

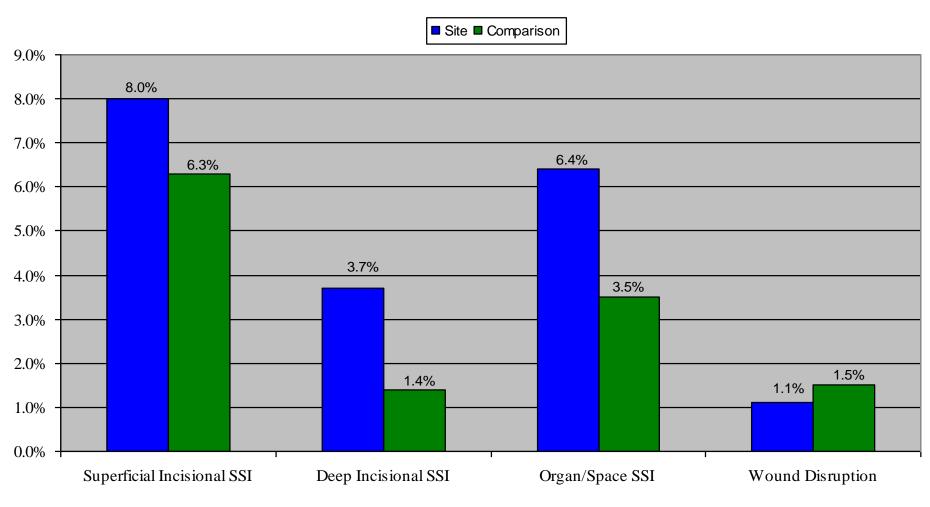
#### Colorectal SSI Bundle, Cleveland Clinic

Review of the evidence: wound protection, skin preparation, bowel preparation with oral antibiotics

June 9, 2013
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#### ACS-NSQIP COLORECTAL WOUND OCCURRENCES

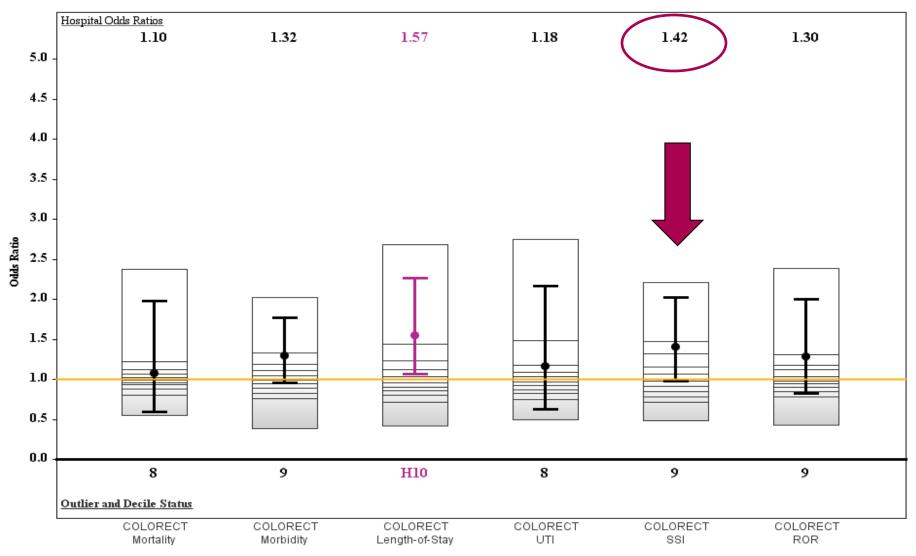
Raw Data: July 2011 through June 2012





#### ACS-NSQIP COLORECTAL WOUND OCCURRENCES

Raw Data: July 2011 through June 2012



#### **NSQIP: SSI Risk Factors**

- Age > 40
- Smoker
- Alcohol abuse
- Steroids
- Diabetes
- Dyspnea
- Recent radiotherapy

- Alb < 3.5 g/dl</li>
- ↑ Total bilirubin
- ASA>2
- Emergency Surgery
- GI Surgery
- RVU>17 (all CORS)
- Wound Class >1

L Neumayer, J Am Coll Surg 2007



#### **Protective Factors for SSI in CORS?**

- Laparoscopic Surgery?
- SCIP Compliance?
- Mechanical Bowel Preparation?
- Oral Antibiotic Bowel Preparation?
- Skin Preparation?
- Wound Edge Protection?
- Blood glucose control, Warming, Culture Change?



# Mechanical Bowel Prep in CORS

L E A K

	No MBP	МВР	P value
LAR	7.5%	9.8%	S
Colon	1.6	2.9	NS
All	3.2	6.2	P<.05
SSI (All)	5.4	7.4	NS

Cochrane Database of Systematic Reviews, 2005 Meta-analysis, N = 1592 patients, elective CORS

## **Mechanical Bowel Preparation in CORS**

#### **Surgical Site Infection**

Study name Events / Total		/ Total	3	Statistics for each study				Odds ratio and 95% CI				
NO MBP MBP	NO MBP	Odds ratio	Lower limit	Upper limit	p-Value						Relativ weigh	
Brownson 1992	21 / 86	10 / 93	2,682	1,181	6,089	0,018	- 1	- 1	I—•—	·	T	7,
Burke 1994	7 / 82	7/87	1,067	0,357	3,185	0,908	- 1	-	$\rightarrow$	1		5,
Santos 1994	24/72	13 / 77	2,462	1,138	5,326	0,022	- 1	- 1	<del></del> -	1		7,
(ale1997	8 / 62	1/20	2,815	0,330	24,010	0,344	- 1	-	<del></del>	—		1,
Miettinen 2000	13 / 138	10 / 129	1,238	0,523	2,930	0,628	- 1	- 1	<b></b>	1		6,
illmann 2001	3/30	3/30	1,000	0,185	5,403	1,000	- 1	I —	-	1		2,
oung-Tabusso 2002	3/24	0/23	7,651	0,373	156,840	0,187	- 1	- 1	-		→	0,
Zmora 2003	19 / 187	17 / 193	1,171	0,589	2,329	0,653	- 1	- 1	<del></del>	1		8,
Fa-Si-Oen 2005	16 / 125	13 / 125	1,265	0,581	2,753	0,554	- 1	- 1	<del></del>	1		7,
Ram 2005	18 / 164	12 / 165	1,572	0,732	3,377	0,246	- 1	- 1	+	1		7,
Bucher 2005	17 / 78	6/75	3,205	1,188	8,646	0,021	- 1	- 1	<del></del>	_l		5,
Pena 2007	19 / 48	11 / 49	2,263	0,933	5,489	0,071	- 1	- 1	<b>├</b>	1		6,
lung 2007	82 / 686	83 / 657	0,939	0,678	1,301	0,704	- 1	- 1	-4-	1		14,
Contant 2007	135 / 670	165 / 684	0,794	0,614	1,027	0,079	- 1	- 1	-	1		15,
			1,403	1,054	1,869	0,020	- 1	- 1	-	1		
				,		,	0,01	0,1	1	10	100	
							0,01	٠,٠	•	. •		
								Favors MBP	Favo	rs NO MBP		

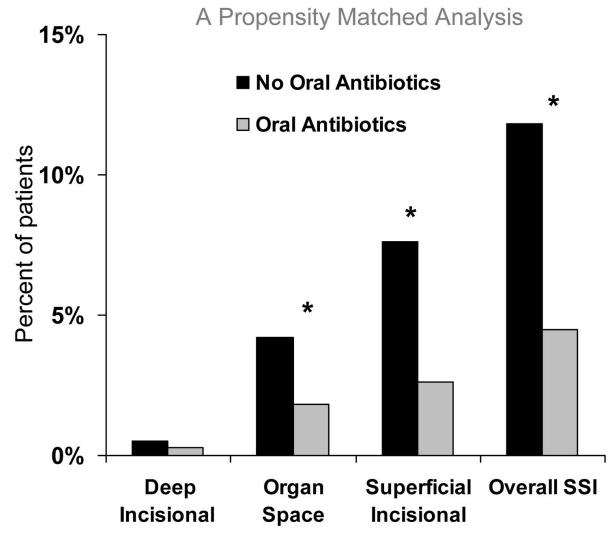
Test for heterogeneity p = 0.016,  $I^2 = 50.4$ 

FIGURE 5. Meta-analysis of the 14 included trials for the outcome "all SSI" showing a significant effect in favor of no MBP.

K. Slim, Annals Surgery 2009



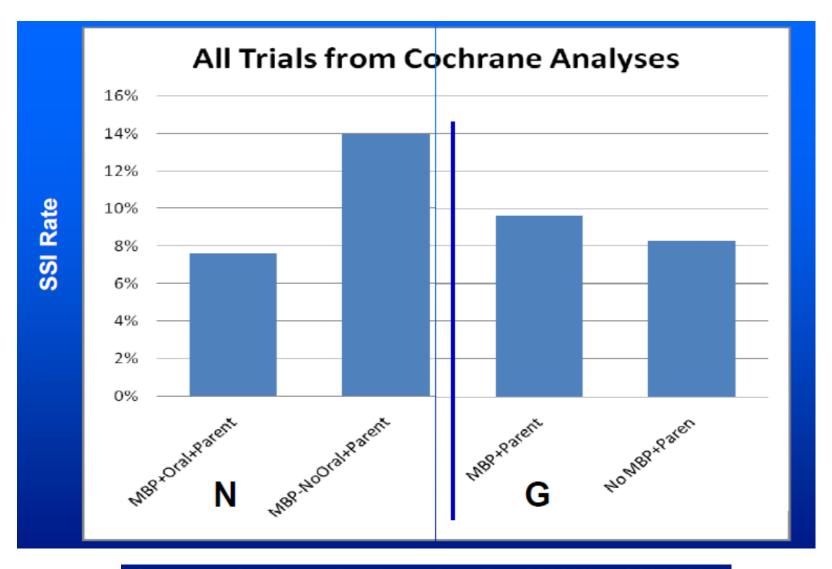
#### Oral Antibiotics with a Bowel Preparation Prior to Elective Colon Surgery



\* P < 0.05

#### More support for oral antibiotic bowel preparation

	Unadji	usted logistic		ted best fit <sup>a</sup>   = 6070
N = 9940	OR	CI	OR	CI
No preparation	REF		REF	
Abx only	0.41	0.31-0.55	0.33	0.21-0.50
Mech only	1.13	0.99-1.30	0.99	0.80-1.22
Mech + abx	0.46	0.39-0.54	0.43	0.34-0.55
lleocolic resection	REF		REF	
Partial colectomy	1.90	0.89-1.33	1.05	0.77-1.42
Rectal resection	1.66	1.33-2.07	1.50	1.10-2.06
Total colectomy	2.08	1.52-2.84	1.52	1.01-2.29
SCIP-1 (timely)	0.78	0.62-0.99	0.76	0.60-0.96
SCIP-2 (appropriate)	0.79	0.63-0.98		
SCIP-3 (discontinued)	1.01	0.82-1.24		
SCIP-6 (hair removal)	1.51	0.72-3.16		
SCIP-7 (normothermia)	1.05	0.91–1.23		



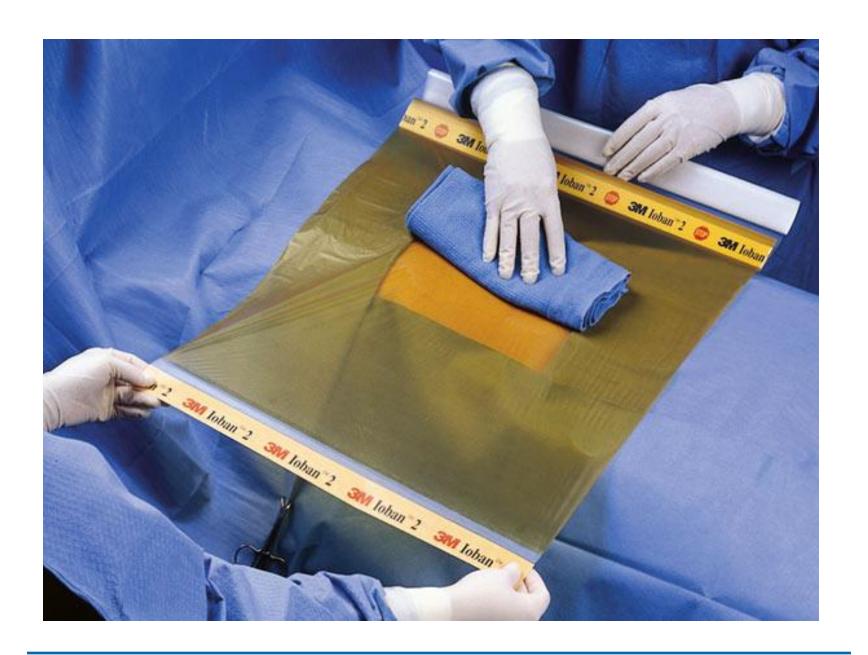
Guenaga. Cochrane Database Syst Rev,2009(1):p.C001544 Nelson. Cochrane Database Syst Rev, 2009,(1): p.CD001181

#### OR Skin Prep: Iodine is the winner...

TABLE 4. Surgical-Site Infections (SSIs) and Wound Classifications, by Preparation Solution Actually Receive						
Variable	No. of SSIs	No. of surgical procedures	Povidone-iodine $(n = 1,514$ procedures)	Chlorhexidine $(n = 827$ procedures)	Iodine povacrylex $(n = 794$ procedures)	$P^{\mathrm{a}}$
SSIs						<u> </u>
$All^b$	178		72 (4.8)	68 (8.2)	38 (4.8)	.001
Superficial	120		49 (3.2)	45 (5.4)	26 (3.3)	.019
Deep	11		6 (0.4)	4 (0.5)	1 (0.1)	.49
Organ/space	49		18 (1.2)	19 (2.3)	12 (1.5)	.12
Wound classification						
Clean		1,154	6/714 (0.84)	5/224 (2.2)	3/216 (1.4)	.21
Clean-contaminated		1,409	44/541 (8.1)	46/454 (10.1)	27/414 (6.5)	.15
Contaminated		204	9/82 (11.0)	5/65 (7.7)	6/57 (10.5)	.78
Dirty		278	13/150 (8.7)	12/77 (15.6)	2/51 (3.9)	.076

#### OR Skin Prep: Chlorhexidine is the winner...

NEJM 2010 Study	Chlorhex-Alcohol	Povidone-lodine	P-value
Any SSI	9%	16%	0.004
Superficial SSI	4	8	0.008
Deep incisional SSI	1	3	0.05
Org SSI	4	4	NS
CORS SSI	15%	22%	NA
Small Bowel SSI	10%	29%	0.004



## Incise drapes and SSI

- Abdominal hernia repair with mesh
- ACS-NSQIP dataset, 2002-06
- Retrospective study: Incise drape vs. no drape and SSI
- 506 hernia repairs, 206 with Incise drapes
- 42 mesh infections (8%)
- . ↑ mesh infection: recurrent hernia, smoker, OR time
- Cochrane review 2011: Iodine-impregnated adhesive drapes had no effect on SSI

Swenson BR, Surg Infect 2008; Webser J, Cochrane Database Review 2011





## Fixed-ring wound protection in CORS

	Control (n = 66)	Intervention $(n = 64)$	P
SSI: as per CDC guidelines, n (%)	15 (22.73)	3 (4.69)	.004
Reoperation for SSI	1	0	1.000
Readmissions for SSI	3	2	1.000
Formal wound drainage for SSI	3	1	.619
Purulent wound drainage	12	2	.009
Intravenous antibiotic (no. of courses used to treat SSI)	10	3	.077
Oral antibiotics (no. of courses used to treat SSI)	10	3	.077
Total length of stay: mean days (SD)	12.3 (6.2)	13.7 (14.1)	.463

130 open colorectal resections, Applied Med Alexis Wound Retractor

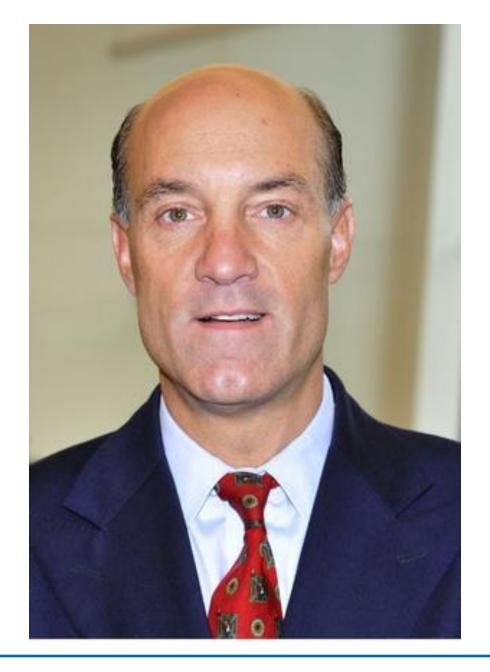
## Fixed-wing Wound Edge Protection and SSI

	Interven	tion	Contr	ol		Risk Ratio		Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	Year	M-H, Random, 95% CI
Maxwelletal34	16	88	12	82	10.7%	1.24 [0.63, 2.47]	1969	
Williams et al <sup>35</sup>	10	84	10	83	9.2%	0.99 [0.43, 2.25]	1972	<del></del>
Psailaet a <sup>36</sup>	8	46	10	47	9.0%	0.82 [0.35, 1.89]	1977	<del></del>
Nystromet al <sup>38</sup>	7	70	6	70	7.2%	1.17 [0.41, 3.30]	1984	<del></del>
Gamble and Hopton et al <sup>37</sup>	10	27	8	29	9.7%	1.34 [0.62, 2.89]	1984	<del> </del>
Batz et al <sup>39</sup>	1	25	7	25	2.7%	0.14 [0.02, 1.08]	1987	
Redmond et al <sup>40</sup>	11	102	27	111	11.1%	0.44 [0.23, 0.85]	1994	<b>→</b>
Brunet et al41	6	73	18	76	8.7%	0.35 [0.15, 0.83]	1994	
Sookhaiet al <sup>42</sup>	23	170	54	182	13.7%	0.46 [0.29, 0.71]	1999	
Horiuchi et al <sup>43</sup>	8	111	16	110	9.3%	0.50 [0.22, 1.11]	2007	<del></del>
Lee et al <sup>44</sup>	1	61	7	48	2.7%	0.11 [0.01, 0.88]	2009	- S
Reid et al <sup>45</sup>	3	64	15	66	6.1%	0.21 [0.06, 0.68]	2010	<del></del>
Total (95% CI)		921		929	100.0%	0.60 [0.41, 0.86]		<b>◆</b>
Total events	104		190					
Heterogeneity: Tau*= 0.2		24.08.		= 0.01	); I <sup>2</sup> = 549	6		har de la la cal
Test for overall effect: Z=			0.0	1 (11)				0.01 0.1 1 10 100 Favours experimental Favours control

- Study: device eligible if it covered the incision edges with impervious plastic sheet
- In 4/12 studies, Alexis wound retractor used- all with >50% reduction in SSI

Gheorghe, Ann Surgery 2012





#### CORS SSI Prevention: Next step at the Cleveland Clinic

1. Bowel Preparation

For all colon and rectal resections

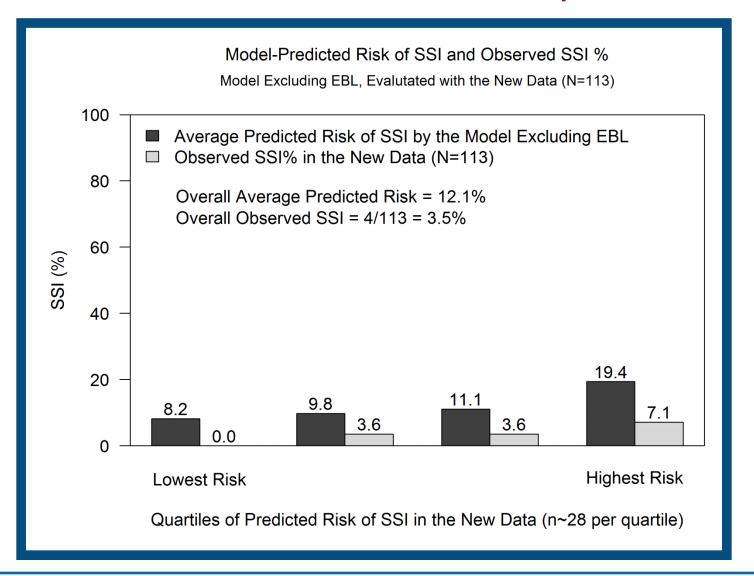
Mechanical bowel preparation completed by 9 pm on day before surgery

Neomycin 1g and Metronidazole 1g PO at 1hr and 2hrs after completion of mechanical preparation

- 2. Alexis wound edge protector for class 2, 3, 4 wounds
- 3. Monitor results with ACS NSQIP data

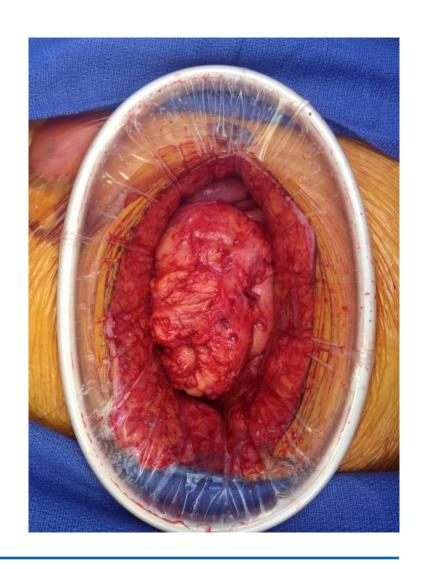


#### **CCF CORS SSI Reduction Bundle Study**



## Summary: SSI Reduction in colorectal surgery

- Antibiotic Bowel Prep
- Laparoscopy
- Alexis Wound Protector
- Best Anesthesia Care
  - Active warming
  - Blood glucose control
  - IV fluid control
- Culture Change



# **Cleveland Clinic**

Every life deserves world class care.