

# Double Ring: Whipples

- RCT in Whipples (pancreatic surgery) with a biliary stent in place
- Randomised to dual ring protector v standard care
- Blinded assessment of ISSI
- 107 patients
- Reduction in ISSI from 44%(22/50) to 21% (12/57),  $p=0.01$

# Why are single and double rings different?

- The double ring provides a tighter seal and therefore better protection of the soft tissue and fascia
  - Less contamination
  - Maintenance of wound homeostasis
  - Less trauma

# Reducing SSI

## Bowel preparation, IV and oral antibiotics



# A Network Meta-analysis of Antibiotics and Bowel Preparation in Elective Colorectal Surgery

J Woodfield, B Schmidt, K Clifford, G Turner,  
M Amer, J McCall



# Bowel preparation before surgery

**Goal: reduce microbial infection and surgical complications**

Two main components.....

**Mechanical:** Wash out faecal material

**Antibiotics:** Decrease microbial load

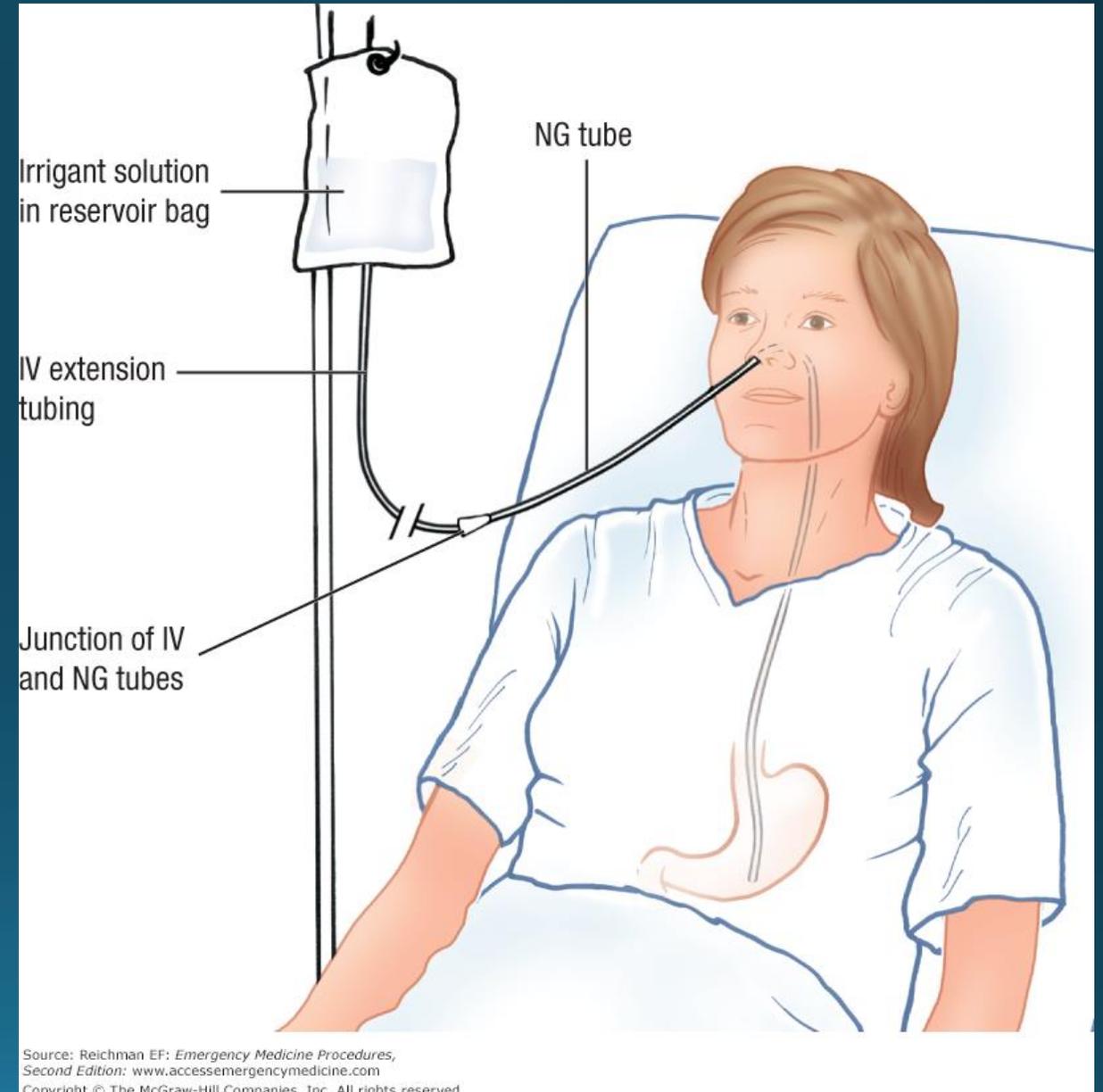


# The history of complications associated with colorectal surgery

- High rates of wound infection: >40% pre antibiotics
- High rates of anastomotic leakage...
  - Irwin and Goligher (BJS 1973) reported a higher leak rate (24% v 7%) in cases where the bowel had been poorly prepared, although other factors had not been controlled for
  - Reducing the faecal / bacterial load is likely to reduce these complications

# Colonic lavage 1950's

- Aimed to 'empty the colon' of all solid faecal material
- "Excellent preparation may be obtained with 30 litres"



# The 'Dogma' of Mechanical Bowel Preparation



*"Intuitively it is unfathomable to believe that stool does not have deleterious effects on a healing anastomosis"*

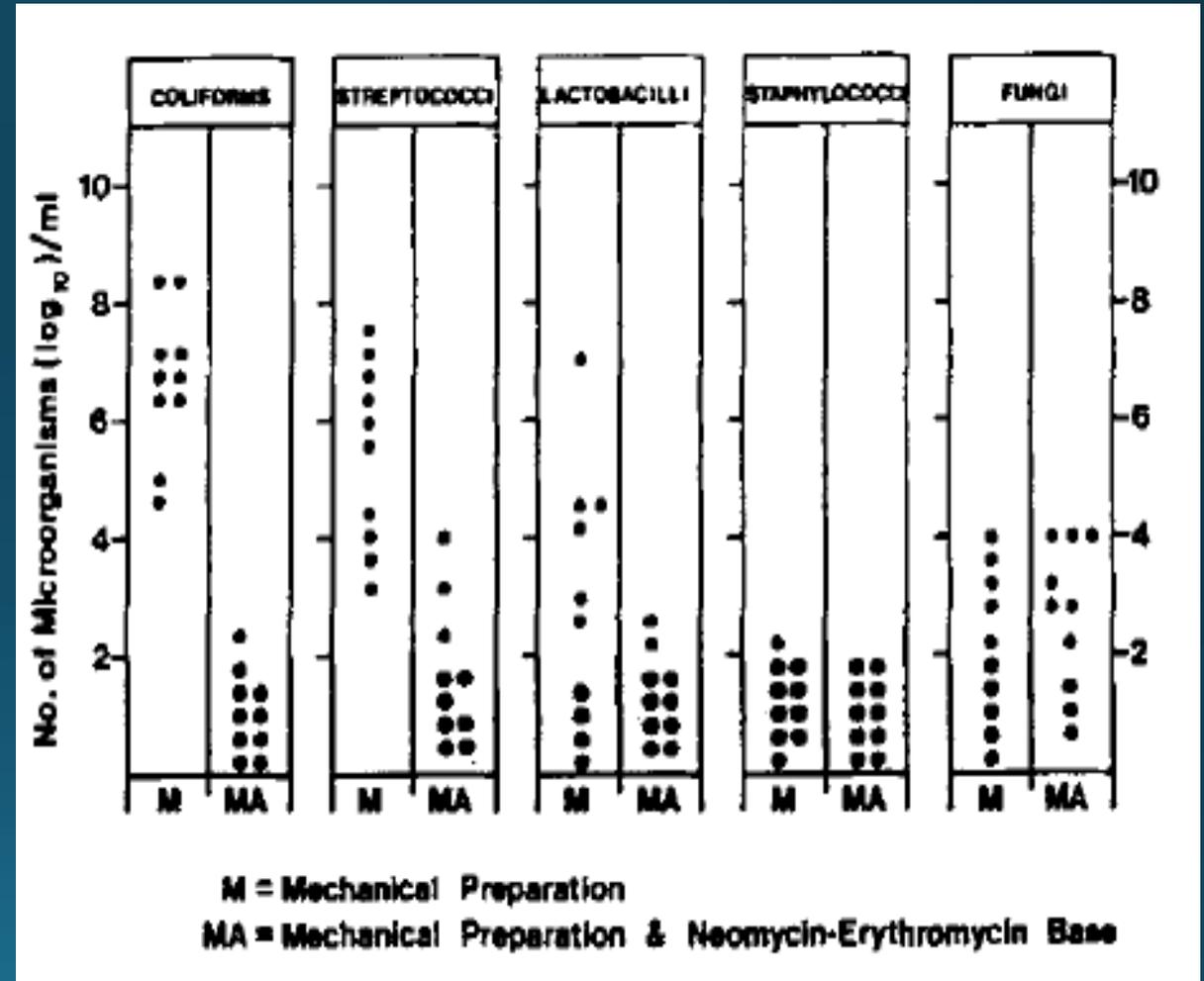


# MBP and decontamination of the colon with oral antibiotics 1970's and 1980's

- 1973 Nichols and Condon proposed a 3 day bowel preparation which included oral neomycin and erythromycin.
- A RCT (USA) comparing OA to placebo showed a reduction in wound infection from 35% to 9% and all infections from 43% to 9% (Clarke et al Ann Surg 1977)
- A RCT (UK) adding neomycin and metronidazole to MBP reduced wound infection from 42% to 18% and all infections from 61% to 21% (Matheson et al BJS 1978)
- 'Good improvement', more than halving wound infection
- Widely used in the 1970's and 1980's

# Microbiology

- Colon contains  $10^8$  to  $10^{12}$  organisms/g of faeces
- MBP alone did not reduce concentration of bacteria
- Adding oral antibiotics did decrease bacterial concentrations (Nichols 1973)



# IV antibiotics better than oral antibiotics (1980's 1990's)

- RCT comparing MBP + oral neomycin and erythromycin (3 doses on the preoperative day) against MBP + IV ceftriaxone and metronidazole in theatre
  - Reduction in wound infection rates from 38% to 6% and all infection from 48% to 10% [Weaver Am JS 1986]
- RCT comparing oral metronidazole and kanamycin v IV metronidazole and kanamycin
  - Wound infection reduced from 36% to 6.5%
  - ❖ Widespread use of MBP + IV, especially in UK

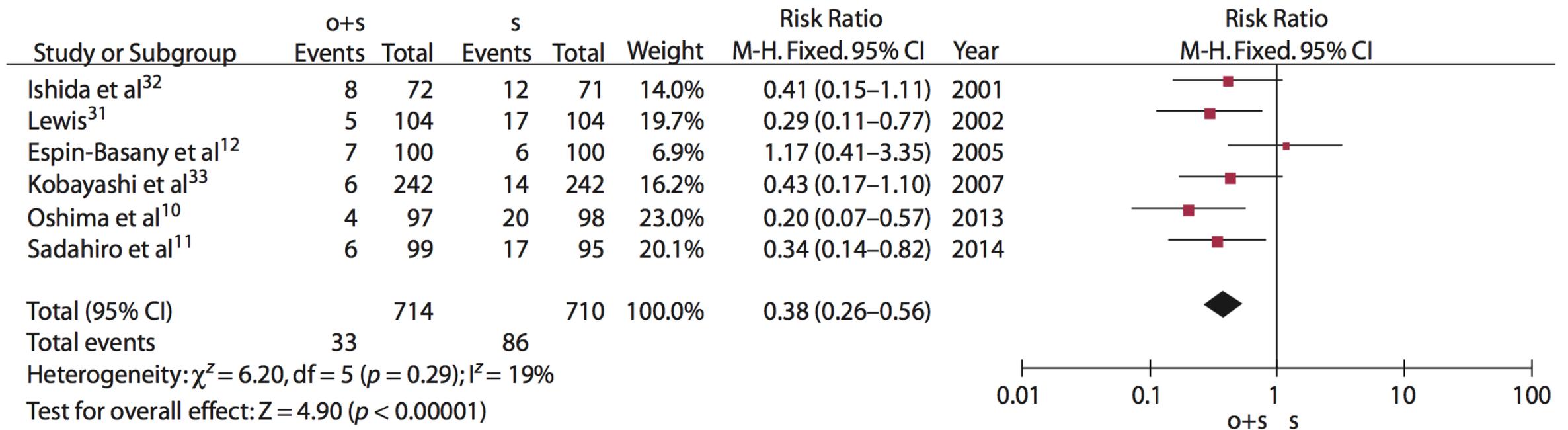


# IV antibiotics alone are as good as MBP + IV (1990's, 2000's)

- By 1990 the most common bowel preparation was a full mechanical bowel preparation and IV antibiotics (MBP + IV)
- A series of RCT, mainly in Europe, demonstrated a similar rate of SSI and Anastomotic leaks when comparing IV antibiotics alone and MBP + IV antibiotics
- A series of meta-analyses of these trials have confirmed this
- Many surgeons (especially in Europe and UK) stopped using MBP
- MBP is not a routine part of ERAS guidelines

# MBP + IV + OA (2000's 2010's)

- A different approach in the USA
- A series of both RCT and meta-analyses have also shown that MBP+IV+OA have better outcomes than MBP+IV [Chen et al 2016 DCR]



**FIGURE 3.** Forest plot for incisional surgical site infection (SSI) after surgery. A Mantel–Haenszel fixed-effects model was used for meta-analysis. Risk ratios are shown with 95% CIs. o = oral antibiotics; s = systemic antibiotics; df = degrees of freedom.

# “Issues” with MBP + IV + OA in USA

- Many of these papers didn't have good aerobic and anaerobic cover in both groups.
- Adding oral antibiotics often meant that the MBP+IV+OA group had better antibiotic cover. So the improved outcome may have been better antibiotic cover, rather than giving additional OA
- Large database reviews (NSQIP) also showed less SSI with MBP+IV+OA
- Not controlled studies, with a number of 'chance' differences between groups
- No data on IV antibiotics used and overall aerobic and anaerobic antibiotic cover



**“MBP+IV+OA reduces complications”**

*More is better*

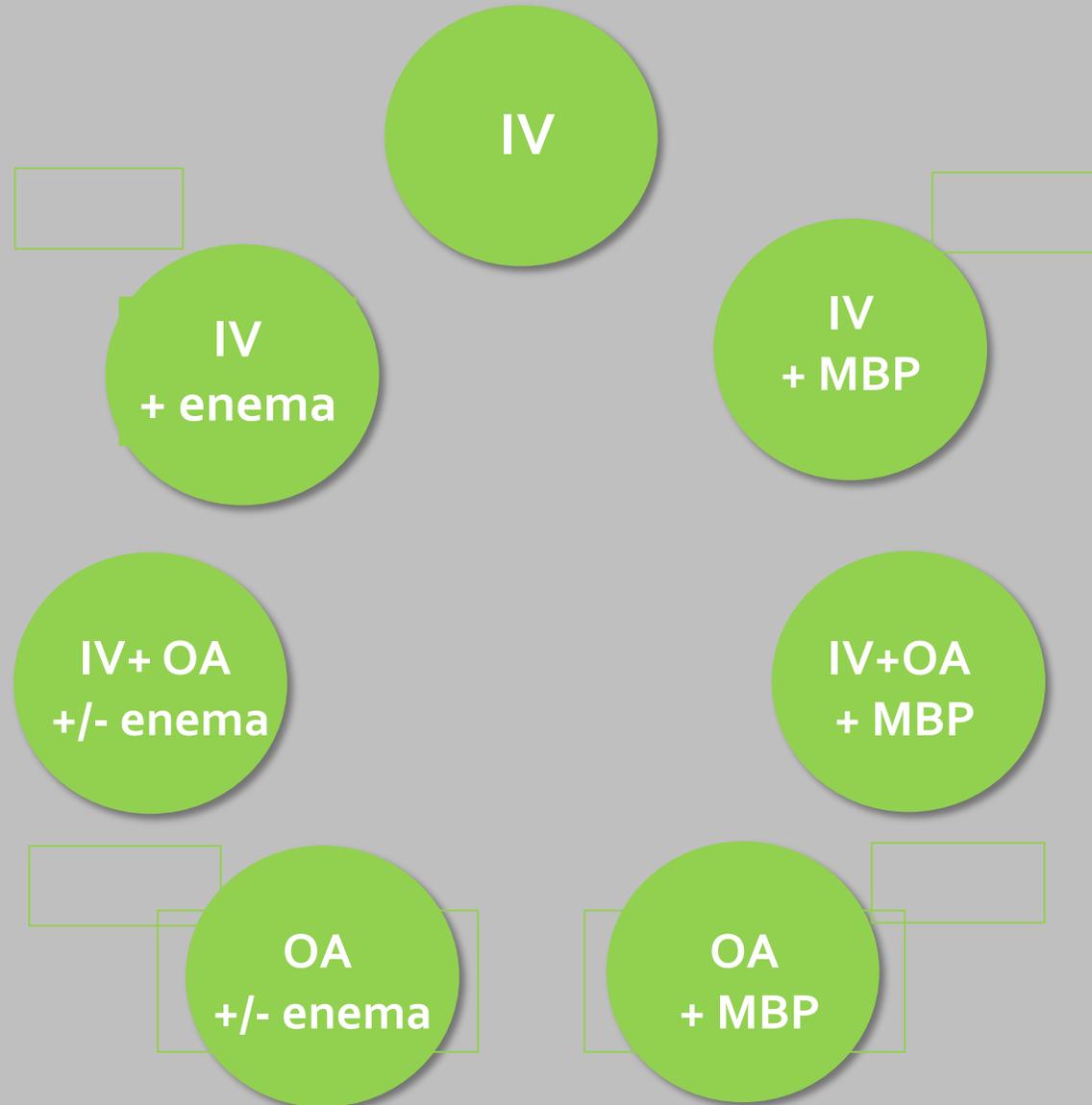
- NSQIP shows that MBP+OA+IV is best
- IV may be as good as MBP + IV, but we are more interested in OA
- The difficulties with MBP are less than the complications prevented
- (No real data for worse CLD infection)

**“MBP does not reduce complications”**

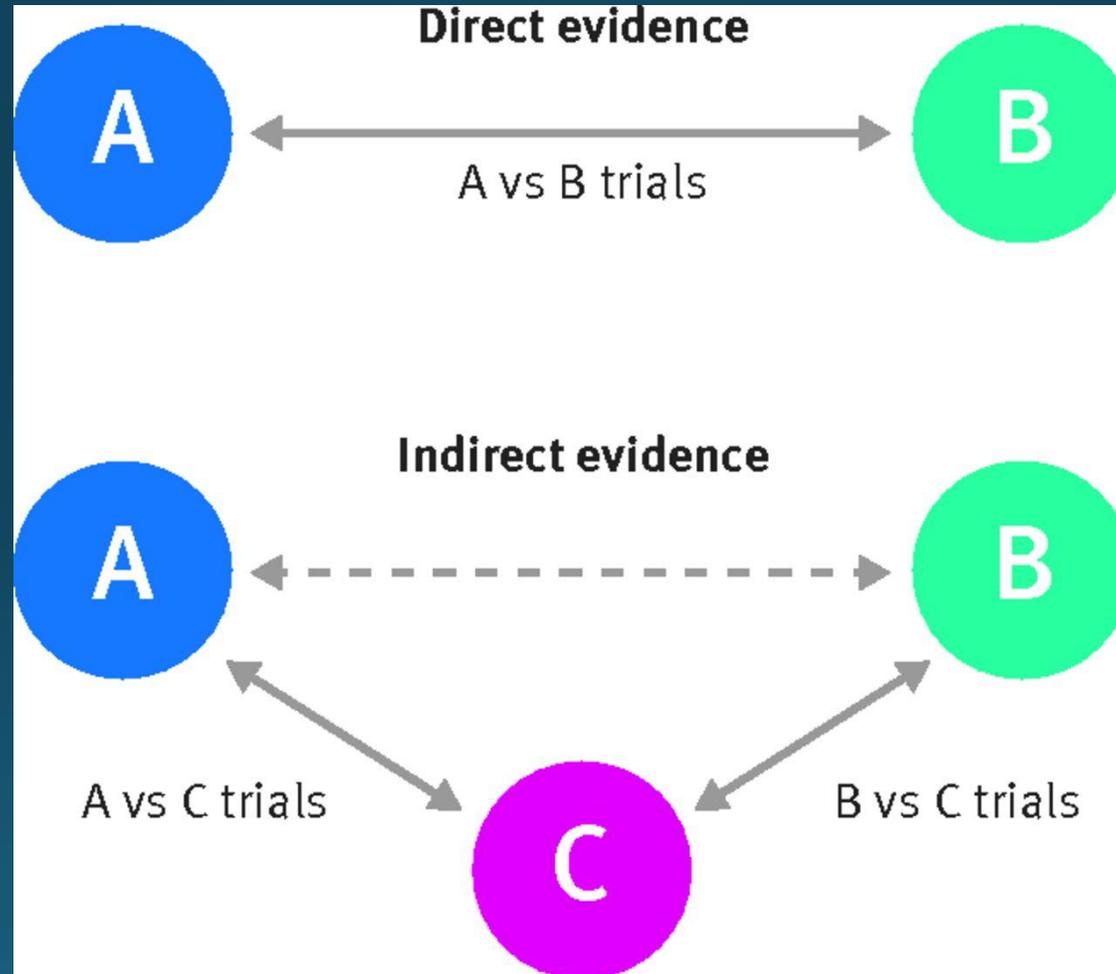
*Less is better*

- We believe RCT are better level of evidence than databases
- Our RCT studies show IV is better/ as good as MBP + IV
- Patients tolerate MBP poorly and we see no advantage in its use
- (There is a risk of CLD infection with OA)

# Overview of NETWORK



# Network Meta-Analysis: Direct and indirect evidence



Literature search period: Up to December 2018  
Databases: Cochrane, Embase, Medline, Scopus and Google Scholar  
Language: All languages  
Design: Searching for RCT. Systematic reviews also included in initial search  
9105 initially identified, 2284 clear title duplicates

5729 Records after duplicates removed (1128 removed + 10 added through other sources)

5729 Records screened

5558 Records excluded after review of titles (5260) and abstracts (298)

171 Full text articles assessed for eligibility

101 Full text articles excluded

70 studies included  
7 treatments, 15,357 patients

<b>MBP+IV</b> 52 studies 5435 patients	<b>IV</b> 17 studies 2307 patients	<b>IV+enema</b> 4 studies 358 patients	<b>IV+OA</b> 4 studies 309 patients	<b>MBP+IV+OA</b> 40 studies 4416 patients	<b>MBP+OA</b> 25 studies 2046 patients	<b>OA</b> 1 study 486 patients
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Identification

Screening

Eligibility

Included

6821 Titles



465 abstracts



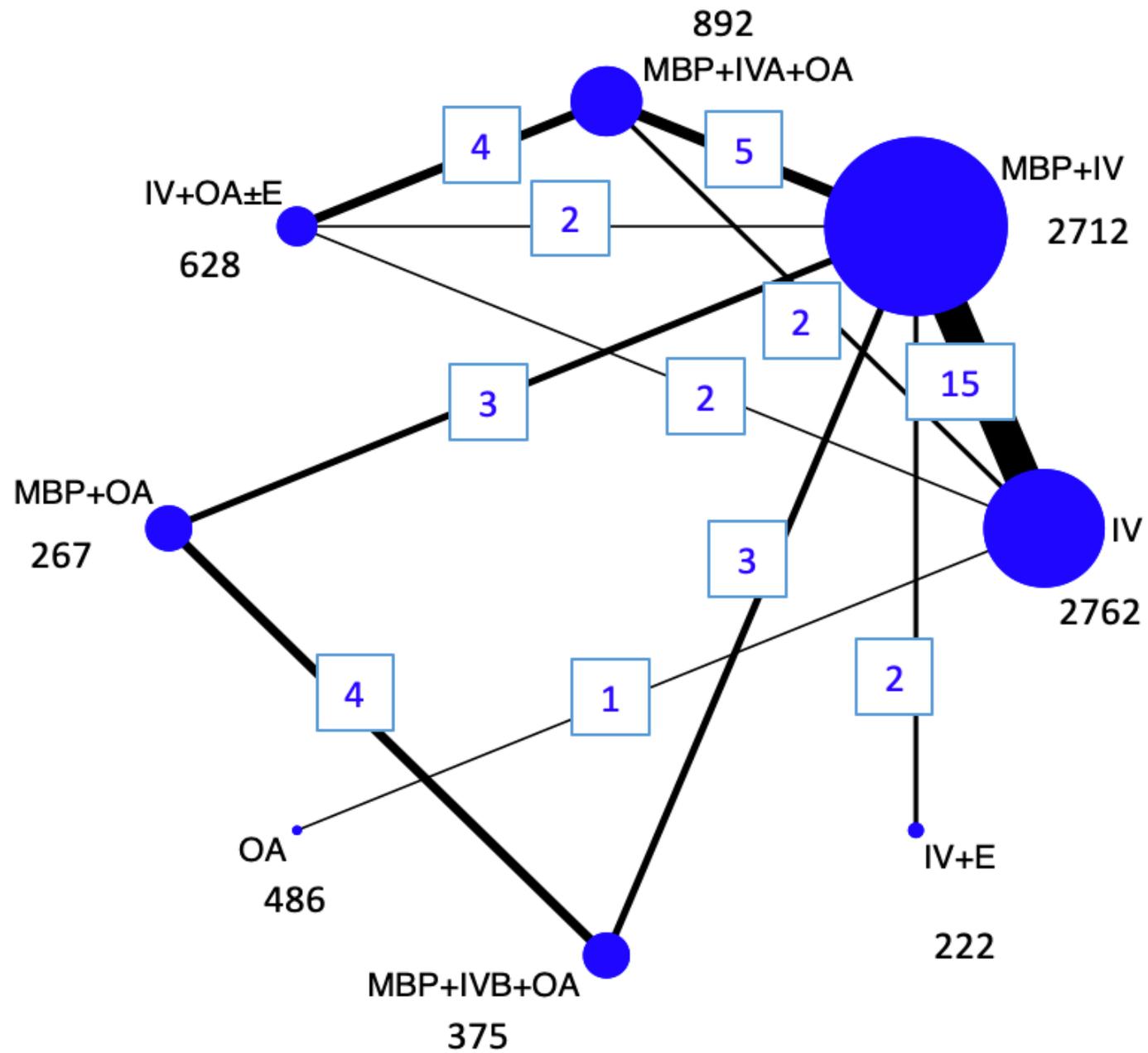
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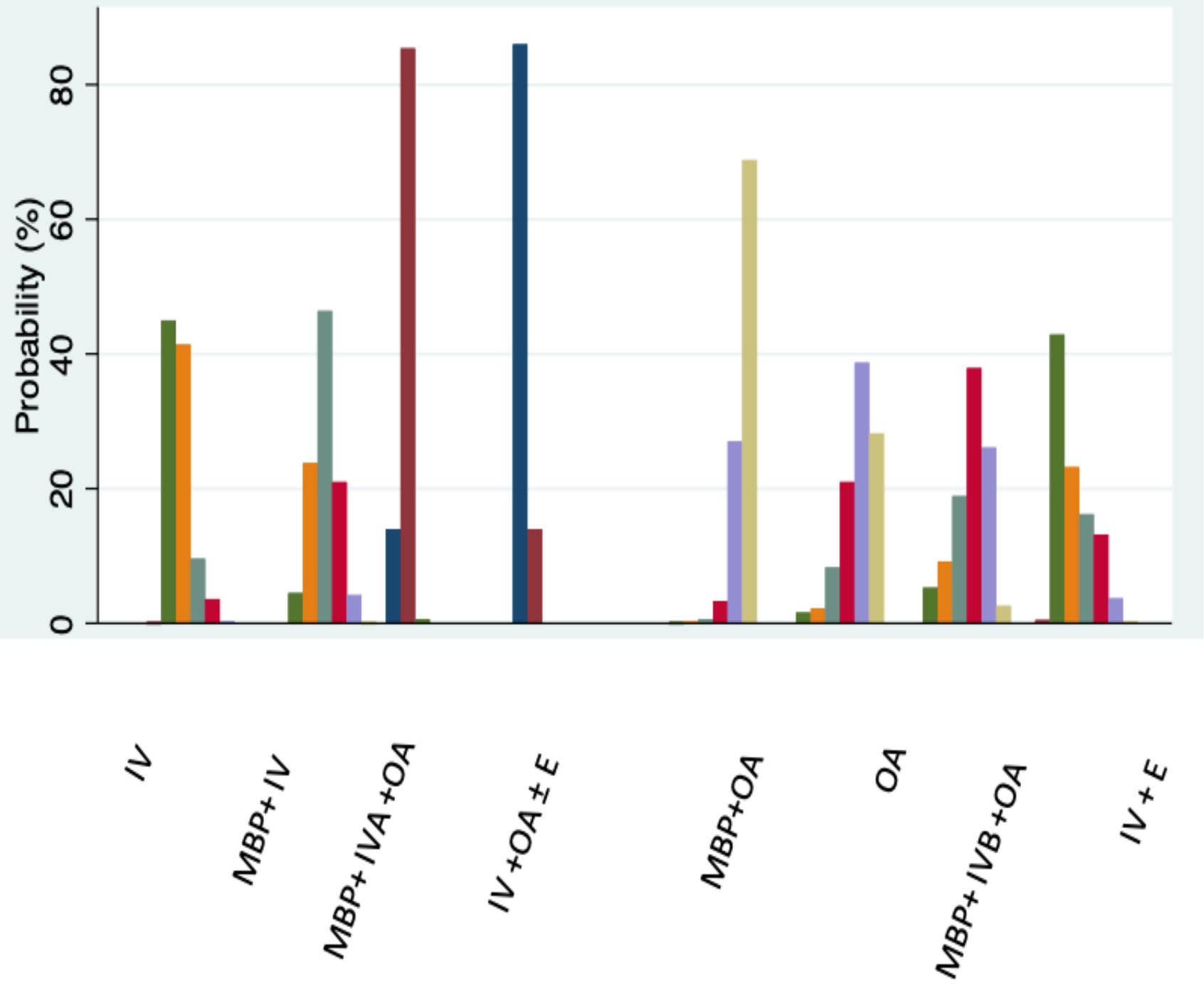
# Antibiotic cover and different models

- Model 1: All RCT regardless of antibiotic cover in different groups: 16,891 patients
- Model 2: All groups being compared must have good aerobic and anaerobic antibiotic cover: 8,377 patients
- Presenting the results for Incisional SSI in model 2



# Odd ratios for Surgical site infection comparing different methods

	IV+OA	MBP+IV+OA
IV+OA+/- E		<b>1.41 (0.83-2.42)</b>
IV+OA+MBP	<b>0.71 (0.41-1.21)</b>	
IV	<b>0.27 (0.15-0.50)</b>	<b>0.38 (0.20-0.48)</b>
IV+E	<b>0.26 (0.11-0.63)</b>	<b>0.37 (0.17-0.81)</b>
IV+MBP	<b>0.22 (0.12-0.40)</b>	<b>0.31 (0.20-0.48)</b>
OA	<b>0.14 (0.06-0.33)</b>	<b>0.19 (0.08-0.43)</b>
OA+MBP	<b>0.10 (0.04-0.25)</b>	<b>0.14 (0.07-0.31)</b>



# Main Findings of NMA

- The best two options were IV+OA+/-Enema followed by MBP+IV+OA
- These two options were significantly better than all the other options
- No significant differences between these two options, but IV+OA+/-E ranked best (at 86% probability)
- Overall adding OA reduced SSI by >50%
- There was a trend for MBP to increase SSI

# Conclusions of NMA

- **IV+OA+/-Enema combines the advantages of less SSI and not having the side effects of a full MBP**
- **There is sufficient data for us to change practice and add OA to our preoperative bowel preparation**
- **Further RCT need to look at comparing IV+OA+/-Enema and for MBP+IV+OA in both colon and rectal surgery**

# Some Conclusions about SSI in colorectal surgery

- SSI continues to be a challenging problem because of bacteria from both the colon and the skin, and because of the increasing age and comorbidity of our patients
- IV prophylactic antibiotics given in theatre has made a big difference
- Double ring wound protectors (not single ring) also make a difference
- There is sufficient evidence to add OA to our 'bowel preparation' before elective colorectal surgery