J.* 2007;86:73-82. 3. Institute for Healthcare Improvement. *Going Lean in Health Care*. Cambridge, MA: Institute for Healthcare Improvement; 2005. Available at: <http://www.ihi.org/resources/Pages/IHIWhitePapers/GoingLeaninHealthCare.aspx>. Accessed August 4, 2014.

The Six Sigma Approach May Improve On-Time Surgeries

- Prior to Six Sigma initiative
 - Average of 11.6 min in the holding area
 - 40.4% of patients spent longer than 10 min in holding
- Six Sigma approach to identify the critical path
 - Time in holding area
 - Surgeon on-time arrival
- Process improvement
 - PACU as staging area



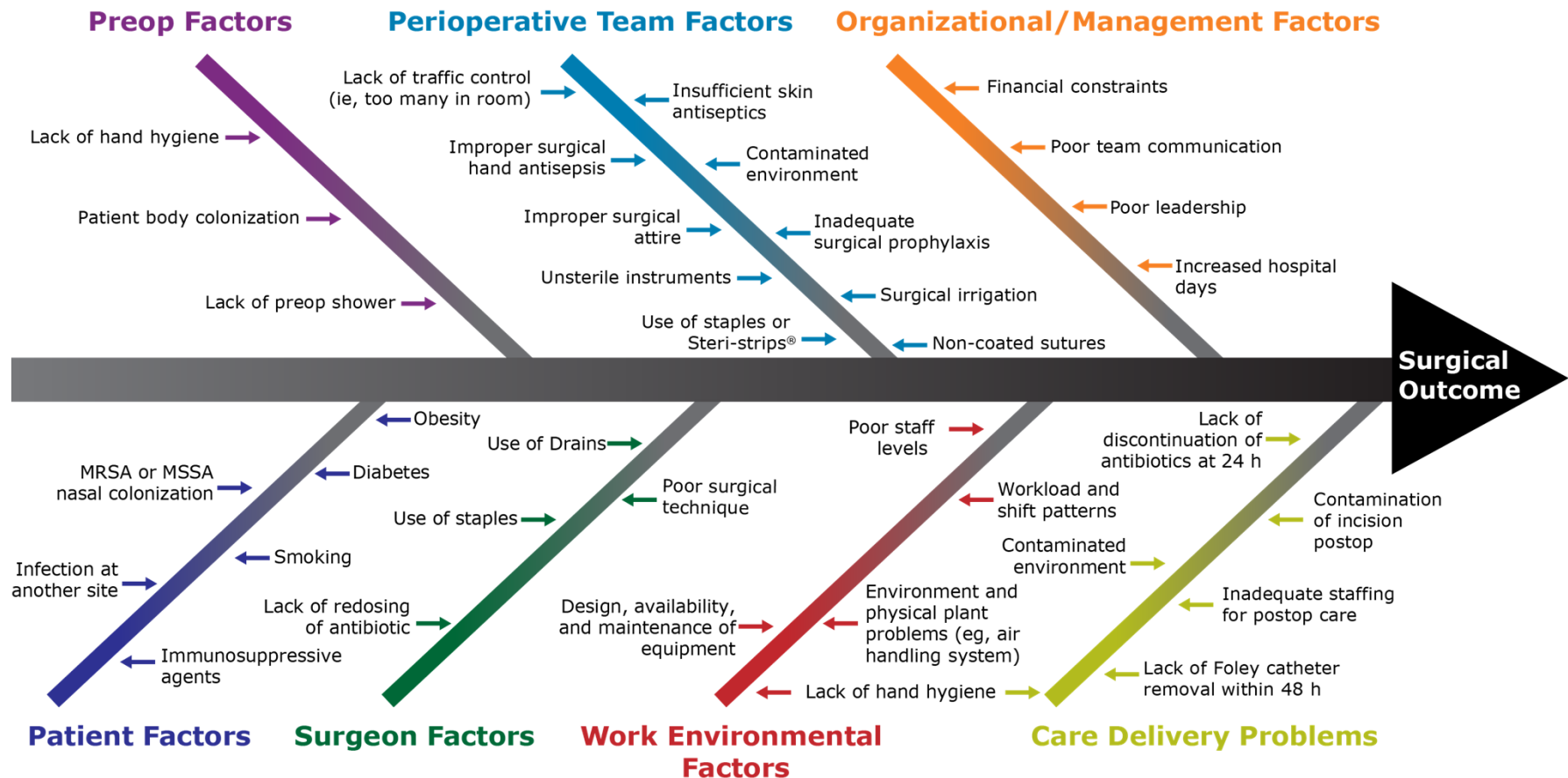
PACU = postanesthesia care unit.

Fairbanks CB. *AORN J.* 2007;86:73-82.

Standardization to Manage Risk Factors in Surgical Care



Many Risk Factors Influence HAI

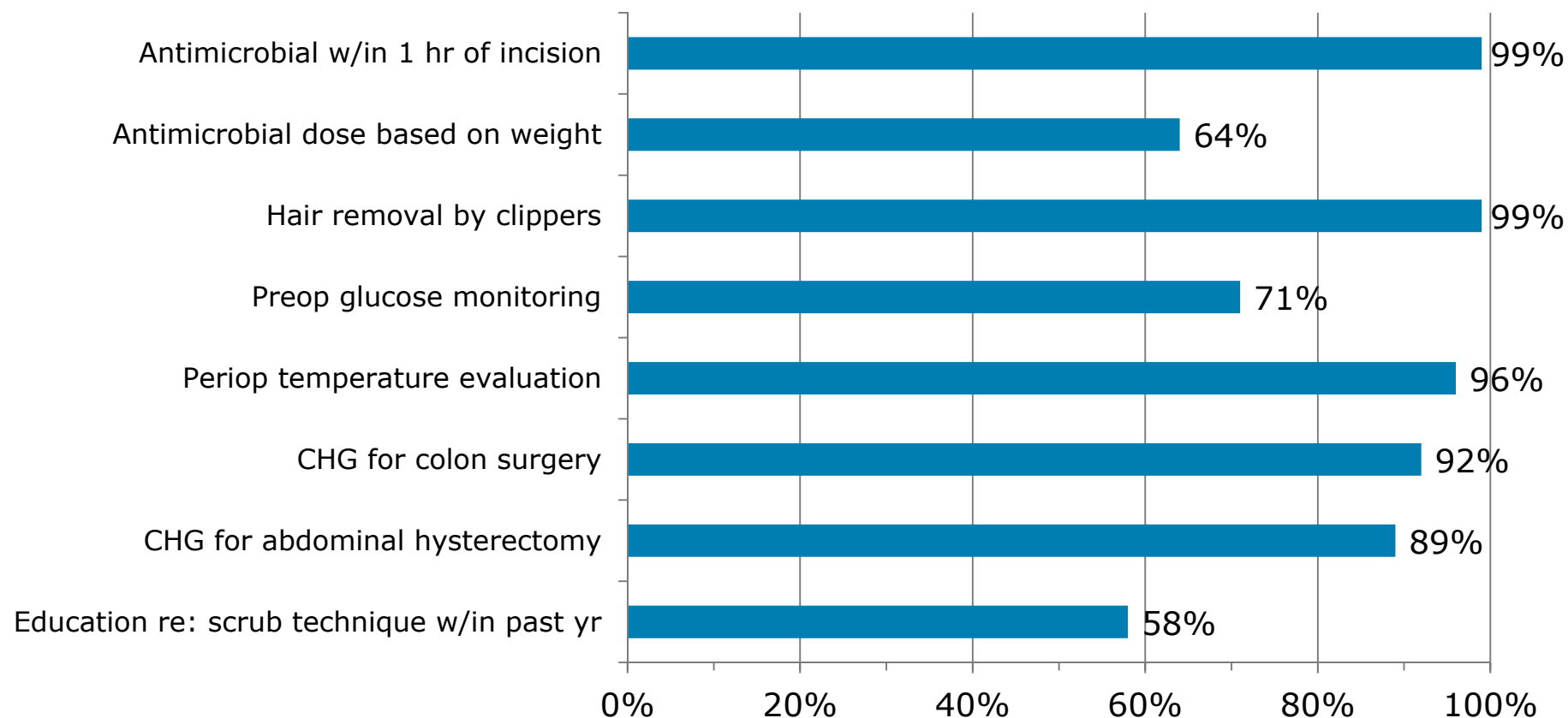


One thing could lead to the failure

1. Adapted with permission from Spencer M. Working Toward Zero Healthcare Associated Infections. Available at: <http://www.workingtowardzero.com>. Accessed August 4, 2014. 2. Fletcher N, et al. *J Bone Joint Surg Am*. 2007;89:1605-18.

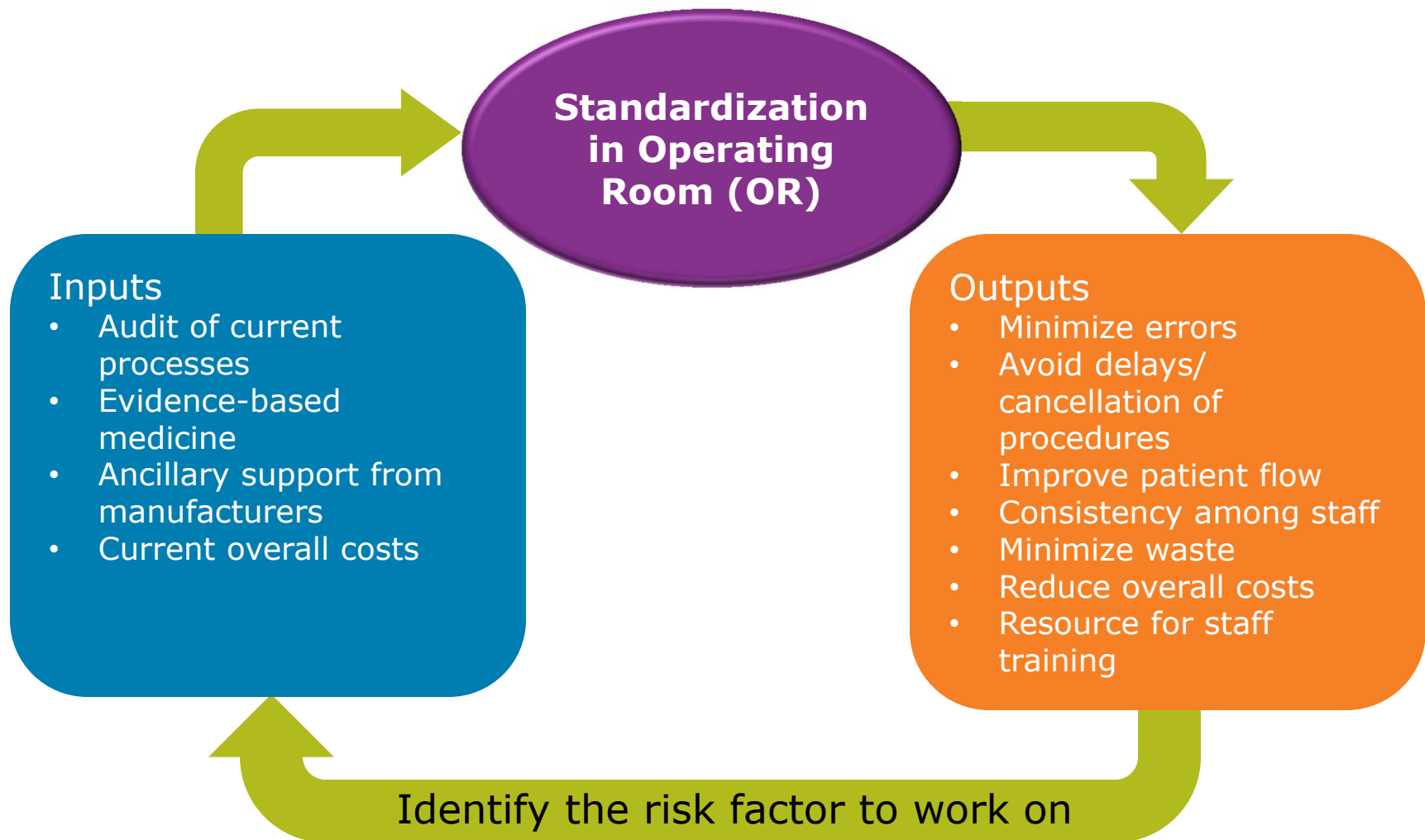
Variability in Surgical Practices Compounds Impacts from Risk Factors

66 Hospitals Performing Surgeries in 16 States and DC



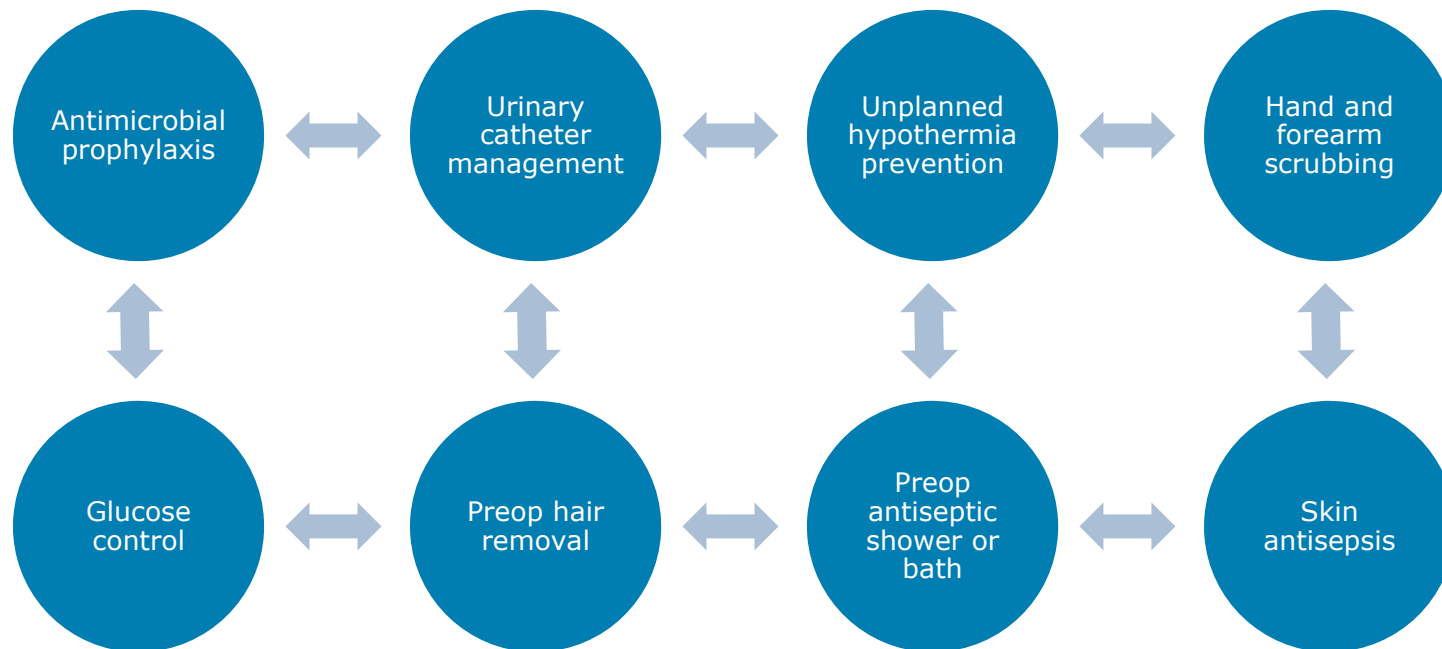
Fakih MG, et al. *Am J Infect Control*. 2013;41:950-4.

Standardization Mitigates Risk Factors



Mitigating the Risk of HAIs With Prevention Bundles

- Holistic approach to collectively reduce HAIs
- Parallel targeting of multiple risk factors
- No “silver-bullet” to HAI risk reduction

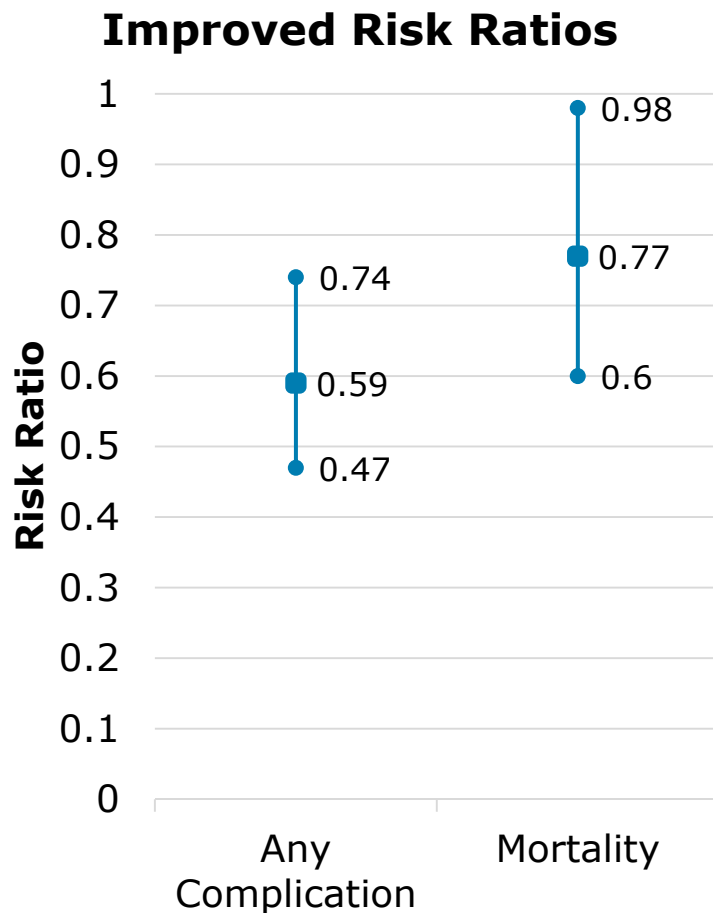


National Initiatives to Improve Surgical Care

- World Health Organization (WHO) Surgical Safety Checklist¹
- Surgical Care Improvement Project (SCIP)²
 - Quality measures aligned between the Centers for Medicare & Medicaid Services (CMS) and The Joint Commission
- Project JOINTS from the Institute for Healthcare Improvement (IHI)³
 - JOINTS = Joining Organizations IN Tackling SSIs

1. World Alliance for Patient Safety. *Implementation Manual Surgical Safety Checklist*. 1st ed. Geneva: WHO; 2008. 2. CMS and The Joint Commission. Specifications manual for national hospital inpatient quality measures [Version 4.2a, October 2012]. Available at: http://www.jointcommission.org/specifications_manual_for_national_hospital_inpatient_quality_measures.aspx. Accessed October 23, 2013. 3. IHI. Welcome to Project JOINTS! Available at: <http://www.ihl.org/engage/initiatives/completed/projectjoints/Pages/default.aspx>. Accessed March 17, 2014.

Standard Checklists Can Improve Clinical Outcomes

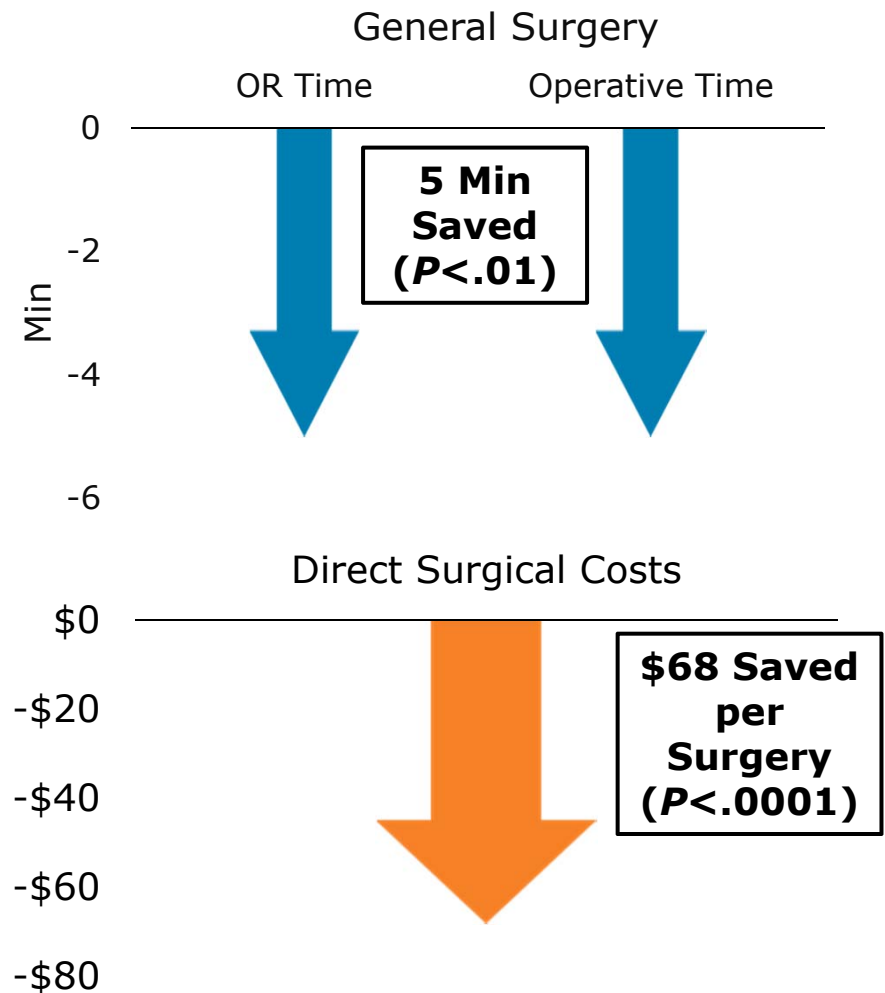


Bergs J, et al. *Br J Surg*. 2014;101:150-8.

- Recent meta-analysis of 7 studies that evaluated the WHO Surgical Safety Checklist
- Strong correlation between decreased complications and adherence to the checklist ($Q=0.82$, $P=.042$)

Standard Checklists Can Improve Efficiency and Costs

- Study at a tertiary-care hospital in Texas
 - 17,204 surgeries prechecklist vs 18,366 postchecklist
- WHO checklist only takes 2 min to complete
 - Despite perception by some that it is too time-consuming

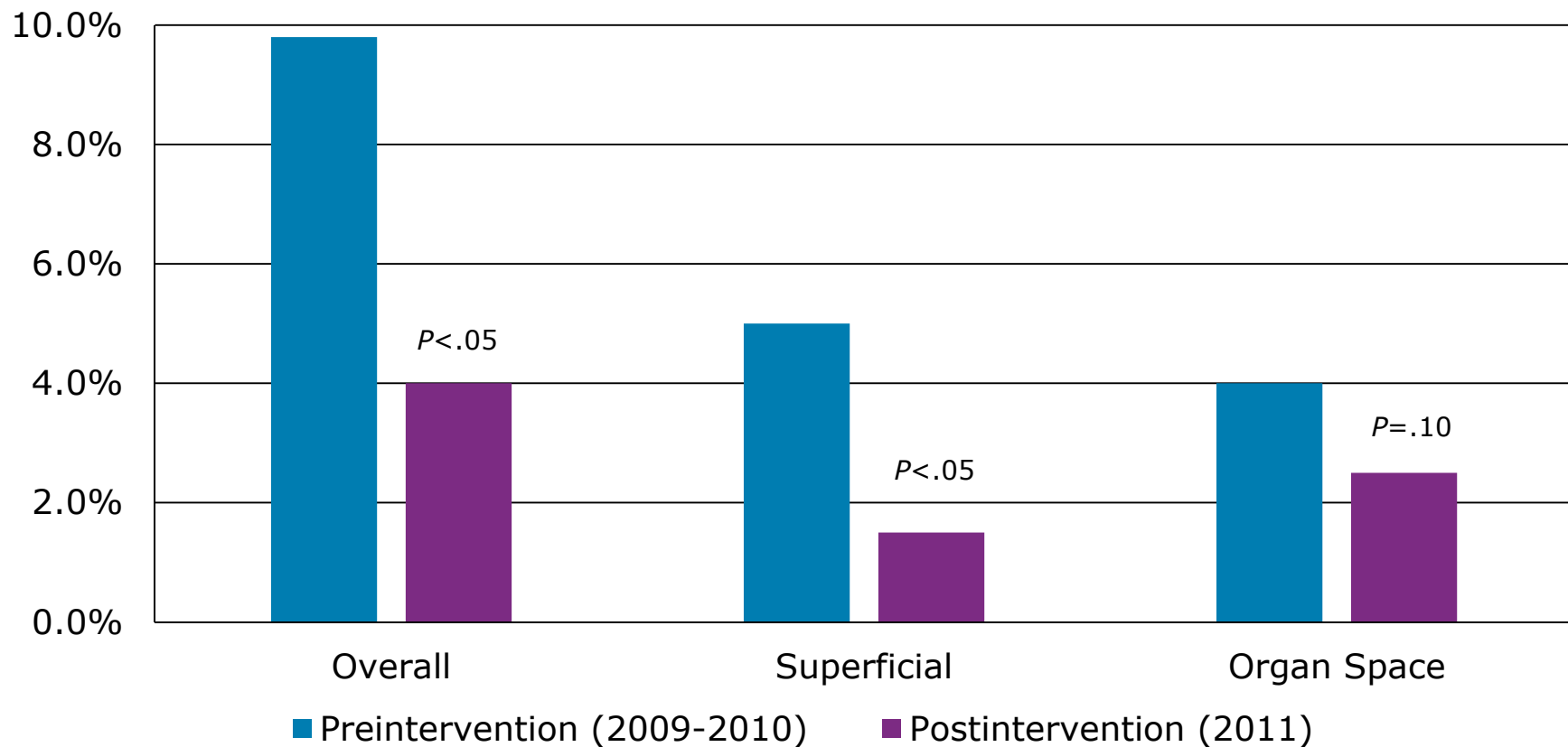


Papaconstantinou HT, et al. *Am J Surg*. 2013;206:853-60.

Standardization to Improve Quality

Quality Improvement at the Mayo Clinic (Rochester, MN)

Colorectal Surgical Infection Complications

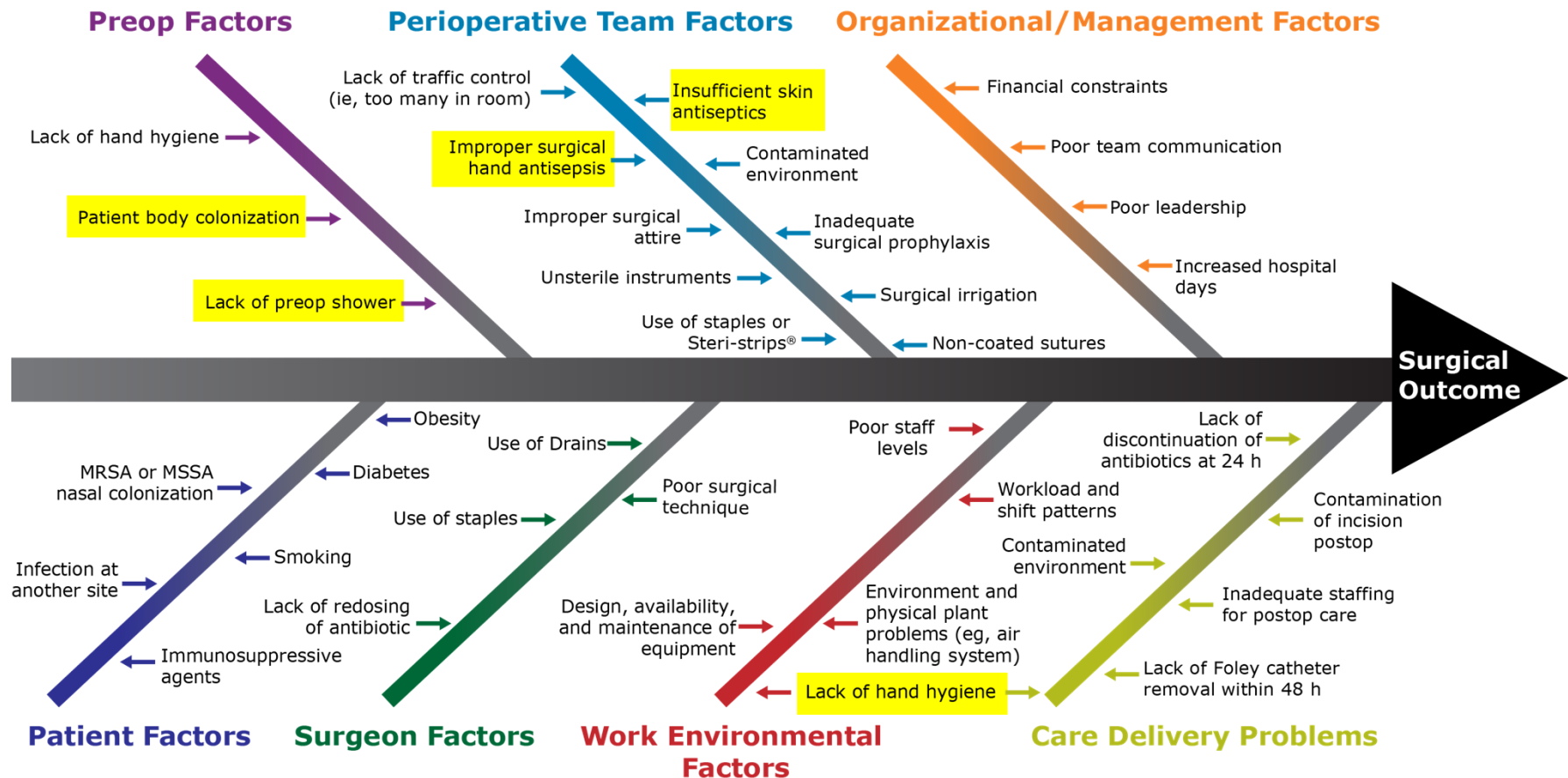


Cima R, et al. *J Am Coll Surg*. 2013;216:23-33.

Standardization for Skin Related Preparation for Surgery



Many Risk Factors Influence HAI Rate

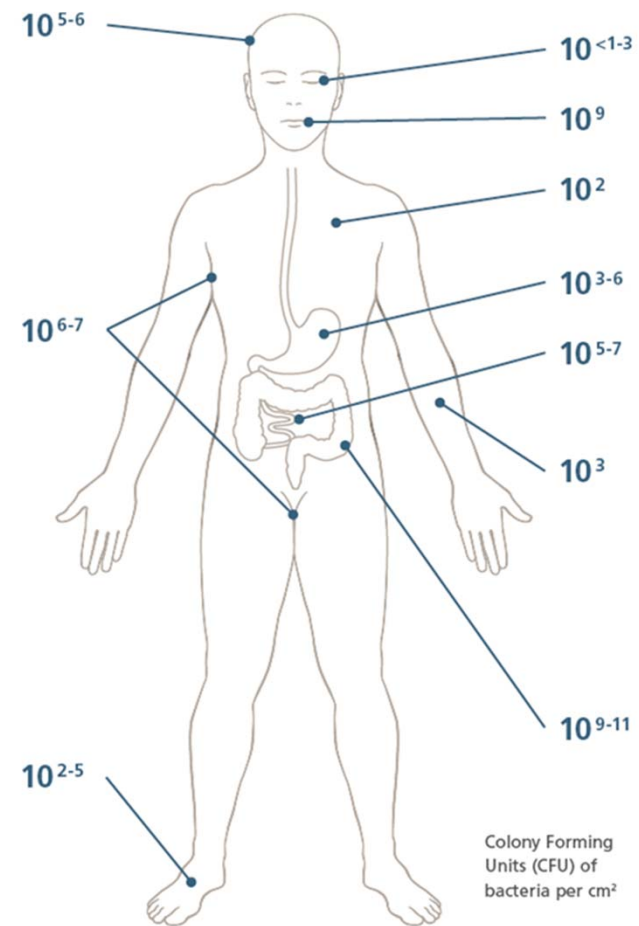


One thing could lead to the failure

1. Adapted with permission from Spencer M. Working Toward Zero Healthcare Associated Infections. Available at: <http://www.workingtowardzero.com>. Accessed August 4, 2014. 2. Fletcher N, et al. *J Bone Joint Surg Am*. 2007;89:1605-18.

Skin: An Overview

- 80% of skin flora in the first 5 cell layers of the stratum corneum¹
- 10^{13} cells in the human body, 10^{14} colonizing microbial cells, a 10-to-1 inequality²
- Major risk factor for HAIs



Proper skin preparation is critical to prevent serious complications

1. Brown E, et al. *J Infect Dis.* 1989;160:644-50. 2. Wenzel RP. *N Engl J Med.* 2010;362:75-7.

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Patient Preoperative Skin Prep

Decolonization Shower or Bath

- Reduces skin microbial colony count¹
- Recommend 2 showers/baths for at least the night before the procedure^{1,2}
 - Emphasize to patients who are home at that time
 - Patient colonization with *S. aureus*, including methicillin-resistant strains, is a risk factor for infection
 - Studies show that preop antiseptic showers decrease colonization, including *S. aureus*

1. Mangram AJ, et al. *Infect Control Hosp Epidemiol*. 1999;20:250-78. 2. Association of Perioperative Registered Nurses (AORN). *Perioperative Standards and Recommended Practices*. Denver, CO: AORN, Inc.; 2013:75-89.

Patient Preoperative Skin Prep

Hair Removal

- AORN guidelines do NOT recommend clipping in OR¹
- Recommended around the incision site only when hair will interfere with the operation²
 - Electric clippers > depilatory agent = no hair removal > razor²
 - Studies show that shaving causes small skin abrasions that may become infected³
- Reporting required as per SCIP-Inf-6³

1. AORN. Perioperative Standards and Recommended Practices. Denver, CO: AORN, Inc.; 2013:75-89. 2. Mangram AJ, et al. *Infect Control Hosp Epidemiol*. 1999;20:250-78. 3. CMS and The Joint Commission. Specifications manual for national hospital inpatient quality measures [Version 4.2a, October 2012]. Available at: http://www.jointcommission.org/specifications_manual_for_national_hospital_inpatient_quality_measures.aspx. Accessed October 23, 2013.

Clinician Hand/Forearm Scrubbing

- Factors other than agent choice influence efficacy
 - Scrub technique¹
 - Scrub up to elbows
 - First scrub of day should include under fingernails
 - After scrub, keep hands up and away from body
 - Keep nails short and remove artificial nails and jewelry
 - Duration of scrub should be at least **3-5 min**²
 - Condition of hands¹
 - Drying and gloving techniques¹
 - Use sterile towels to dry
 - Don sterile gloves and gown after scrub

1. Mangram AJ, et al. *Infect Control Hosp Epidemiol*. 1999;20:250-78. 2. AORN. Perioperative Standards and Recommended Practices. Denver, CO: AORN, Inc.; 2013:63-74.

Patient Preoperative Skin Prep

Surgical Site Skin Antiseptics

- Critically important in reducing the risk of HAIs
- Key factors include:
 - Antiseptic agent
 - Application method
 - Dry time
- Numerous choices available, which can lead to confusion in the OR
- Opportunity to standardize procedures and reduce variability

Comparison of Preop Antiseptics Agents

	CHG	IPA	I ₂ / Iodophors	PCMX	CHG/IPA	Iodophor/IPA
Advantages¹⁻⁴						
Broad spectrum	+	+	+	+	+	+
Rapid activity		+		+	+	+
Long-acting	+			+	+	
Active in blood/ organic matter	+			+	+	
Disadvantages^{1-3,5-8}						
Resistance	+/-	+/-	+/-	+/-	- ^a	- ^a
Flammable		+			+	+
Skin irritation	+/-	+	+/-	+	+	+

CHG = chlorhexidine gluconate; IPA = isopropyl alcohol; I₂ = iodine; PCMX = parachlorometaxylenol.

^aBecause of dual mechanisms of action, resistance to the combination product is expected to be low.

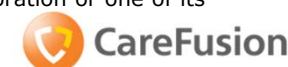
1. Mangram AJ, et al. *Infect Control Hosp Epidemiol*. 1999;20:250-78. 2. AORN. Perioperative Standards and Recommended Practices. Denver, CO: AORN, Inc.; 2013: 75-89. 3. Galvin P. *Am J Nurs*. 2009;109:49-55. 4. Karpanen TJ, et al. *Antimicrob Agents Chemother*. 2009;53:1717-9. 5. McDonnell G, Russell AD. *Clin Microbiol Rev*. 1999;12:147-79. 6. Lambert RJW. *J Appl Microbiol*. 2004;97:699-711. 7. Marquardt C, et al. *Eur J Med Res*. 2010;15:204-9. 8. Mailer LE, et al. *Dermatol Clin*. 2009;27:251-64.

Differing Application Instructions Among Patient Skin Prep Agents

	CHG/IPA	Iodine/ IPA	Aqueous CHG	Iodine Scrub/Paint
Example	Chloraprep® ¹	DuraPrep™ ² Prevail-Fx® ³	Exidine® ⁵	Wet PVP-I Tray ⁶
Application method	Gentle back and forth strokes	Paint in concentric circles	Swab back and forth	Scrub and paint in concentric circles
Application time	0.5-2 min	≥0.5 min ⁴	4 min	5 min ⁷
Dry time ^a	≥3 min	≥3 min	Blot	~2-3 min

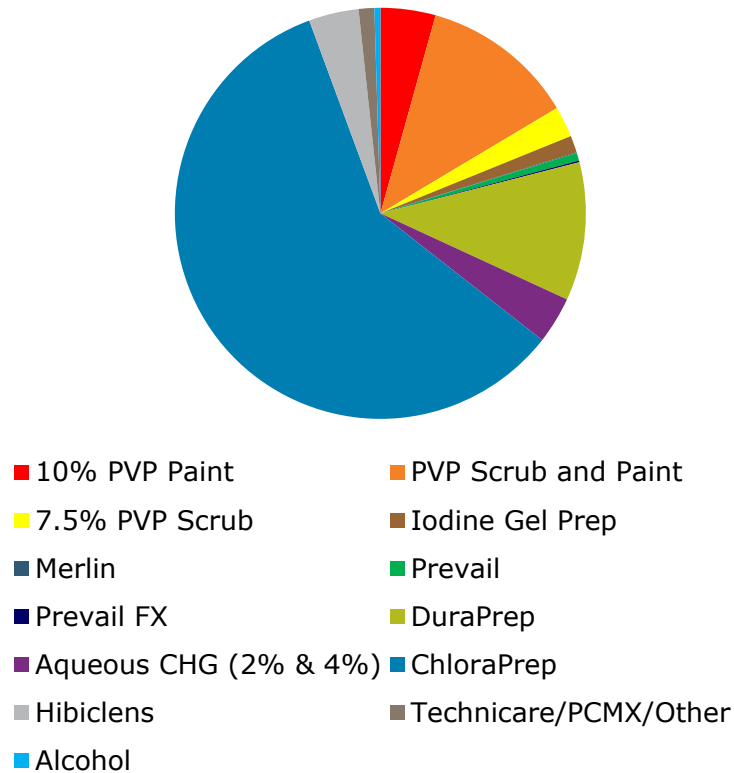
^aOn hairless skin.

1. CareFusion. Labels. Available at: <http://www.carefusion.com/medical-products/infection-prevention/skin-preparation/labels.aspx>. Accessed March 24, 2014. 2. 3M. 3M™ DuraPrep™ Surgical Solution Application Instructions. Available at: <http://multimedia.3m.com/mws/mediawebserver?mwsId=66666UF6EVsSyXTtMxTXOXf6EVtQEVs6EVs6EVs6E6666666--&fn=0503-MS-22164E.pdf>. Accessed March 24, 2014. 3. CareFusion. Prevail-Fx® In-Service Video. Available at: <http://www.carefusion.com/medical-products/infection-prevention/skin-preparation/surgical-trays-brushes-bulk-solutions/prevail-fx-in-service-video.aspx>. Accessed April 4, 2014. 4. Jeng DK. *Am J Infect Control*. 2001;29:370-6. 5. CareFusion. Exidine® 2% CHG Scrub Solution. Available at: <http://www.carefusion.com/medical-products/infection-prevention/skin-preparation/surgical-trays-brushes-bulk-solutions/exidine-scrub-solution-2percent.aspx>. Accessed April 4, 2014. 6. CareFusion. Scrub & Pain In-Service Video. Available at: <http://www.carefusion.com/medical-products/infection-prevention/skin-preparation/surgical-trays-brushes-bulk-solutions/scrub-and-pain-in-service-video.aspx>. Accessed April 4, 2014. 7. Scrub Care® Povidone Iodine Cleansing Solution, Scrub [product label]. San Diego, CA: CareFusion; 2010. Chloraprep, Prevail-Fx, Exidine, CareFusion and the CareFusion logo are trademarks or registered trademarks of CareFusion Corporation or one of its subsidiaries. All other trademarks are the property of their respective owners.

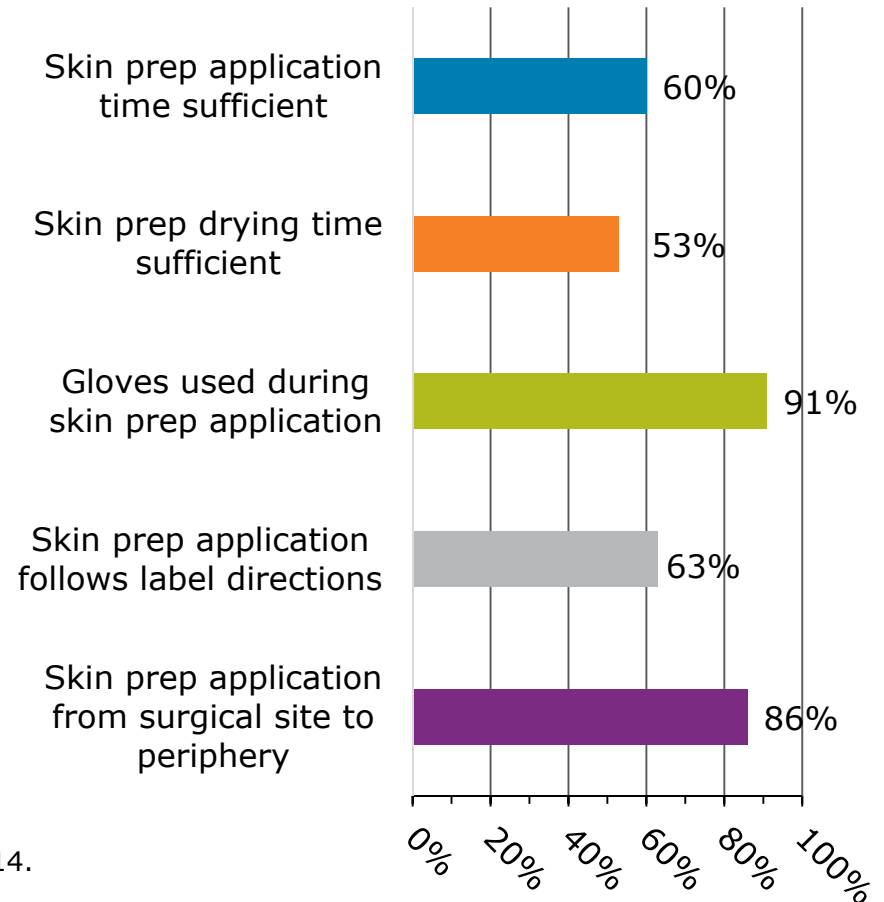


High Variability in Patient Skin Prep

Primary Skin Prep Use¹
3005 Observations in 197 Hospitals^a



Processes Followed²



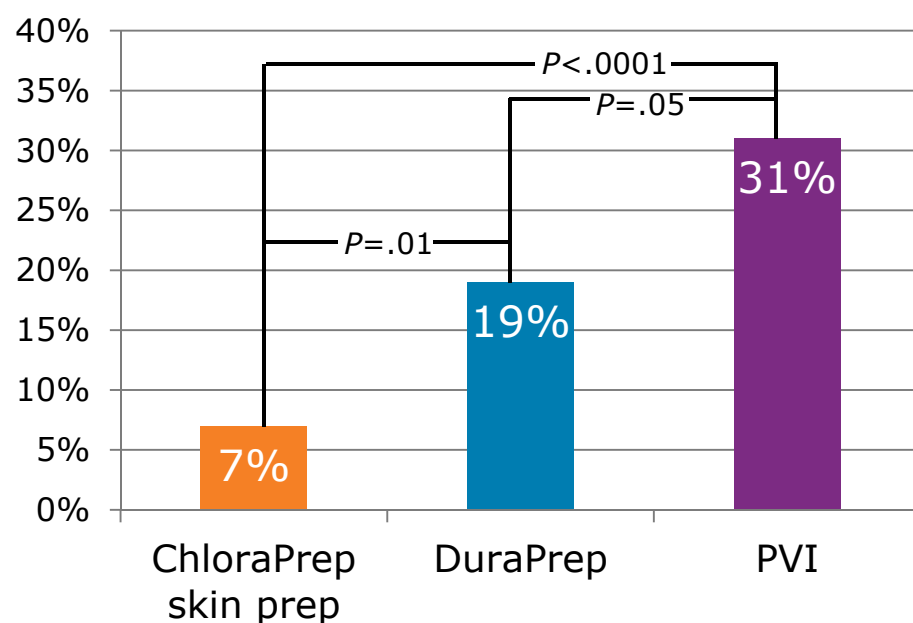
^aOR observations conducted between October 2013 and July 2014.

1. Data on file. 2. Xi H, et al. Focus on Quality Care: An Audit of Surgical Skin Prep Practices in U.S. Hospitals. Presented at the 2014 AORN Surgical Expo and Conference; March 30–April 2, 2014; Chicago, IL. ChloraPrep, Prevail-Fx, Exidine, CareFusion and the CareFusion logo are trademarks or registered trademarks of CareFusion Corporation or one of its subsidiaries. All other trademarks are the property of their respective owners.

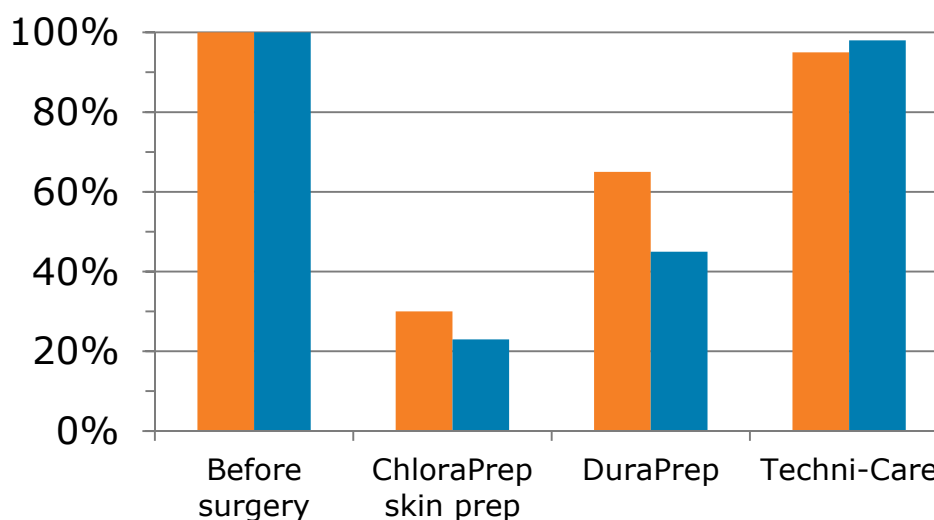


Effectiveness of Skin Prep Agents

Shoulder surgery¹
Positive Culture After Prep



Foot/Ankle Surgery²
Positive Culture Before Surgery



^a $P < .05$ vs DuraPrep; ^b $P < .001$ vs Techni-Care; ^c $P < .05$ vs Techni-Care and preop.

■ Hallux ■ Toe

1. Saltzman MD, et al. *J Bone Joint Surg Am.* 2009;91:1949-53. 2. Ostrander RV, et al. *J Bone Joint Surg Am.* 2005;87:980-5. ChloraPrep, Prevail-Fx, Exidine, CareFusion and the CareFusion logo are trademarks or registered trademarks of CareFusion Corporation or one of its subsidiaries. All other trademarks are the property of their respective owners.

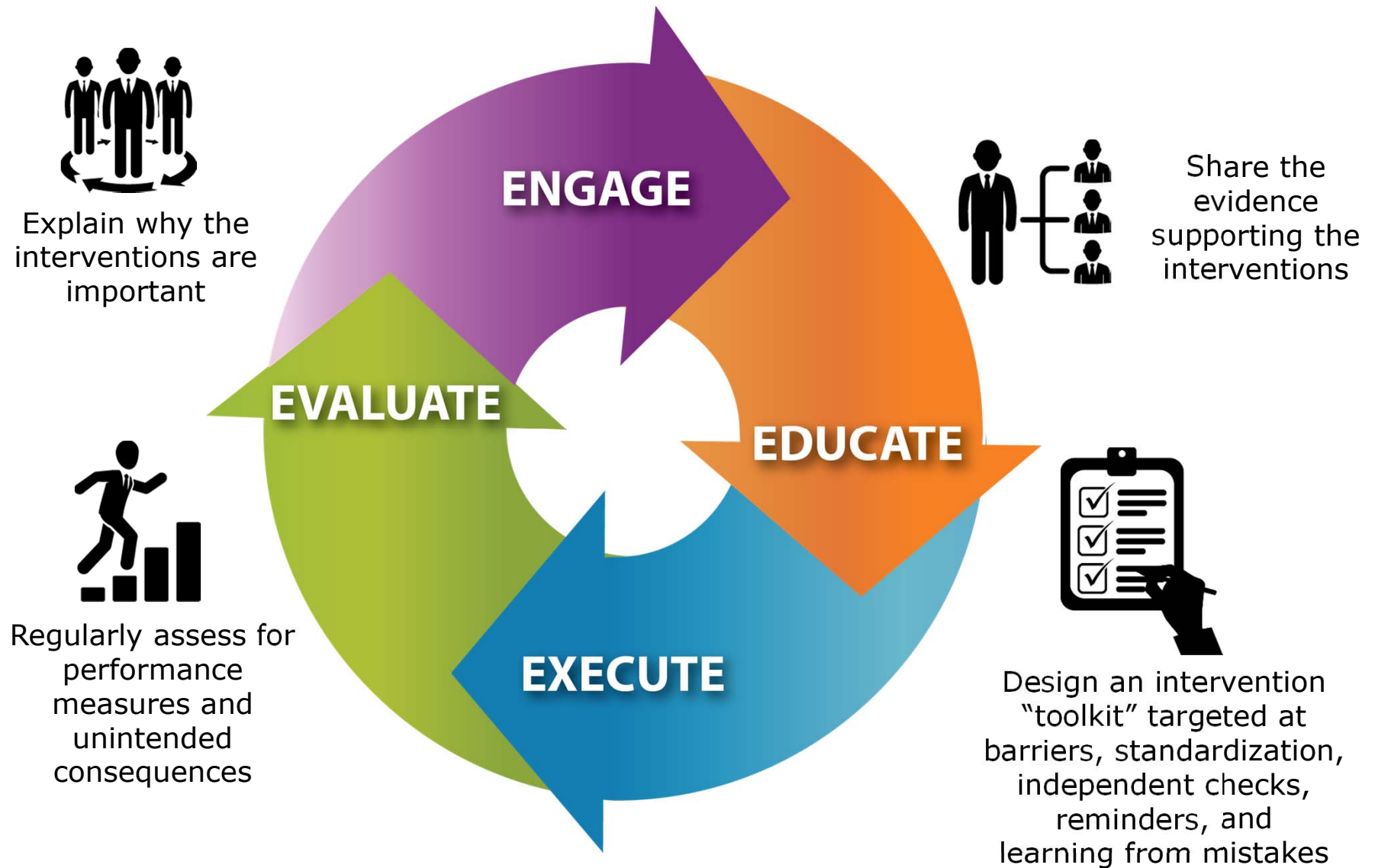
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Implementation of Standardization



Standardization Process: The Four E's

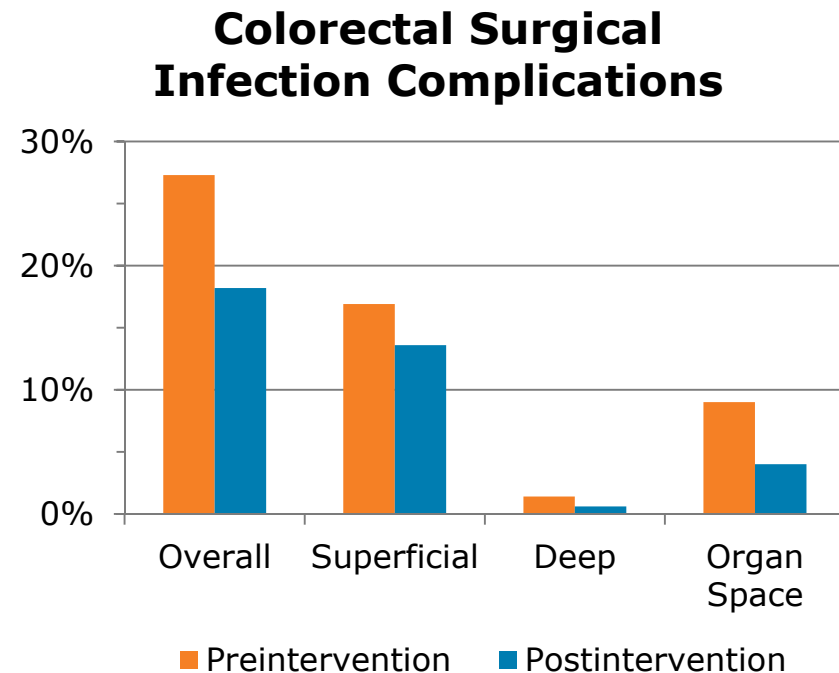


1. Pronovost PJ, et al. *BMJ*. 2008;337:963-5. 2. Anderson DJ, et al, *Infect Control Hosp Epidemiol*. 2014;35:605-27.

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A Culture of Team Engagement Improves Quality

- Comprehensive Unit-Based Safety Program (CUSP)
 - Introductory safety education
 - Staff safety survey
 - How will surgical infection complication develop in next patient?
 - What can we do to prevent this?
 - Senior executive partnership
 - Learning from defects
 - Trained to use a structured tool
 - Implement teamwork and communication tools
 - Review unit safety data monthly and develop local quality initiatives

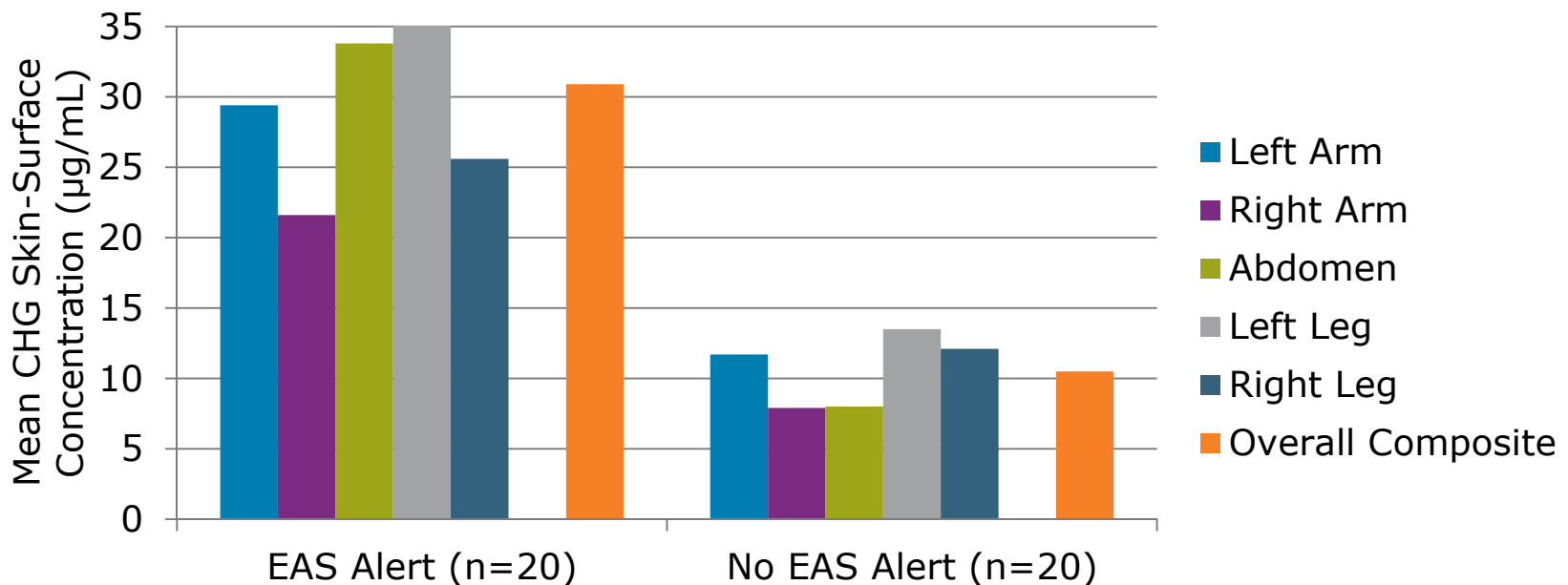


Overall surgical infection complications decreased from 27% to 18% ($P < .0001$)

Wick EC, et al. *J Am Coll Surg.* 2012;215:193-200.

Patient Engagement Is Critical

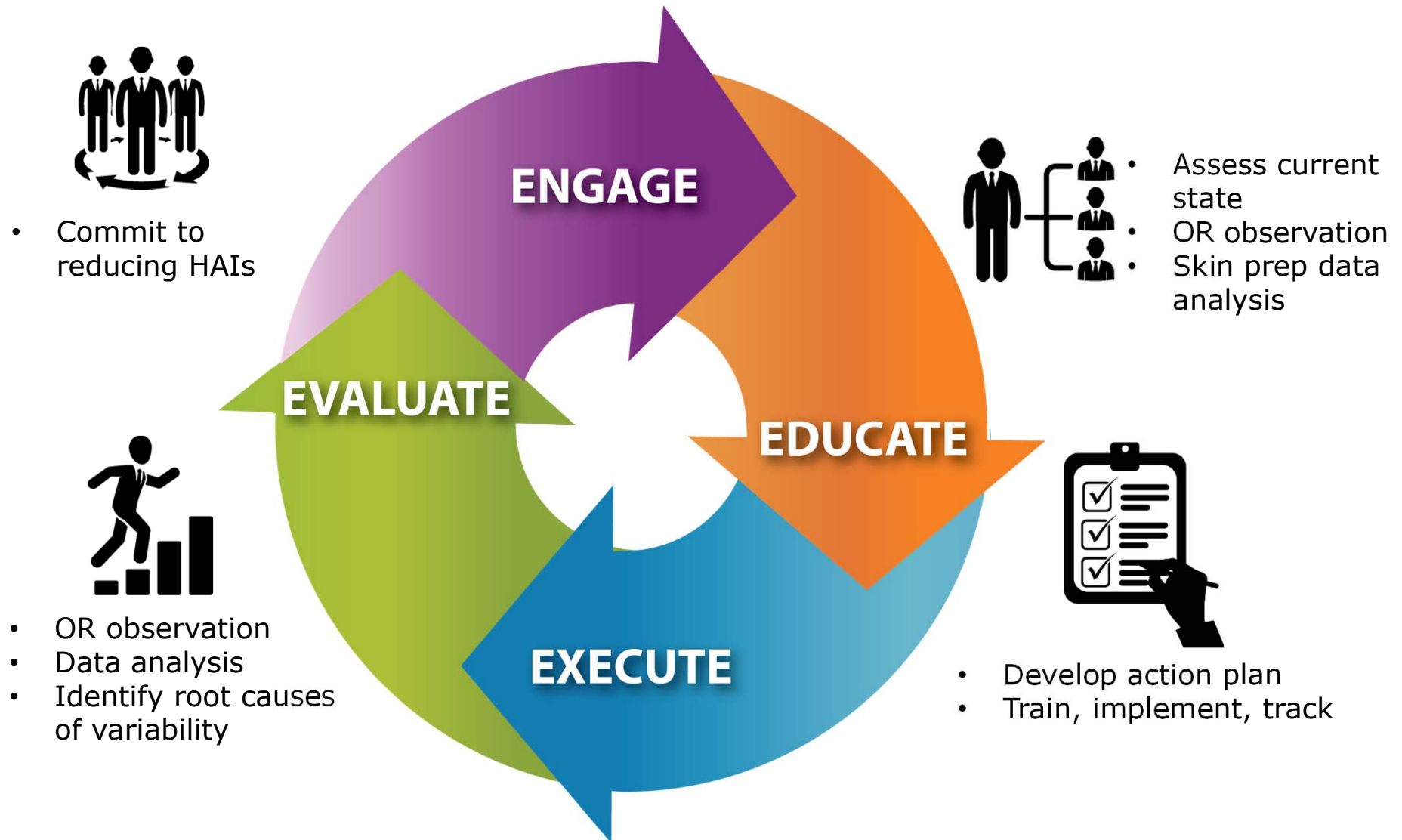
- Healthy volunteers showered with 4% CHG soap 2-3 times, ± electronic alert system (EAS) reminder
 - With an EAS reminder, patients had about 3-fold higher mean composite skin-surface CHG concentrations ($P<.007$)



EAS reminders were by SMS text message, voicemail, or e-mail.

Edmiston CE Jr, et al. *J Am Coll Cardiol*. 2014; in press.

Partnering for Quality Improvement



1. Pronovost PJ, et al. *BMJ*. 2008;337:963-5. 2. Anderson DJ, et al, *Infect Control Hosp Epidemiol*. 2014;35:605-27.

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Conclusions



Conclusions

- HAIs deserve our attention NOW
- Reducing variability in healthcare system improves quality of care
- Standardization of skin related preparation may aid quality initiatives in surgical care
- “Evaluate, engage, educate and execute” (4 E’s) is the key process for quality culture change
- We should leverage resources available for 4 E’s in standardizing skin related preparation

Questions

Thank you



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