

# 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

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# Bowel preparation before surgery

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

Two main components.....

**Mechanical:** Wash out faecal material

**Antibiotics:** Decrease microbial load

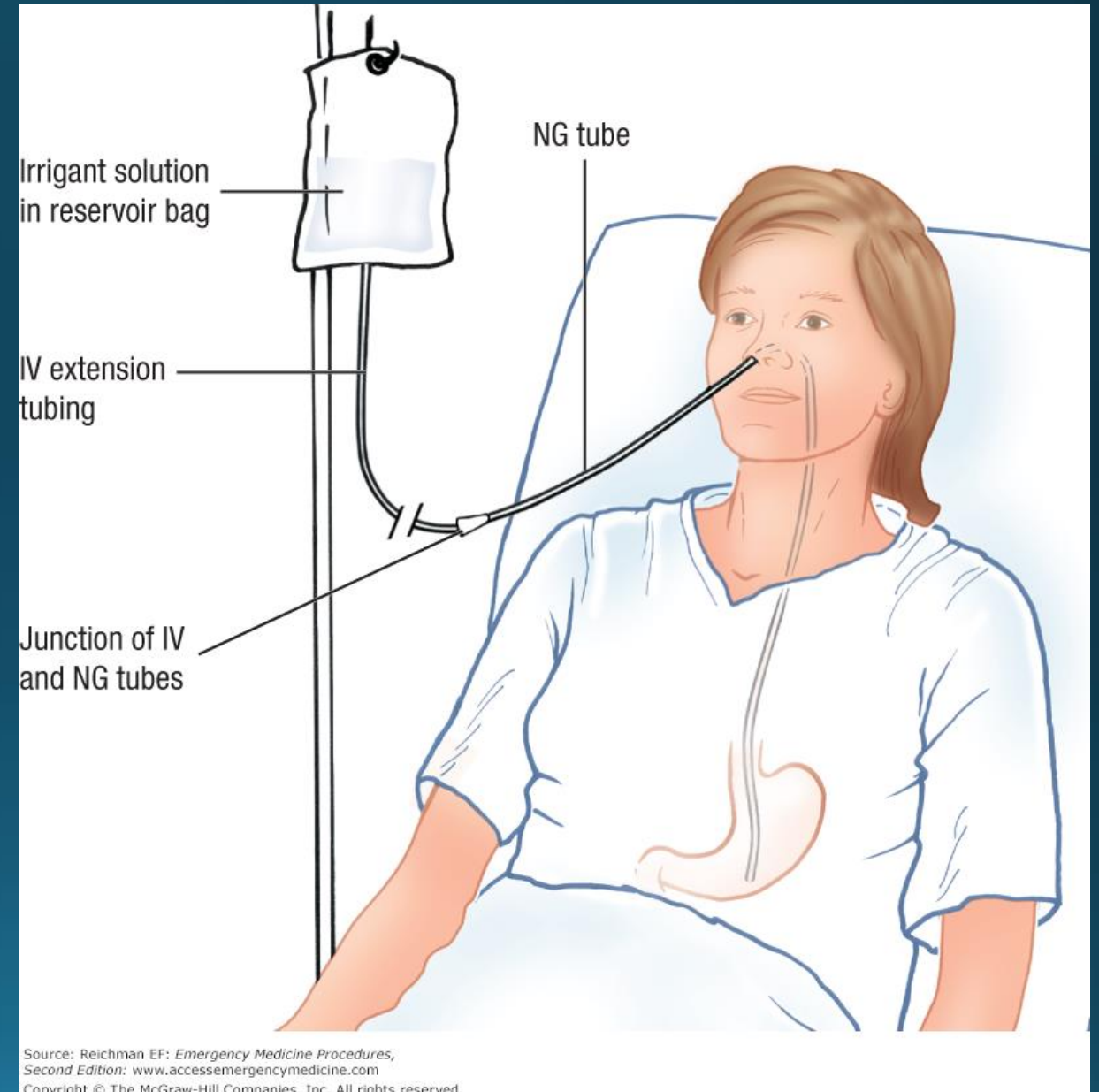


# The history of complications associated with colorectal surgery

- 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"*



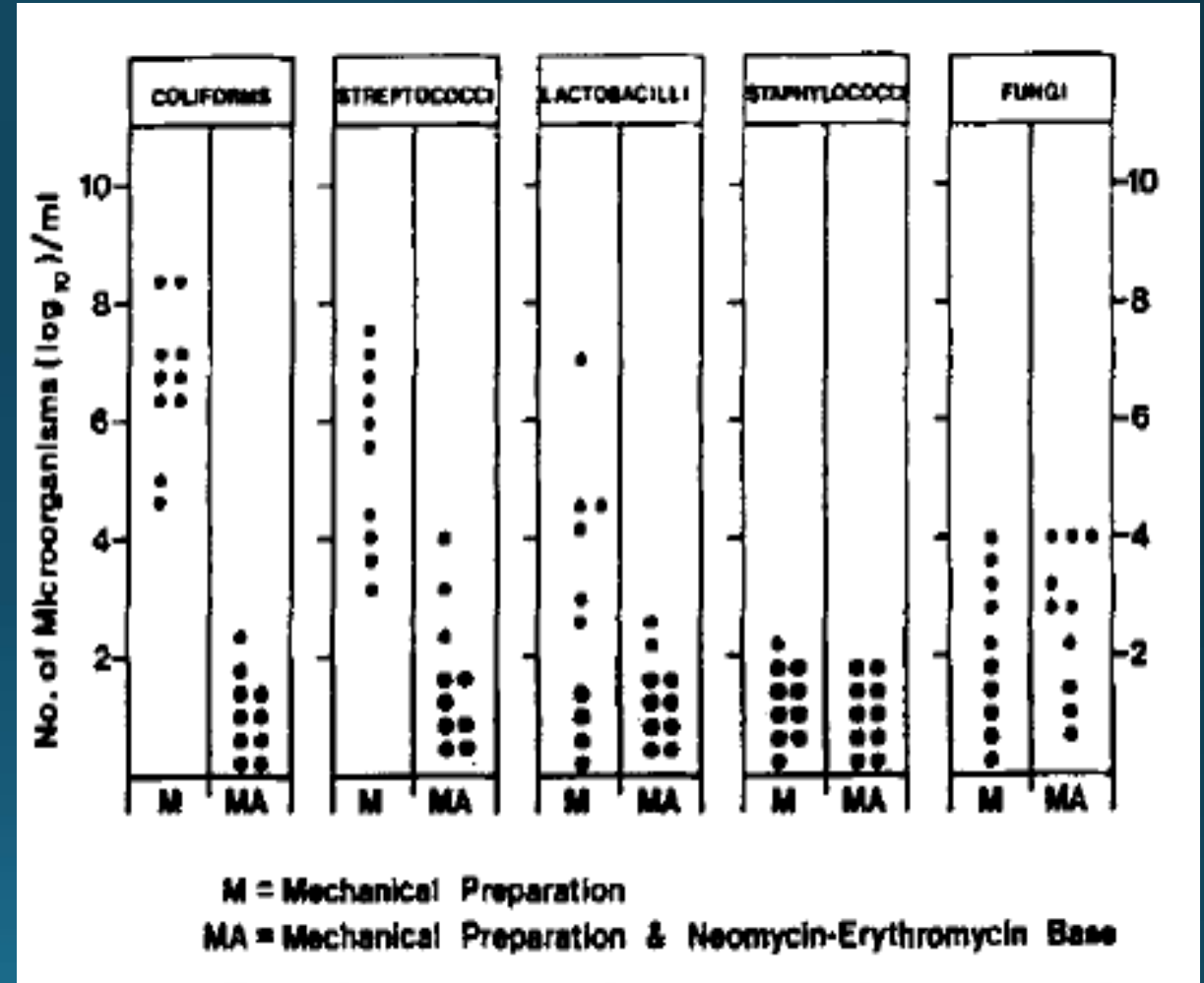


# MBP and decontamination of the colon with oral antibiotics 1970's and 1980's

- 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

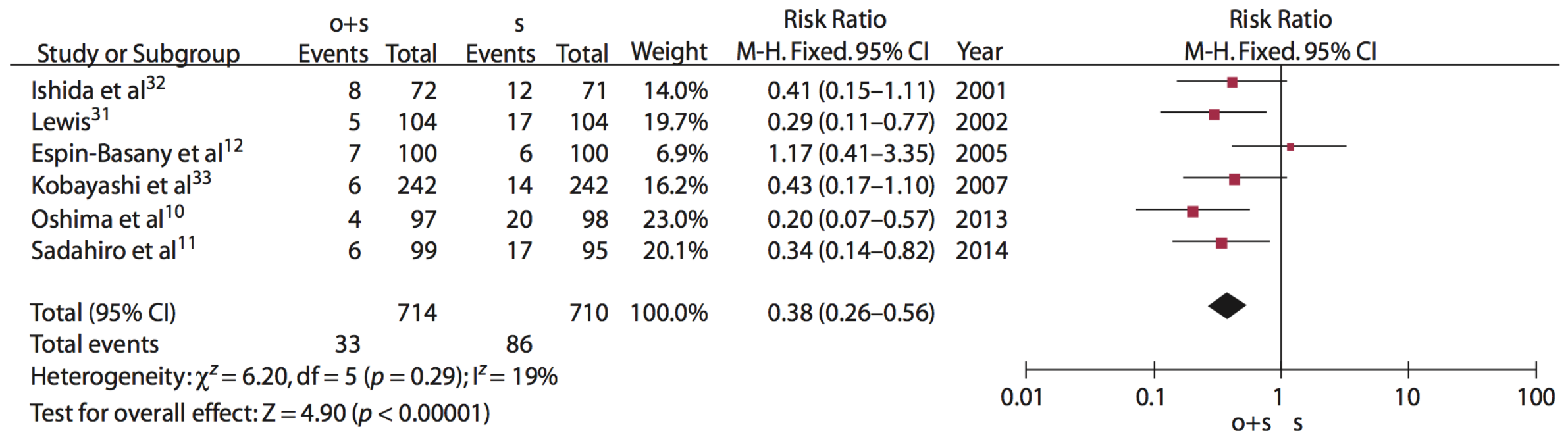


# IV antibiotics alone are as good as MBP + IV (1990's, 2000's)

- 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*

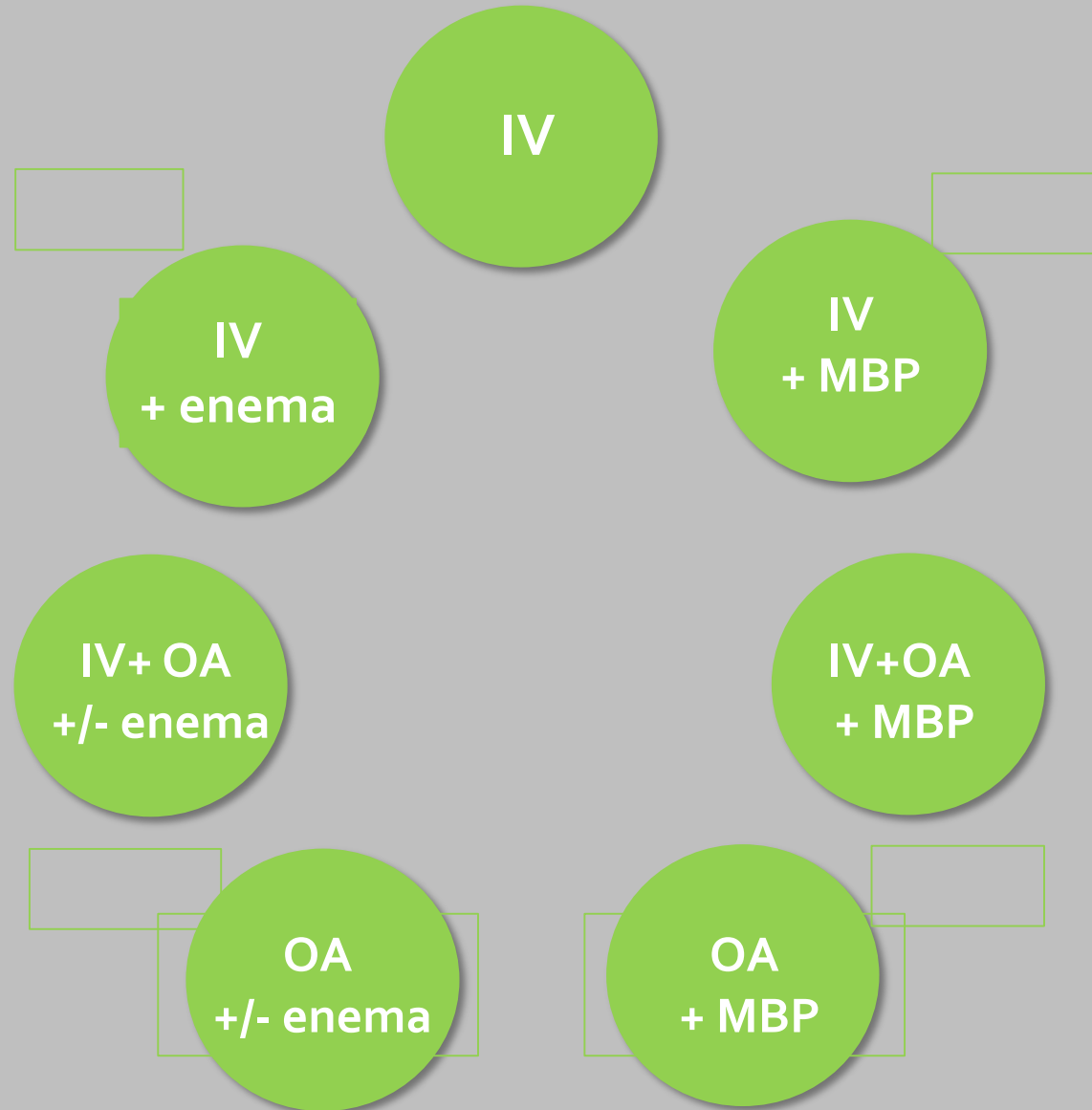
- NSQIP shows that MBP+OA+IV is best
- IV may be as good as MBP + IV, but we are more interested in OA
- The difficulties with MBP are less than the complications prevented
- (No real data for worse CLD infection)

“MBP does not reduce complications”

*Less is better*

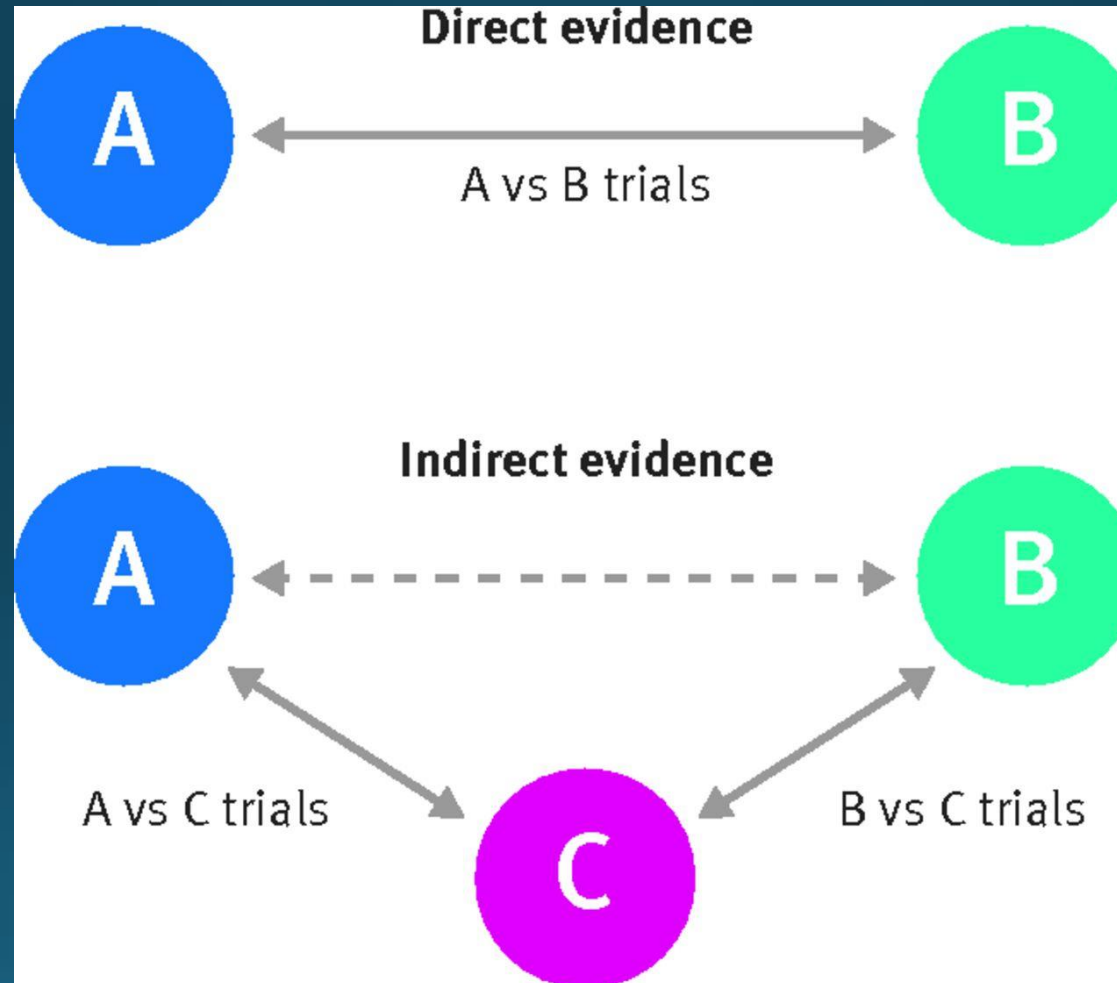
- We believe RCT are better level of evidence than databases
- Our RCT studies show IV is better/ as good as MBP + IV
- Patients tolerate MBP poorly and we see no advantage in its use
- (There is a risk of CLD infection with OA)

# Overview of NETWORK





# Network Meta-Analysis: Direct and indirect evidence



Identification

Screening

Eligibility

Included

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

**MBP+IV**  
52 studies  
5435  
patients

**IV**  
17 studies  
2307  
patients

**IV+enema**  
4 studies  
358  
patients

**IV+OA**  
4 studies  
309  
patients

**MBP+IV+  
OA**  
40 studies  
4416

**MBP+OA**  
25 studies  
2046  
patients

**OA**  
1 study  
486  
patients

**6821** Titles

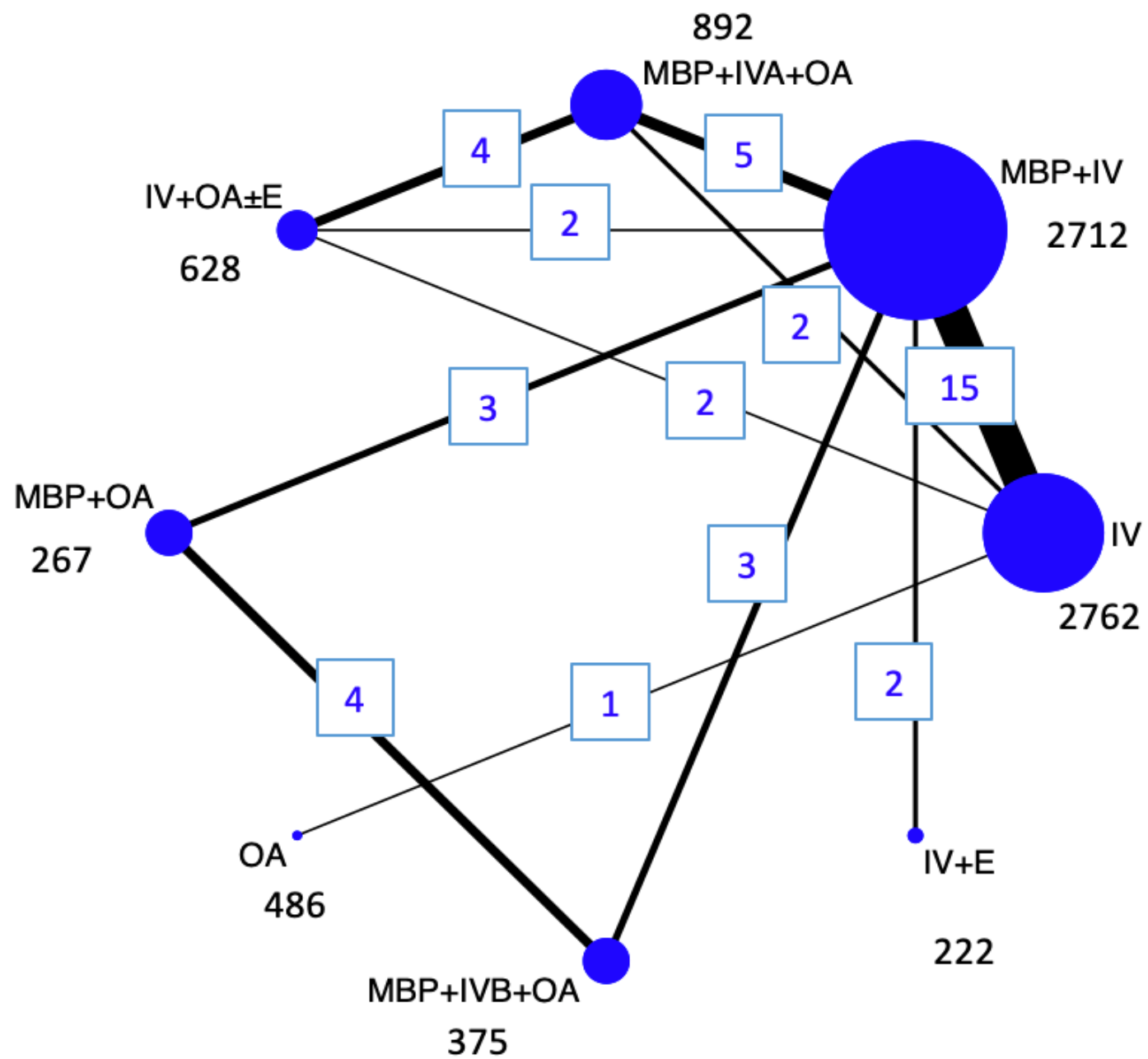
**465** abstracts

**171** Papers

**70** RCT selected

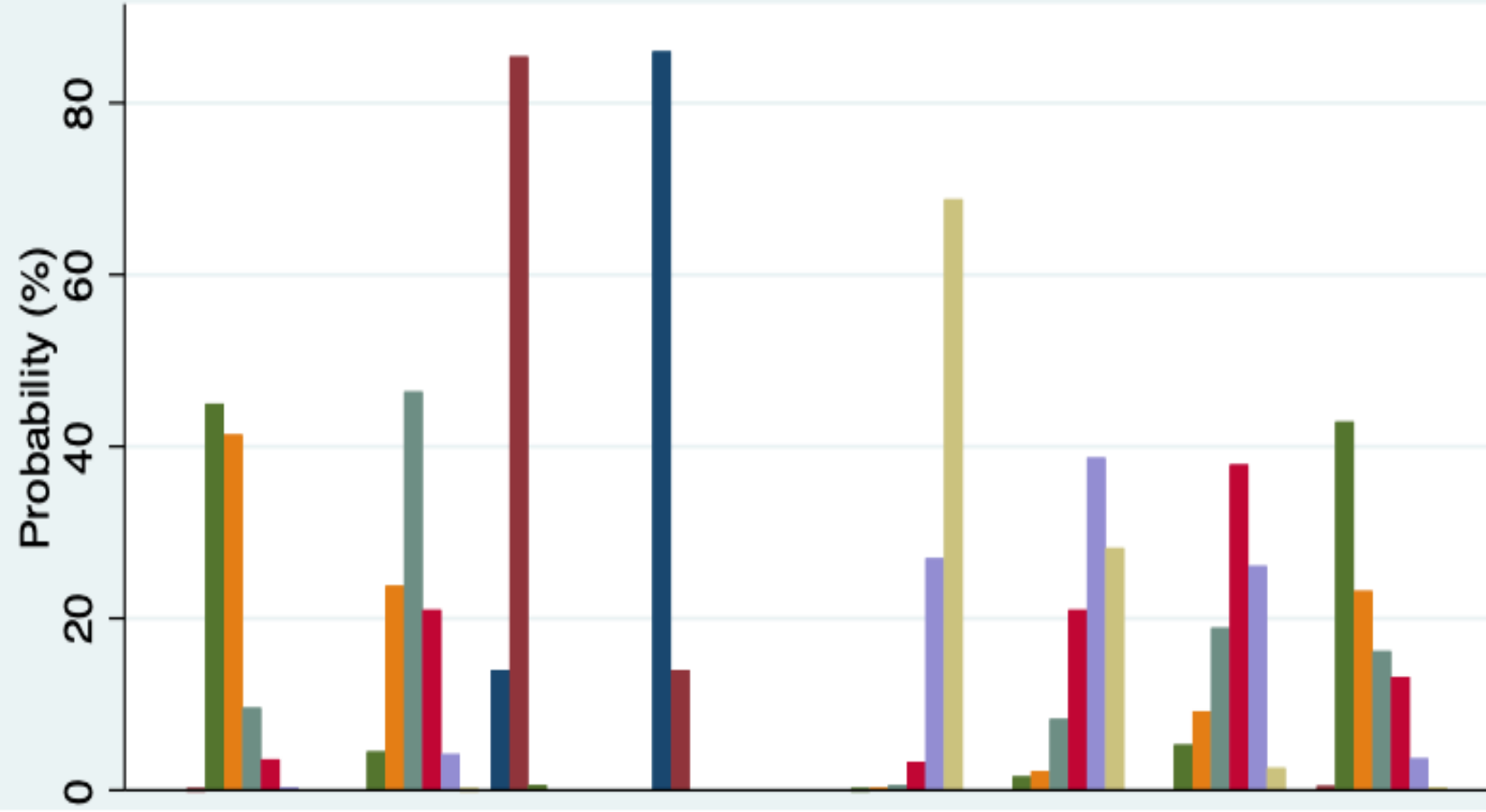
# Antibiotic cover and different models

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



# 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