Limitations of Evidence-based Recommendations in Infection Control Guidelines

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Nothing to declare

Disclosures

- AHRQ funded the quasi-experimental study that I will discuss (Schweizer, et al.)
- CDC is funding unrelated studies
- I am not an expert on this topic!

Outline

- Timeliness
- CDC HICPAC: changes to guideline categorization
- CDC & WHO SSI Guidelines
- Summary & conclusions

CDC Guidelines

Guideline	Year	Year	Year
Hand Hygiene	1985	2002	
D ization	1985	2008	FUD*
A ealthcare Settings	1994	2005	
I He			
S ons			
E tion Control	2003	FUD	
M Organisms	2006		
Isolation Precautions (1970, 1977)	1983	1995	2007
Intravascular Catheter-Related Infections	2002	2011	FUD

HICPAC CREATED 1992

FUD: Focused update

Timeliness

- Resource & time intensive
- Limited budgets
- Speed at which new information becomes available
- Thorough update vs. focused updates
- Issues related to bureaucratic clearance

Focused Updates

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Environmental Fogging [December 2009]

Clarification Statement: CDC and HICPAC have recommendations in both *2003 Guidelines for Environmental Infection Control in Health-Care Facilities* and the *2008 Guideline for Disinfection and Sterilization in Healthcare Facilities* that state that the CDC does not support disinfectant fogging. Specifically, the 2003 and 2008 Guidelines state:

- 2003: "Do not perform disinfectant fogging for routine purposes in patient-care areas. Category IB"
- 2008: "Do not perform disinfectant fogging in patient-care areas. Category II"

These recommendations refer to the spraying or fogging of chemicals (e.g., formaldehyde, phenol-based agents, or quaternary ammonium compounds) as a way to decontaminate environmental surfaces or disinfect the air in patient rooms. The recommendation against fogging was based on studies in the 1970's that reported a lack of microbicidal efficacy (e.g., use of quaternary ammonium compounds in mist applications) but also adverse effects on healthcare workers and others in facilities where these methods were utilized. Furthermore, some of these chemicals are not EPA-registered for use in fogging-type applications.

These recommendations do not apply to newer technologies involving fogging for room decontamination (e.g., ozone mists, vaporized hydrogen peroxide) that have become available since the 2003 and 2008 recommendations were made. These newer technologies were assessed by CDC and HICPAC in the 2011 Guideline for the Prevention and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings, which makes the recommendation:

"More research is required to clarify the effectiveness and reliability of fogging, UV irradiation, and ozone mists to reduce norovirus environmental contamination. (No recommendation/unresolved issue)"

Focused Updates

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Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011

Notice to Readers:

⚠ **Content Removed [October 2017]:** Content in the **Notice to Readers** section was removed to reflect the recommendation update and the evolution of CDC infection control guideline methodology.

New Focused Updates

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11. Use a sterile sleeve for all pulmonary artery catheters [81]. *Category IB*

12. ⚠ **Recommendation Update [July 2017]** For patients aged 18 years and older:

    a. Chlorhexidine-impregnated dressings with an FDA-cleared label that specifies a clinical indication for reducing catheter-related bloodstream infection (CRBSI) or catheter-associated blood stream infection (CABSI) are recommended to protect the insertion site of short-term, non-tunneled central venous catheters. Updated Recommendations References 8-12 *Category IA*

    (See Updated Chlorhexidine-Impregnated Dressings, Implementation Considerations for Patients Aged 18 Years and Older [https://www.cdc.gov/infectioncontrol/guidelines/bsi/c-i-dressings/considerations.html]).

    [**Superseded 2011 Recommendation**] Use a chlorhexidine-impregnated sponge dressing for temporary short-term catheters in patients older than 2 months of age if the CLABSI rate is not decreasing despite adherence to basic prevention measures, including education and training, appropriate use of chlorhexidine for skin antisepsis, and MSB [93, 96–98]. *Category IB*

13. ⚠ **Recommendation Update [July 2017]** For patients younger than 18 years:

    a. Chlorhexidine-impregnated dressings are **NOT** recommended to protect the site of short-term, non-tunneled central venous catheters for premature neonates due to risk of serious adverse skin reactions. Updated Recommendations References 13,14 *Category IC*

Superseded Recommendations

Recommendations 12 & 13 have been superseded. See the ***Updated Recommendations on Chlorhexidine-Impregnated Dressings*** (https://www.cdc.gov/infectioncontrol/guidelines/bsi/c-i-dressings/index.html) for more information.

Other Issues

- CDC is an agency of the US federal government: recommendations are often interpreted as mandates, which has regulatory & accreditation implications
- HICPAC is reluctant to recommend practices when:
  - Supporting data are limited
  - When only one company makes a product/device

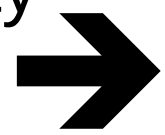
HICPAC CATEGORIES

CDC HICPAC Categorization

- May be too complex:
  - Difficult to translate recommendations into practice
  - Rationale for category choice is not always apparent
- Does not deal well with data gaps
- Difficult to address bundled interventions
- Has not been coordinated with other partners & stakeholders

HICPAC Recommendation Categories

- IA: A strong rec; high to moderate quality evidence . . . .
- IB: A strong rec; low-quality evidence . . . .
- IC: A strong rec required by regulation. . . .
- II: A weak rec; any quality evidence . . . .
- No rec/unresolved issue . . . .



- Recommendation
- Conditional recommendation
- No recommendation

Recommendation

- Benefits clearly exceed harms or harms clearly exceed benefits
- Usually supported by high to moderate quality evidence
- Evidence quality may be “lesser” if:
  - High-quality evidence is impossible to obtain
  - Benefits strongly outweigh harms
  - Required by federal law

Conditional Recommendation

- Benefits likely outweigh harms or vice versa
- Supporting evidence may be low to moderate or high when:
  - High quality data: benefit/harm balance isn't clearly tipped in one direction
  - Weak data: may not consistently create benefit
  - Relatively high-quality data: benefit extrapolated from one patient population/clinical situation to another
  - Cannot separate the effect from other interventions
  - Additional research might shift benefit/harm balance
  - Benefit likely if used as a supplementary measure

No Recommendation

- Lack pertinent evidence
- Unclear balance between benefits & harms

Recommendation Components

- Aggregate evidence quality
- Benefit
- Risks/harms
- Benefit/harms assessment
- Resource use
- Value judgments
- Intentional vagueness
- Exceptions

Aggregate Evidence Quality

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	High	Moderate	Low
Studies	Multiple studies; no major limitations	Few studies; some have limitations but no major flaws	Studies have major flaws
Variation between studies	Little variation	Some variation	Important variation
Summary estimate CI	Narrow	Wide	Very wide

CDC & WHO SSI GUIDELINES

CDC SSI Guideline 2017

The guideline:

- Focused on select measures needing assessment to advance SSI prevention.
  - Feedback from clinical experts
  - Input from HICPAC
- Was based on a systematic literature review.
- Did not reevaluate strong recommendations in CDC's 1999 SSI Prevention Guideline that are considered accepted practice.

SJ Berrios-Torres, et al. JAMA Surg 2017;152:784-791

CDC SSI Guideline 2017

- 25/42 (59.5%): No recommendation
  - Did not identify randomized controlled trials (studies) that . . . .
  - Randomized controlled trial evidence suggested uncertain trade-offs between benefits & harms . . . .
- **9 positive recommendations**
- 2/4 category IB; Do not:
  - Apply antimicrobials to the incision
  - Withhold necessary transfusions
- 3/5 category II; Not necessary:
  - Autologous platelet-rich plasma
  - Microbial sealant after skin prep
  - Plastic adhesive drapes +/- antimicrobial properties

SJ Berrios-Torres, et al. JAMA Surg 2017;152:784-791

WHO SSI Guideline

- Identified key questions: expert opinion & according to the PICO process
- Assessed study quality: Cochrane Collaboration tool to assess risk of bias for RCT & Newcastle-Ottawa Quality Assessment Scale for cohort studies
- Developed recommendations & strengths:
  - Balance between benefits & harms
  - Evidence quality
  - Cost & resource implications
  - User & patient values & preferences

WHO SSI Guideline

- Strong:
  - Intervention's benefits outweigh the risks
  - Recommendation is adaptable to most/all settings & patients should receive intervention
- Conditional:
  - Intervention's benefits probably outweigh risks
  - Intervention should be considered based on consultation with stakeholders & involvement of patients & healthcare professionals

WHO SSI Guideline

- Pre-op: 13 topics
  - 7 strong recommendations; 2/7 are “do not”
  - 6 conditional recommendations; 2/6 are “do not”
- Intra-op & post-op: 16 topics
  - 2 strong recommendations; 1/2 are “do not”
  - 14 conditional recommendations; 4/14 are “do not”

Study Quality

Quality	CDC	WHO
High	5	
High-Moderate	4	
Moderate	3	12
Low-Moderate		1
Low	2	7
Low-Very low		4
Very low		5
Accepted practice	3	

Pre-Op

	Recommendations	
Topic	**CDC**	**WHO**
Preop bathing	Bathe or shower w/ plain or antimicrob soap or anti-septic at least night before	Bathe or shower w/ plain or antimicrob soap
Hair removal	Do not remove unless hair will interfere w/ op; if necessary, remove immediately w/ clipper	Do not remove; if necessary, use clipper
SAP: optimal timing	When indicated by guide-lines; time so concentration in serum/tissues is bactericidal for incision	Before incision when indicated

SAP: surgical antibiotic prophylaxis

Pre-Op

	Recommendation Strength & Quality	
Topic	**CDC**	**WHO**
Preop bathing	IB–strong rec; accepted practice	Cond rec; moderate
Hair removal	IA-Re-emphasized from 1999	Strong rec; moderate
SAP: optimal timing	IB–strong rec; accepted practice	Strong rec; low
Hand prep	IB-Re-emphasized from 1999	Strong rec; moderate
Skin prep	IA–strong rec; high	Strong rec; Low-moderate
Skin sealants	II–weak rec; low	Cond rec; very low

SAP: surgical antibiotic prophylaxis

Pre-Op

	Recommendation Strength & Quality	
Topic	**CDC**	**WHO**
SAP: precise timing	No rec; unresolved	Strong rec; mod
S. aureus carriers: cardiothor or ortho op: mupirocin +/- CHG	Not addressed	Strong rec; mod
S. aureus carriers: other op: mupirocin +/- CHG	Not addressed	Cond rec; mod
MBP + oral antibiotics	Not addressed	Cond rec; mod
MBP w/out oral antibiotics	Not addressed	Strong rec; mod

Intra-Op & Post-Op

	Recommendations	
Topic	**CDC**	**WHO**
Adhesive incise drapes	Not necessary	Should not be used
PVI wound irrigation	Consider irrigating deep or subcut tissues intraop w/ PVI; Intraperiton lavage w/ PVI in contam/dirty abd procedures is not necessary.	Consider irrigating incisions w/ PVI particularly clean & clean-contam
Antibiotic wound irrigation	Do not apply antimicrobials to incision	Should not be used

WHO SSI Guideline: Decolonization

Author	Study Years	Study Design	Proce-dures	Patients	Interven-tion	Results
Perl*	1995-1998	RDBPC 2 sites	Cardiac, Gen Surg, Neurosurg	Mup 1933 (SAC: 444) Plac 1931 (SAC: 447)	2% Mup bid x 5 d pre-op	SA HAI Total 2.4% vs 2.0% SA HAI SAC 4.0% vs 7.7% P = 0.02 SA SSI Total 2.3% vs 2.4% SA SSI SAC 3.7% vs 5.9% P = .18
Kalmeijer *	1997-1999	RDBPC 1 site	Elective ortho: hip, knee, back	Mup 315 Plac 299	2% Mup ≥ 2 doses	SA SSI 0.59 (0.20–1.79) Endo SA SSI 0.19 (0.02–1.62)
Konva-linka	1997-2003	RDBPC 1 site	Elective cardiac	Mup 130 Plac 127	2% Mup bid x 7 d 4% CHG	SA SSI Mup 3.9% Plac 3.2%

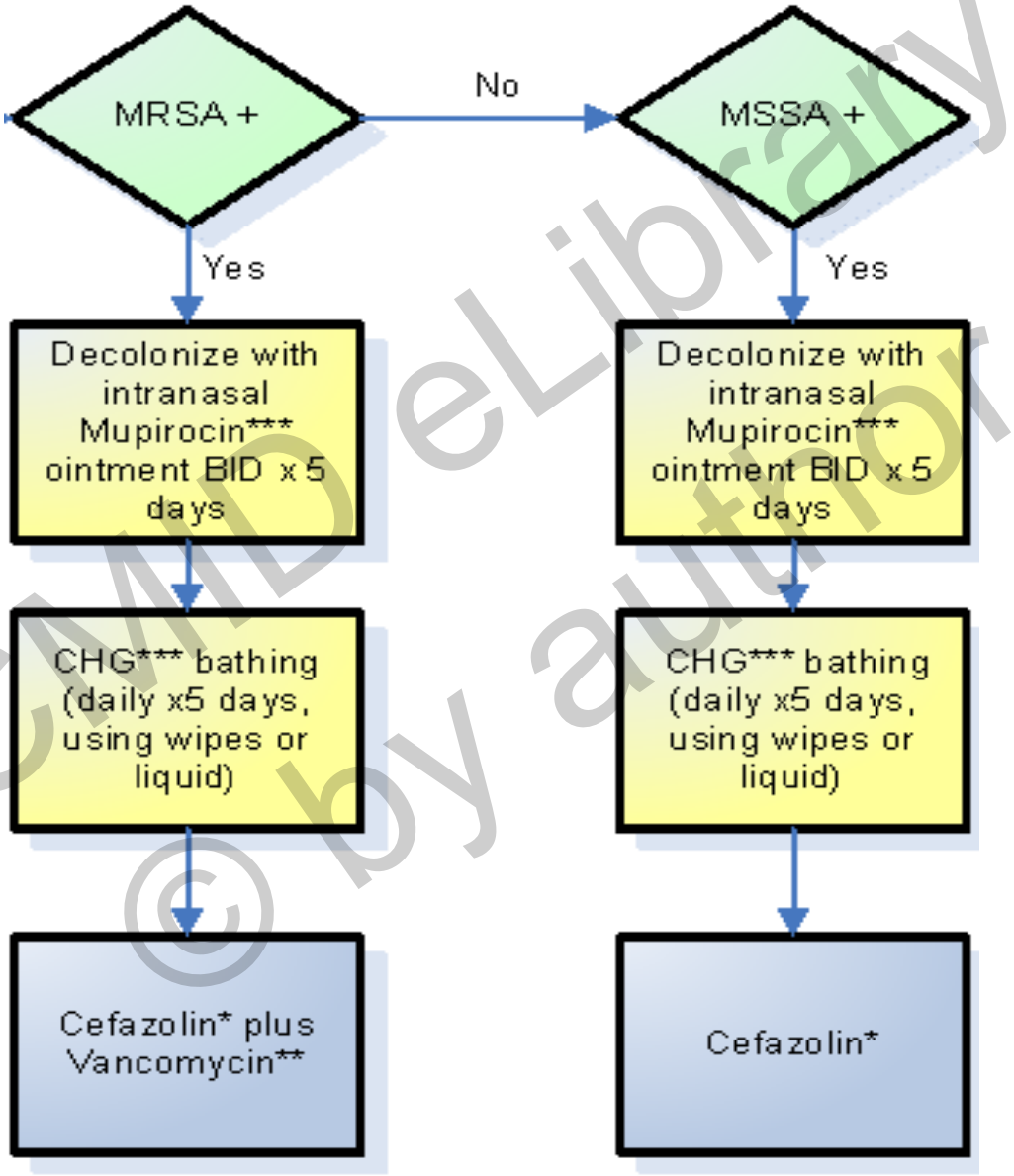
SAC = S aureus carrier; * all patient included

Author	Study Years	Study Design	Proce-dures	Patients	Interven-tion	Results
Garcia*	?	Rand. 1 site	Cardiac	Mup 96 No Rx 95	2% Mup bid x 5 d	SA SSI Mup 1.0% No Rx 6.3% P = 0.06
Bode	2005-2007	RDBPC 3 sites	Cardiac, Vasc, Ortho, GI, Gen Surg	808 colonized surgical	2% mup bid 4% CHG body wash x 5 d	SA HAI RR 0.42 (0.23-0.75) Deep SA SSI RR 0.21 (0.07-0.62)
Schweizer	2009-2012	QE 20 sites	Cardiac, THA, TKA	Pre: 28,218 Inter: 14,316	Mup bid CHG daily x 5 d	Complex SA SSI RR 0.58, (0.37-0.92)
Tai	2011	Rand. 1 site	Mohs	Colonized 102 decol 101 No Rx	2% Mup q d 4% CHG face/body wash x 5 d pre-op	SSI RR 0.3 (0.01-1.0) P = .05

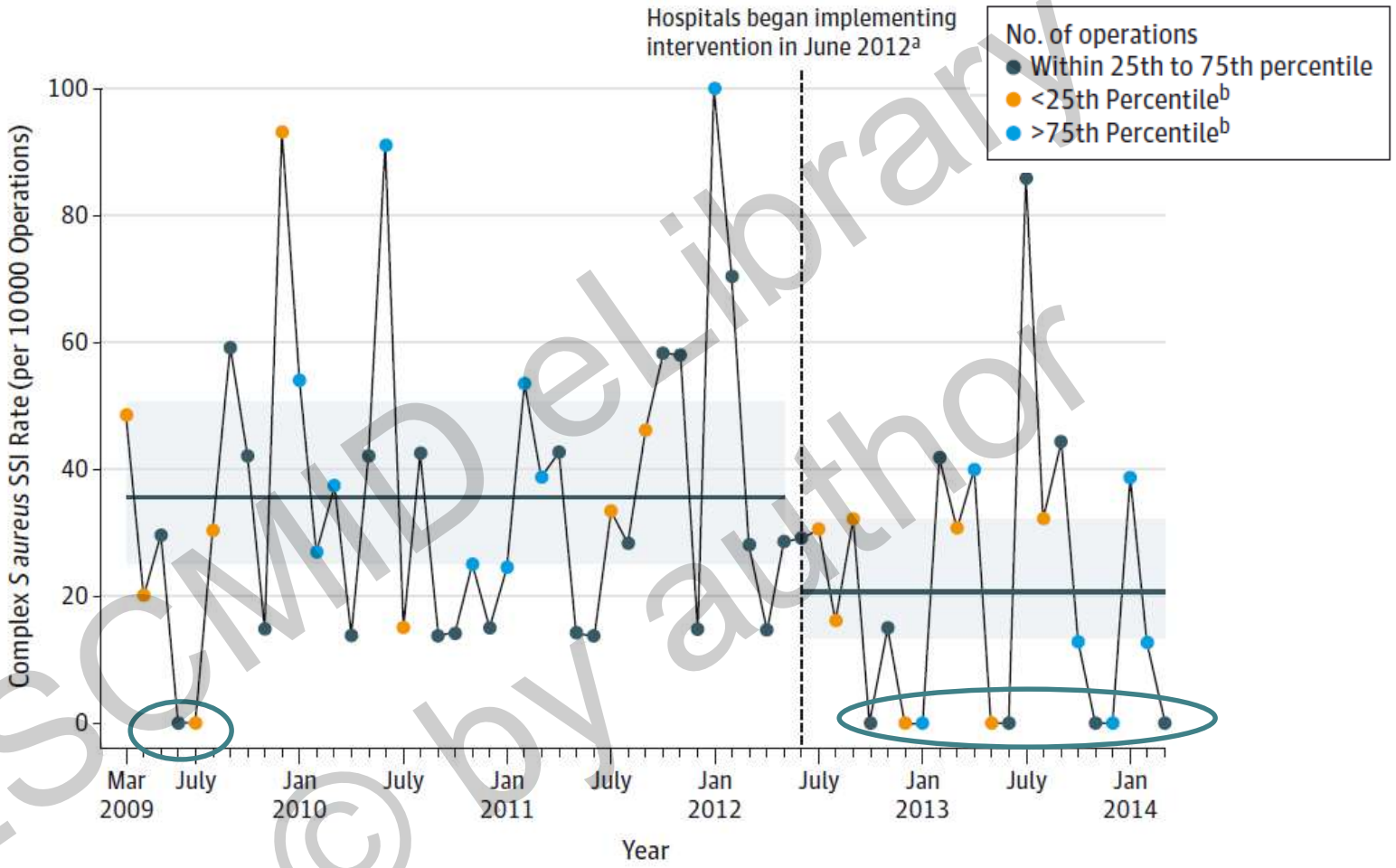
WHO SSI Guideline: Decolonization

Study	SSI Definition	Who Identified Outcome?	Duration of Follow up	Comp-liance Data
Perl	CDC	RA	30 days	Yes
Kalmeijer	CDC	?	30 days	Yes
Konvalinka	?	RA	8 weeks	Not provided
Garcia	CDC	IPC	4 weeks	No
Bode	CDC	?	1st 6 weeks	Not provided
Schweizer	CDC	IPC	90 days	Yes
Tai	?	?	Sutures out	No

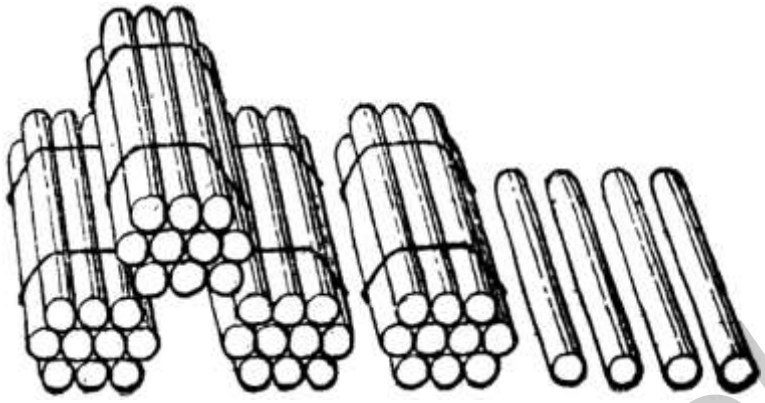
S. aureus Positive



Pooled Rate of Complex *Staphylococcus aureus* Surgical Site Infections (SSIs) by Admission Month



The number of months without any complex *S aureus* SSIs increased from 2 of 39 months (5.1%) to 8 of 22 months (36.4%; *P* <0.01)



Evaluating an Evidence-Based Bundle for Preventing Surgical Site Infection: A Randomized Trial

T Anthony, et al.

Arch Surg. 2011;146:263-269

Standard Arm

- Mechanical bowel preparation with oral antibiotics;
- Intraoperative forced air warming;
- Physiologic concentration of inspired oxygen after intubation (target FiO2 = 30%);
- IV fluid given at anesthesiologist's discretion;
- No wound edge protectors;
- IV prophylactic Abx c/w SCIP: cefoxitin or ertapenem

T. Anthony, et al. Arch Surg. 2011;146:263-269

Extended Arm

- No mechanical bowel preparation;
- Preoperative & intraoperative warming;
- Supplemental oxygen during & immediately after the operation;
- Intraoperative IV fluid restriction;
- Use of a surgical wound protector;
- IV prophylactic Abx c/w SCIP: cefoxitin or ertapenem

T. Anthony, et al. Arch Surg. 2011;146:263-269

Results

- Extended arm SSI = 45% vs. Standard arm = 24% (P = 0.003).
- Extended arm: superficial incisional SSIs = 36% vs. Standard arm = 19%; (P = 0.004).
- Multivariable analysis: Extended arm associated w/ ↑ SSI risk of 2.49-fold (95% CI, 1.36-4.56; P = 0.003).

T. Anthony, et al. Arch Surg. 2011;146:263-269

So much for the bundle!

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Summary & Conclusions

- Timeliness remains an issue
- Update extent & frequency: unresolved issue
- Reason for the recommendation strength given the study quality is not always clear
- CDC & WHO:
  - Level of specificity may vary
  - Recommendations may differ
  - Assessment of study quality may differ
  - Have not addressed studies of bundled interventions

Summary & Conclusions

- CDC:
  - Has excluded non-randomized studies
  - Often did not give recommendations
  - Sometimes referred to other organization's guidelines
  - Is improving its recommendation categories
- WHO:
  - Provided guidance for low to middle income settings
  - SSI guideline provided more guidance than does CDC's
  - Apparently excluded bundled interventions regardless of study quality

Final Comments

- Must improve the quality of infection prevention & control studies
- Must define bundled interventions & address how to assess/incorporate the results of bundled interventions in guidelines
- Could consider:
  - Separating the literature assessment & the identification of useful/useless interventions FROM guidance regarding prioritization & implementation
  - Helping healthcare facilities prioritize implementation based on their setting & risk assessment

"How come I never get to be in the control group?"