

Preventing Surgical Site Infections

What's New (or Really Old)
&

What Should We Focus on with
SCOAP?

E. Patchen Dellinger

Preventing SSI

Antibiotics

Which procedures

Timing

Dose

Choice

Duration

Antiseptics (skin prep)

Bowel prep

Surgical Technique

Fluid management

Surgical dressings

Double gloves

Oxygen

Temperature

Glucose

Preventing SSI

Antibiotics

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10-29

"I don't know what this is, but it's new and improved, so it must be good!"

Relative Benefit from Antibiotic Surgical Prophylaxis

<u>Operation</u>	<u>Prophylaxis (%)</u>	<u>Placebo (%)</u>	<u>NNT*</u>
Colon	4-12	24-48	3-5
Other (mixed) GI	4-6	15-29	4-9
Vascular	1-4	7-17	10-17
Cardiac	3-9	44-49	2-3
Hysterectomy	1-16	18-38	3-6
Craniotomy	0.5-3	4-12	9-29
Spinal operation	2.2	5.9	27
Total joint repl	0.5-1	2-9	12-100
Brst & hernia ops	3.5	5.2	58

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Effect of Mechanical Bowel Prep on Colon Flora (\log_{10})

	<u>Coliforms</u>	<u>Bacteroides</u>	<u>Clostridia</u>
No Prep	4.5 – 7.5	7.9 – 9.5	1.8 – 3.6
Prep	3.0 – 4.3	7.8 – 9.0	0.7 – 2.5

Nichols. Dis Col & Rect 1971; 14: 123-7

Antibiotic and Mechanical Bowel Prep for Colectomy (48 hrs)

	<u>Any SSI</u>
Placebo (63)	27 (43%)
Neomycin (68)	28 (41%)
Neo + Tetracycline (65)	3 (5%)

p<0.01

Washington. Ann Surg 1974;180:567-71

Antibiotic and Mechanical Bowel Prep for Colectomy (18 hrs)

	<u>Any SSI</u>
Placebo (56)	26 (43%)
Neo + Erythro (56)	5 (9%)
	p=0.0001

Clarke. Ann Surg 1977; 186:251-9

Antibiotic and Mechanical Bowel Prep for Colectomy (48 hrs)

	<u>Any SSI</u>
Placebo (59)	25 (42%)
Neo + Metronidazole (51)	9 (18%)

p<0.01

Matheson. Br J Surg 1978; 65:597-600

Antibiotic and Mechanical Bowel Prep for Colectomy (48 hrs)

	<u>Any SSI</u>
Placebo (39)	16 (41%)
Kanamycin + Erythro (38)	3 (8%)
	p<0.001

Wapnick. Surgery 1979; 85:317-21

Antibiotic and Mechanical Bowel Prep for Colectomy (18 - 48 hrs)

Bowel Prep +	<u>Placebo</u>	<u>Oral Ab</u>
1974	43%	5%
1977	43%	9%
1978	42%	18%
1979	41%	8%

Colorectal Prophylaxis: Oral vs Parenteral-Duration of Operation

Duration	Cefoxitin	Neo/Erythro
< 4 h	5%*	4%
≥ 4 h	36%*†	0†

* $P < .01$.

† $P < .05$.

Kaiser. *Ann Surg.* 1983;198:525-530.

Parenteral v. Oral Antibiotics for Colectomy Prophylaxis

Kanamycin + Metronidazole

SSI

Oral only

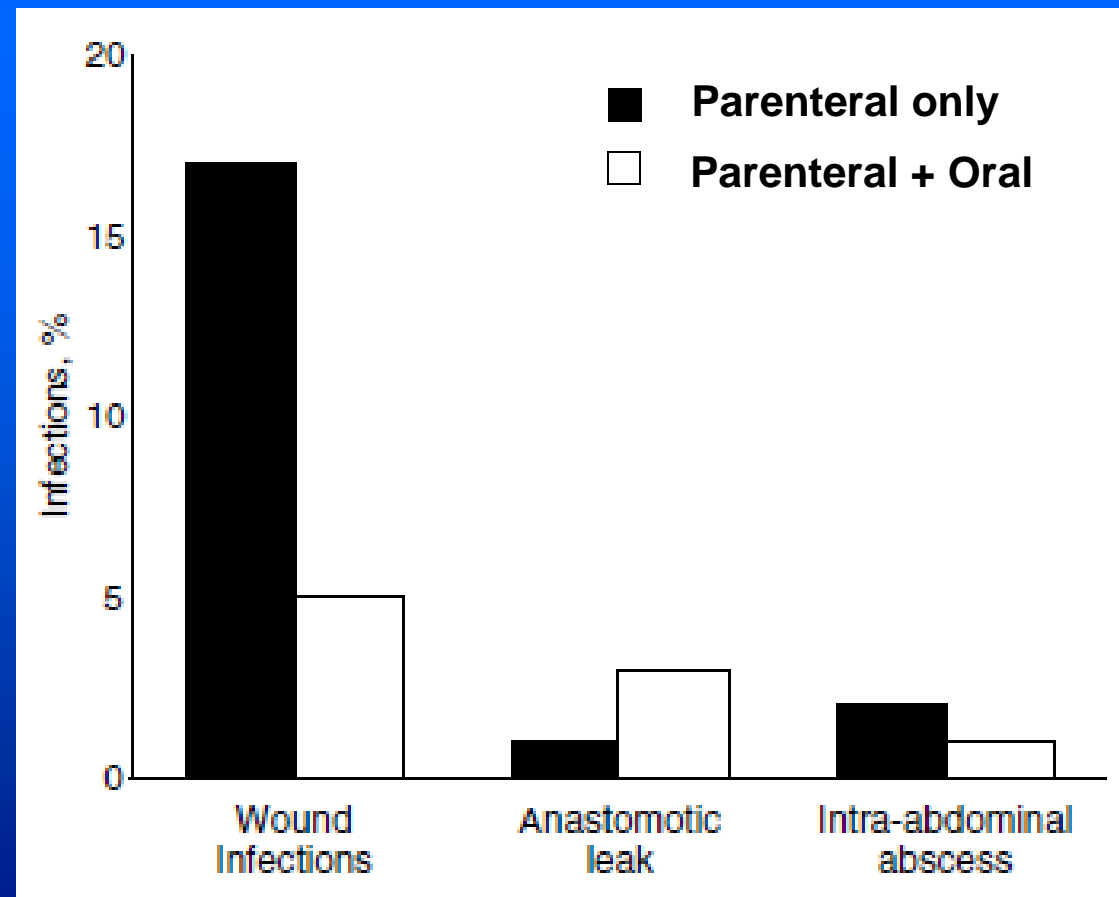
17/47 (36%)

I.V. only

3/46 (7%)

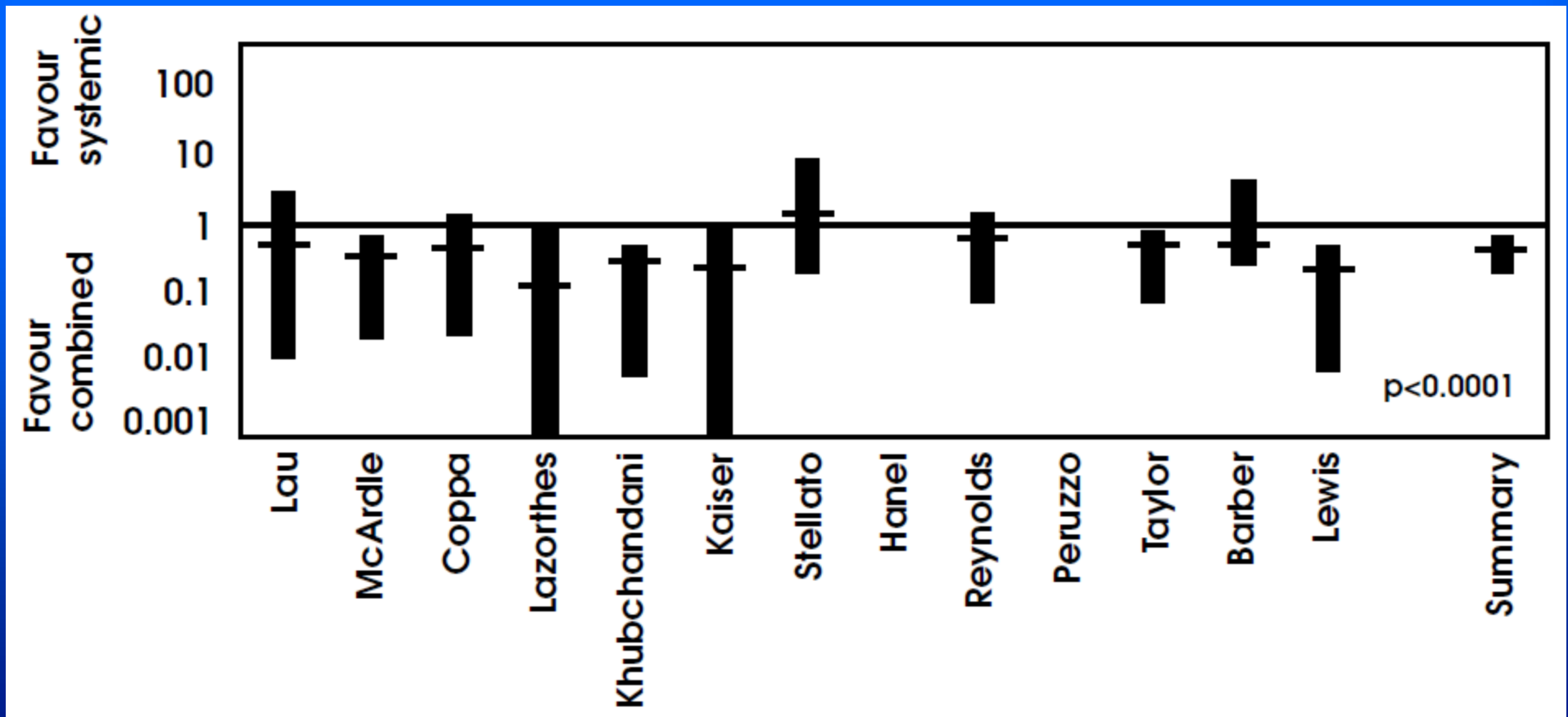
Keighley. Lancet 1979; 313:894-7

Parenteral Alone vs Parenteral and Oral Antibiotics – All with Bowel Prep for Colectomy



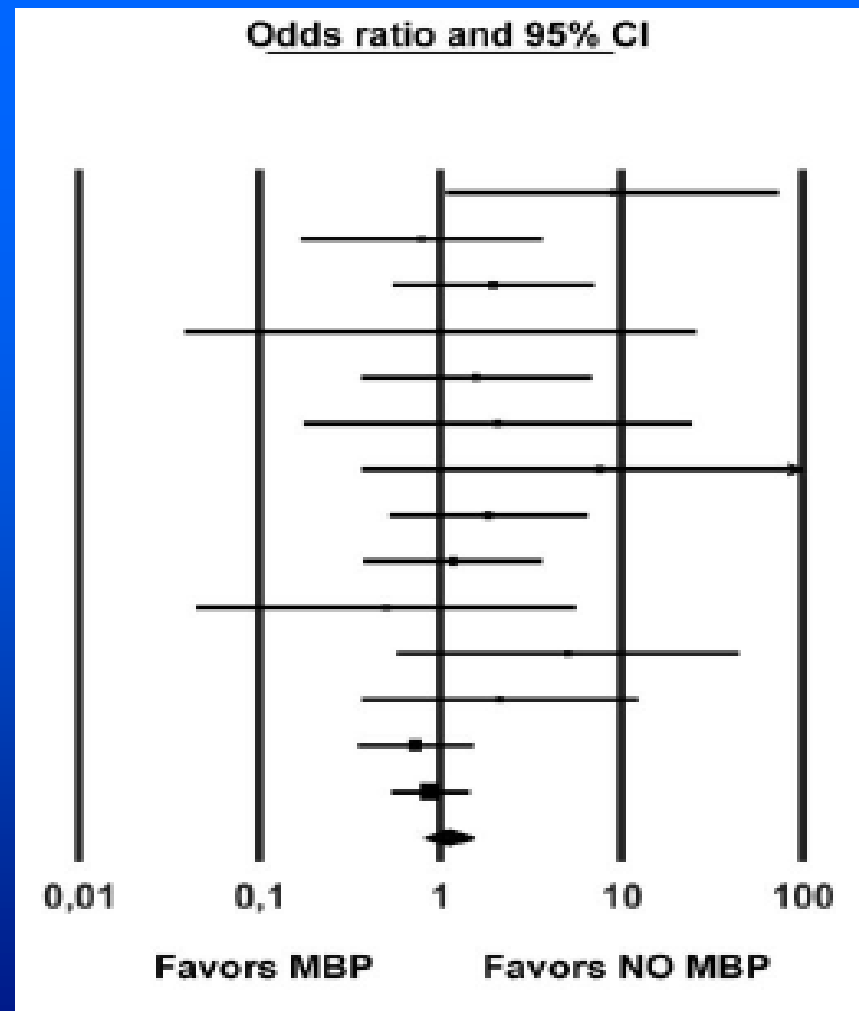
Lewis. Can J Surg 2002; 45: 173-80

Parenteral Alone vs Parenteral and Oral Antibiotics – All with Bowel Prep for Colectomy – Meta-Analysis



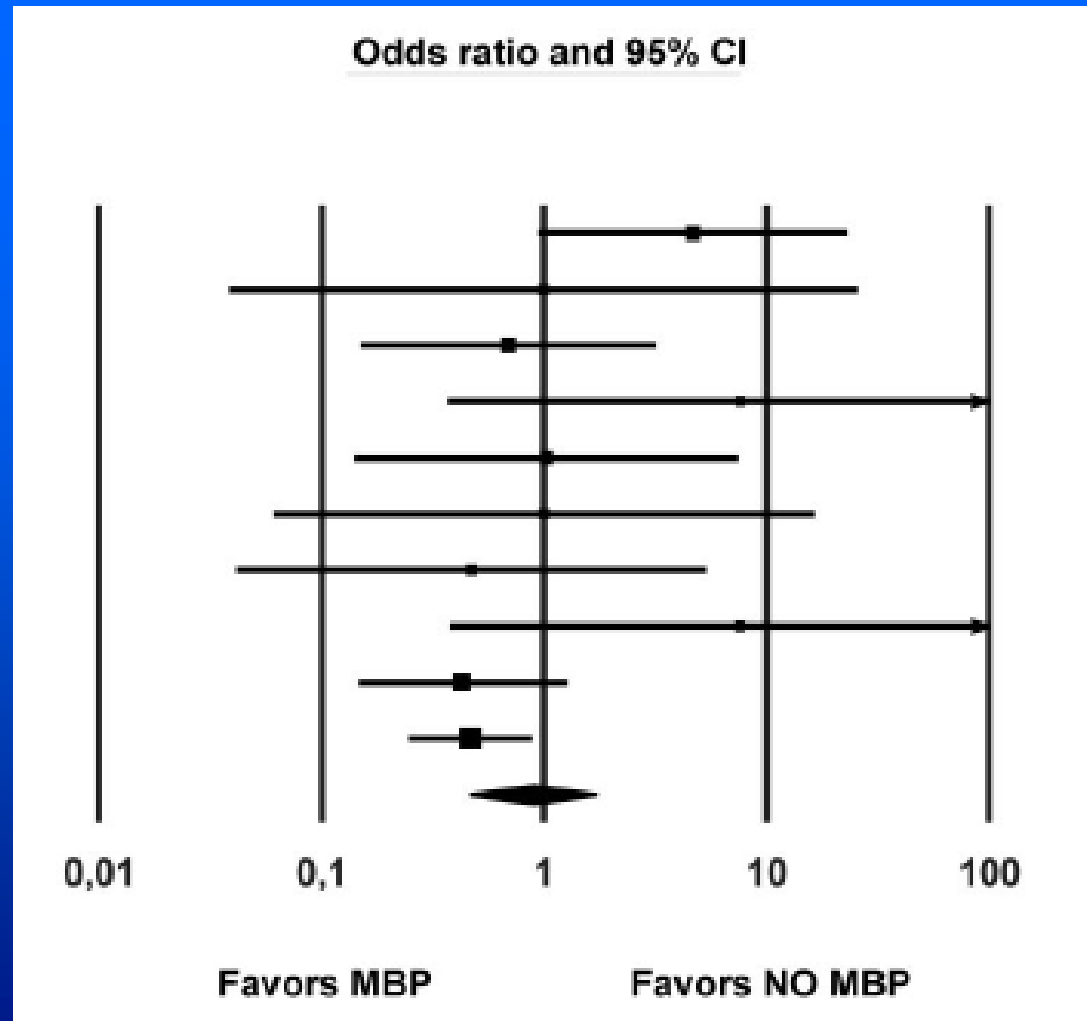
Lewis. Can J Surg 2002; 45: 173-80

Mechanical Bowel Prep and Anastomotic Leak



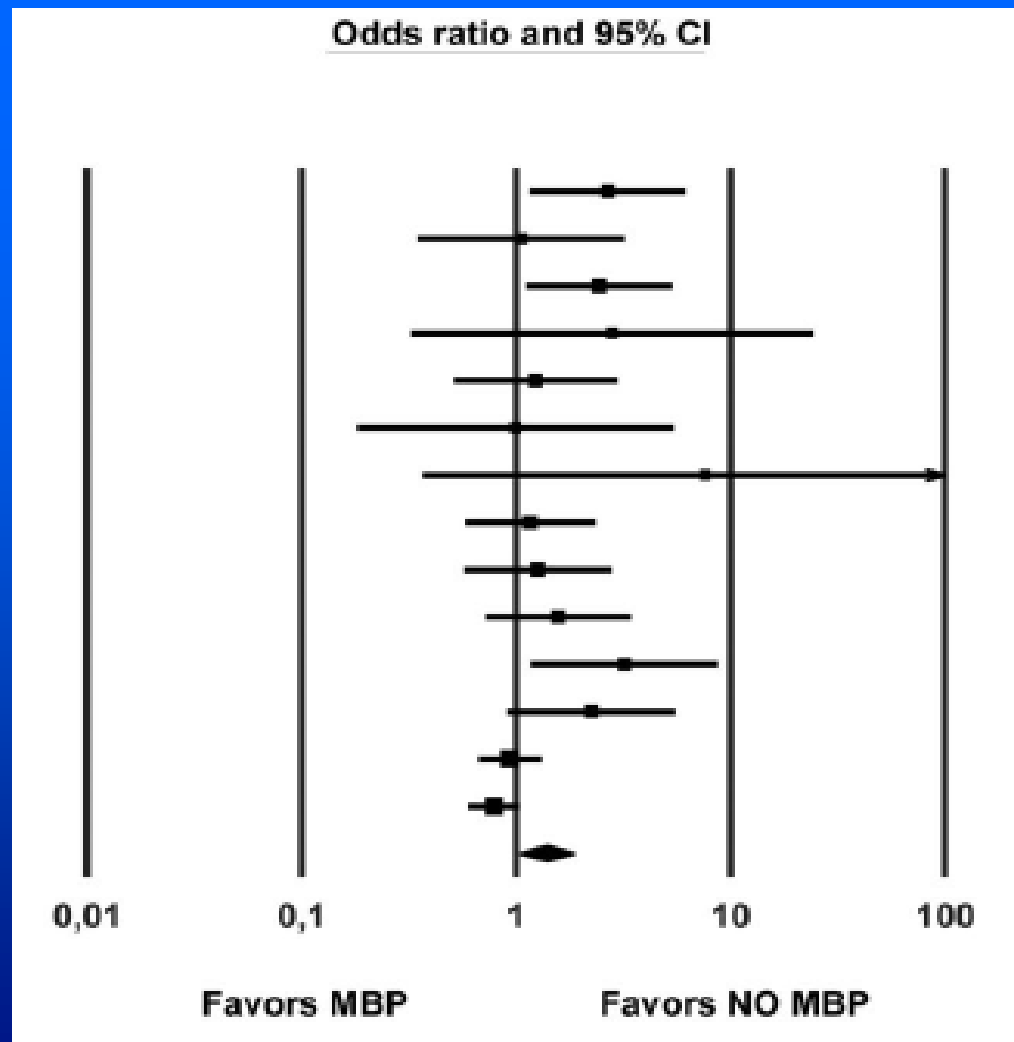
Slim. Ann Surg 2009; 249: 203-9

Mechanical Bowel Prep and Abdominal Abscess



Slim. Ann Surg 2009; 249: 203-9

Mechanical Bowel Prep and Surgical Site Infection



Slim. Ann Surg 2009; 249: 203-9

SCOAPing out Bowel Preps and Oral Antibiotics

Should SCOAP track

1. Whether bowel preps are used
2. Whether oral antibiotics are given
3. Whether these affect our infectious complication rates

???

Antisepsis and Sterility in the O.R.

**Does the antiseptic used make a
difference?**

Skin Prep and Infection

In a Prospective Trial of Cefazolin v. Placebo for Vascular Surgery

Prep

SSI

Hexachlorophene/EtOH

7/68 (10%)

Povidone Iodine

11/394 (3%)

Kaiser. Ann Surg 1978; 188: 283-8

ORIGINAL ARTICLE

Effects of Preoperative Skin Preparation on Postoperative Wound Infection Rates: A Prospective Study of 3 Skin Preparation Protocols

Brian R. Swenson, MD, MS; Traci L. Hedrick, MD; Rosemarie Metzger, MD; Hugo Bonatti, MD;
Timothy L. Pruett, MD; Robert G. Sawyer, MD

OBJECTIVE. To compare the effects of different skin preparation solutions on surgical-site infection rates.

DESIGN. Three skin preparations were compared by means of a sequential implementation design. Each agent was adopted as the preferred modality for a 6-month period for all general surgery cases. Period 1 used a povidone-iodine scrub-paint combination (Betadine) with an isopropyl alcohol application between these steps, period 2 used 2% chlorhexidine and 70% isopropyl alcohol (ChloraPrep), and period 3 used iodine povacrylex in isopropyl alcohol (DuraPrep). Surgical-site infections were tracked for 30 days as part of ongoing data collection for the National Surgical Quality Improvement Project initiative. The primary outcome was the overall rate of surgical-site infection by 6-month period performed in an intent-to-treat manner.

SETTING. Single large academic medical center.

PATIENTS. All adult general surgery patients.

RESULTS. The study comprised 3,209 operations. The lowest infection rate was seen in period 3, with iodine povacrylex in isopropyl alcohol as the preferred preparation method (3.9%, compared with 6.4% for period 1 and 7.1% for period 2; $P = .002$). In subgroup analysis, no difference in outcomes was seen between patients prepared with povidone-iodine scrub-paint and those prepared with iodine povacrylex in isopropyl alcohol, but patients in both these groups had significantly lower surgical-site infection rates, compared with rates for patients prepared with 2% chlorhexidine and 70% isopropyl alcohol (4.8% vs 8.2%; $P = .001$).

CONCLUSIONS. Skin preparation solution is an important factor in the prevention of surgical-site infections. Iodophor-based compounds may be superior to chlorhexidine for this purpose in general surgery patients.

Povidone Iodine v. Chlorhexidine v. Iodine Povacrylex (all with alcohol) Time Sequence Study

SSI	No. SSI	Pov Iod 1514	CHG 827	Iod Povacryl 794	P
Any	178	72 (4.8%)	68 (8.2%)	38 (4.8%)	0.001
Superficial	120	49 (3.2%)	45 (5.4%)	26 (3.3%)	0.019
Deep	11	6 (0.4%)	4 (0.5%)	1 (0.1%)	0.49
Organ/space	49	18 (1.2%)	19 (2.3%)	12 (1.5%)	0.12

Swenson. ICHE 2009; 30:964-971

ORIGINAL ARTICLE

Chlorhexidine–Alcohol versus Povidone–Iodine for Surgical-Site Antisepsis

Rabih O. Darouiche, M.D., Matthew J. Wall, Jr., M.D., Kamal M.F. Itani, M.D., Mary F. Otterson, M.D., Alexandra L. Webb, M.D., Matthew M. Carrick, M.D., Harold J. Miller, M.D., Samir S. Awad, M.D., Cynthia T. Crosby, B.S., Michael C. Mosier, Ph.D., Atef AlSharif, M.D., and David H. Berger, M.D.

CHG/Alcohol v. Povidone Iodine

Type of Infection	Chlorhexidine-		Relative Risk (95% CI)*	P Value†
	Alcohol (N=409)	Povidone-Iodine (N=440)		
	<i>no. (%)</i>			
<u>Any surgical-site infection</u>	39 (9.5)	71 (16.1)	0.59 (0.41–0.85)	0.004
Superficial incisional infection	17 (4.2)	38 (8.6)	0.48 (0.28–0.84)	0.008
Deep incisional infection	4 (1.0)	13 (3.0)	0.33 (0.11–1.01)	0.05
Organ-space infection	18 (4.4)	20 (4.5)	0.97 (0.52–1.80)	>0.99
Sepsis from surgical-site infection	11 (2.7)	19 (4.3)	0.62 (0.30–1.29)	0.26

Iodine v. Chlorhexidine & Alcohol v. No Alcohol Only Clean-Contaminated Cases

SSI (%)	Pov Iod No Alcohol	Pov Iod + Alcohol	CHG + Alcohol	Iod Povacryl + Alcohol
Swenson (n=1459)		8.7	10.7	5.9
Darouice (n=849)	16.1		9.5	

Swenson. ICHE 2009; 30:964-971
Darouiche. NEJM 2010;362:9-17

SCOAPing out Skin Preps

Should SCOAP track

1. What skin preps are used
 2. Whether chlorhexidine is used
 3. Whether the prep includes alcohol
- ???