Surgical Antibiotic Prophylaxis Duration

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Preventing SSI

1. Good teamwork & communication
2. Keep the patient warm
3. Prophylactic antibiotics
4. Don’t shave
5. Skin prep
6. Oxygenation
7. Control glucose
8. Surgical technique, stitch size
9. Antimicrobial sutures
10. Gloves, double glove, change gloves?
11. Instrument change?
12. Surgeon’s attire?
13. Wound protectors
14. Negative pressure dressings
15. Surveillance
16. Staphylococcal decolonization

Prophylactic Antibiotics
Questions

- Which cases benefit?
- Which drug should you use?
- When should you start?
- How much should you give?
- How long should antibiotics be continued?

Antibiotic Prophylaxis Duration

- Most studies have confirmed efficacy of ≤12 hrs.
- Many studies have shown efficacy of a single dose.
- Whenever compared, the shorter course has been as effective as the longer course.

The First Definitive Paper on Surgical Prophylaxis

Cephaloridine "on call" & 5 & 12 hrs later

	Ceph	Placebo	P
GastroDuod	32	36	
SSI	0	11 (31%)	0.001
Colorectal	54	50	
SSI	4 (7.4%)	15 (30%)	0.001
All cases	101	98	
SSI	6 (6%)	29 (29%)	0.001

Polk. Surgery 1969; 66: 97-103

Multiple Subsequent Trials of Single Dose vs Placebo

Morran C, McNaught W, McArdle CS. Prophylactic co-trimoxazole in biliary surgery. Br Med J 1978;2:462-4

Mitchell NJ, Evans DS, Pollock D. Pre-operation single-dose cefuroxime antimicrobial prophylaxis with and without metronidazole in elective gastrointestinal surgery. The Journal of antimicrobial chemotherapy 1980;6:393-9

Geraghty J, Feely M. Antibiotic prophylaxis in neurosurgery. A randomized controlled trial. Journal of neurosurgery 1984;60:724-6

Lewis RT, Allan CM, Goodall RG, et al. A single preoperative dose of cefazolin prevents postoperative sepsis in high-risk biliary surgery. Canadian journal of surgery Journal Canadien de Chirurgie 1984;27:44-7

Morran CG, Thomson G, White A, McNaught W, Smith DC, McArdle CS. Wound sepsis after low risk elective cholecystectomy: the effect of cefuroxime. The British journal of surgery 1984;71:540-2

Kune GA, Hunt RF, Jed A, Lusink C, McLaughlin S, Carson P. Wound infection in elective biliary surgery: controlled trial using one dose cephamandole. The Australian and New Zealand journal of surgery 1985;55:19-22

Abramov D, Jeroukhimov I, Yinnon AM, et al. Antibiotic prophylaxis in umbilical and incisional hernia repair: a prospective randomised study. The European journal of surgery = Acta chirurgica 1996;162:945-8

Duration of Prophylaxis Colorectal

Author	Drug	Duration	Infection
Törnqvist 1981	doxycycline	1 dose	10%
		3 days	19%
Juul 1987	amp/metronid	1 dose	6%
		3 days	6%

Tornqvist. Brit J Surg 1981; 68: 565-8
Juul. Dis Colon Rectum 1987; 30: 526-8

Duration of Prophylaxis Joint Replacement

Author	Drug	Duration	Infection
Pollard 1979 (hips)	cephaloridine	12 hours	2.5%
	flucloxacillin	14 days	3.4%
Heydemann 1986 (hips and knees)	cefazolin	1 dose	0
		24 hours	1%
		48 hours	0
		7 days	1.5%

Pollard. Brit Med J 1979; 1: 707-9
Heydemann. Clin Orthopaed Rel Res 1986; 184-7

Duration of Prophylaxis: Infection and Antibiotic Resistance Risk in Cardiac Surgery

	< 48 hr Short	>48 hr Long	Odds Ratio
Number	1502	1139	
SSI	131 (8.7%)	100(8.8%)	1.0 (0.8-1.3)
Acq Ab Res	6%		1.6 (1.1-2.6)

Harbarth. Circulation 2000;101:2916

National Surgical Infection Prevention Project - CMS

3 Performance Measures:

1. Antibiotic Prophylaxis given within 1 hour before incision
2. Prophylactic agent consistent with published guidelines
3. Discontinuation within 24 hours after the end of surgery

Bratzler. Clin Inf Dis 2004; 38: 1706-15

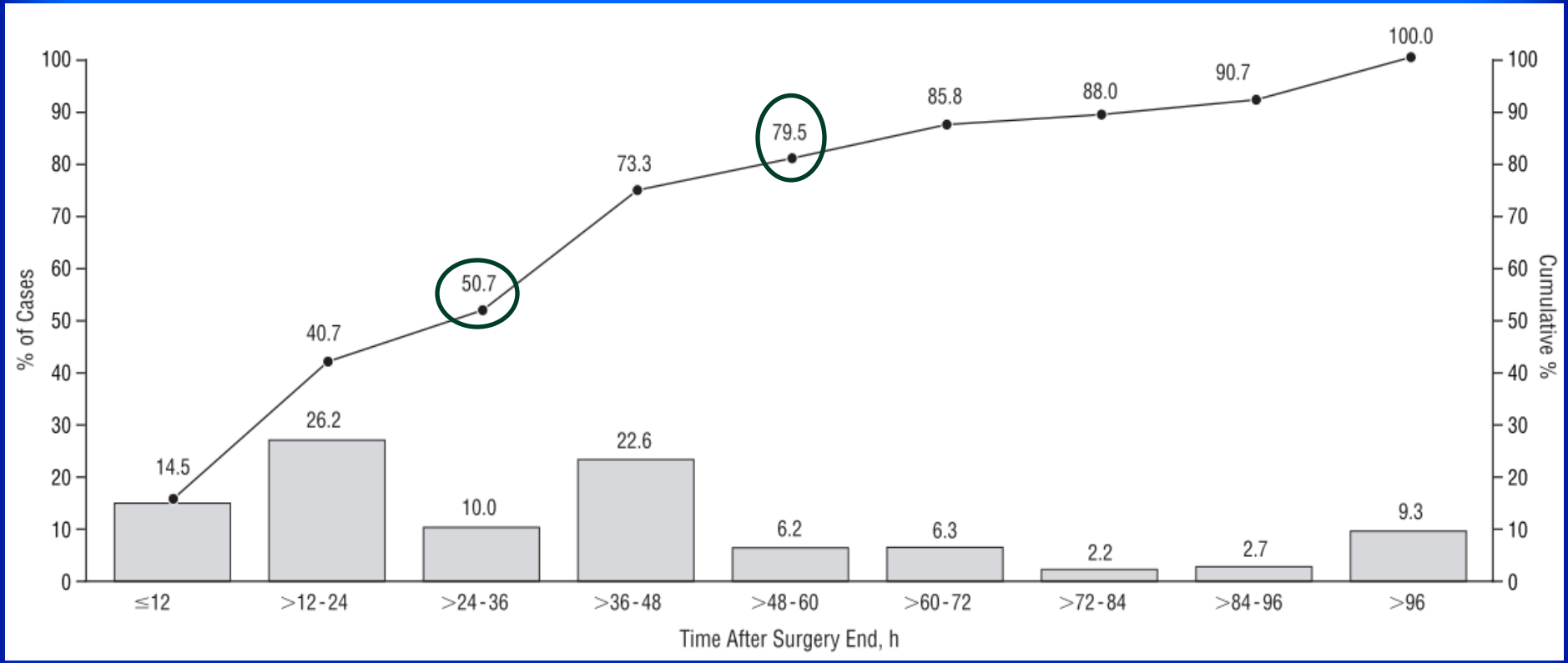
Prophylaxis Literature 1972 - 2003

39 papers comparing varying degrees of post-op prophylaxis to pre-op & intra-op only covering:

Cardiac	Cholecystectomy	Hysterectomy
Colorectal	Cesarean section	“Gen Surg”
Hip fracture	Orthopedic surg	Thoracic
Appendectomy (non perf)		Urologic surg

Random Sample of 34,133 CMS Patients in 2001

Proportion Discontinued after Surgery



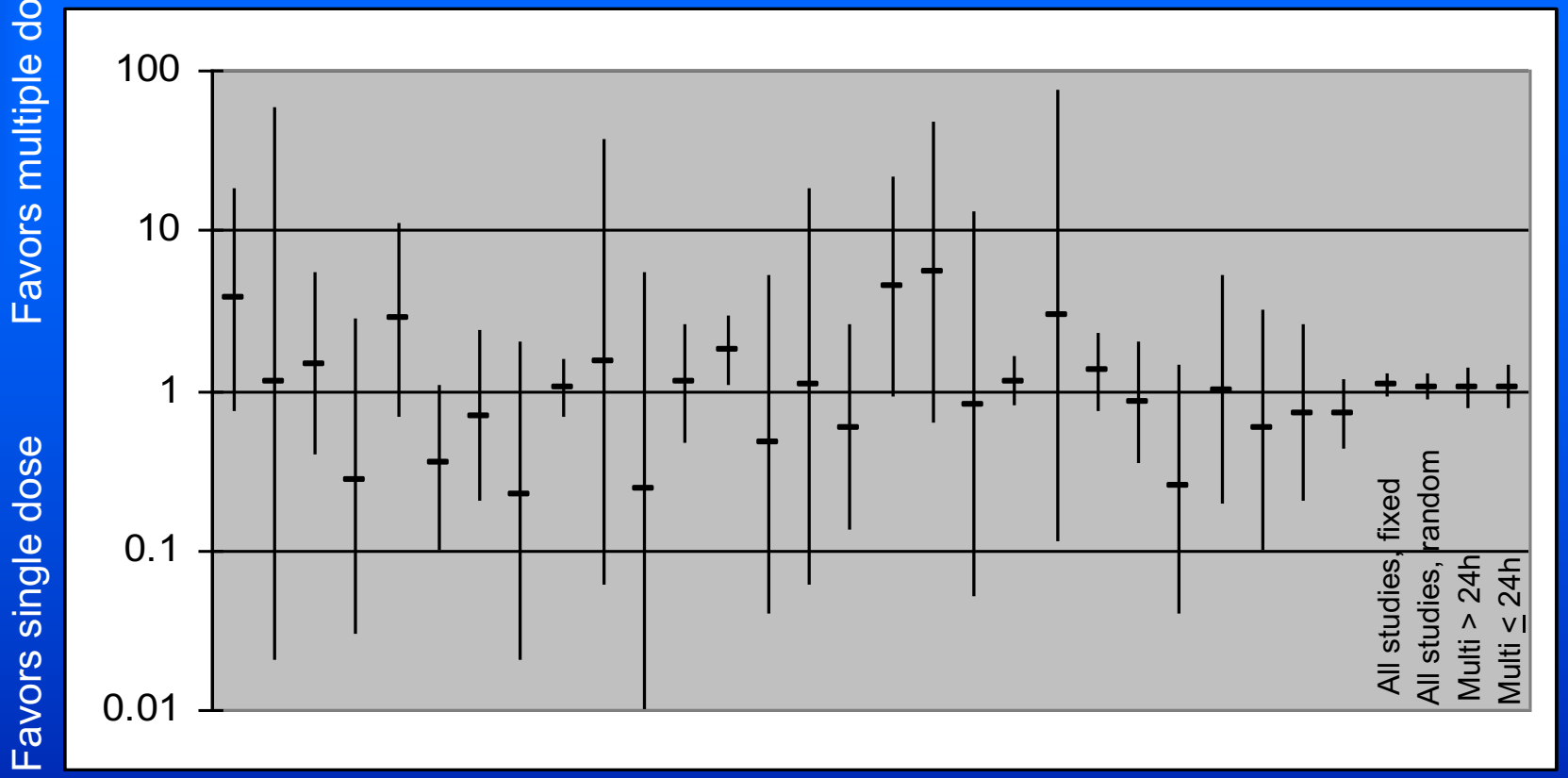
Bratzler. Arch Surg 2005; 140: 174-82

Prophylaxis Literature 2007 - 2019

15 papers reporting durations greater than 24 hours up to 5 day post-op:

Cardiac	Hepatic resection	Gynecology
Colorectal	Neurosurgery	“Gen Surg”
Head & Neck	Orthopedic surg	

Single vs Multiple Dose Surgical Prophylaxis: Systematic Review



McDonald. Aust NZ J Surg 1998;68:388

Most Recent SSI Prevention Guidelines

World Health Organization-WHO (Allegranzi B, Zayed B, Bischoff P, et al. New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: an evidence-based global perspective. Lancet Infect Dis 2016;16:e288-e303.)

Centers for Disease Control-CDC (Berrios-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017; JAMA Surg 2017;3.)

"Surgical antibiotic prophylaxis administration should not be prolonged after completion of the operation."

Meta-Analysis for WHO

52 papers, 19,273 patients, SSI rates

No postop doses	5.76%
Postop doses	5.05%

24 papers, 9170 patients, first dose within 60 minutes of incision & intra-op redose for twice $T_{1/2}$ duration, SSI rates

No postop doses	4.1%
Postop doses	4.2%

De Jonge. Lancet Inf Dis 2020;20: 1182-92

Number of Prophylaxis Doses and *C. difficile*

Cardiac, Colon, Hysterectomy, Vascular, Craniotomy, Arthroplasty

Number of Doses	Odds Ratio for *C. difficile*
1	1
2-5	1.7
>5	2.6

Carignan. Clin Inf Dis 2008;46:1838-43

Number of Doses & *C. difficile*

Duration of Prophylaxis	Odds Ratio for *C. difficile*	Odds Ratio for *C. difficile*
	Nephrectomy	Cystectomy
1 day	1	1
> 1 day	3.79	1.64

Calvert. J Urology. 2014;192:425-9

Discontinuation of Post Op Antibiotics for Ventricular Drains

	Before	After	Prob
C. diff/1,000 Pt Days in Neuro ICU	1.97	0.51	<0.004
C. diff/1,000 Pt Days Neurosurg Svc	1.18	0.55	<0.05
Cefazolin doses/1,000 Pt Days		Reduced by 50%	

Dellit. Infect Control Hosp Epidemiol 2014;35:589-90

Duration of Prophylaxis and *C. difficile* – CABG

Prophylaxis ≥ 2 days

Odds Ratio = 1.43 (1.07 – 1.92)

Poeran. J Thoracic Cardiovasc Surg 2016; 151: 589-97

Duration of Prophylaxis and *C. difficile*

Ortho, Neurosurg, Gen Surg, Trauma

Duration of Prophylaxis	Odds Ratio for *C. difficile*	Prob
≤ 24 hrs	1	
> 24 hrs	3.38 (1.16-9.90)	<0.03

Bernatz. Infect Control Hosp Epidemiol. 2017;38:1254-7

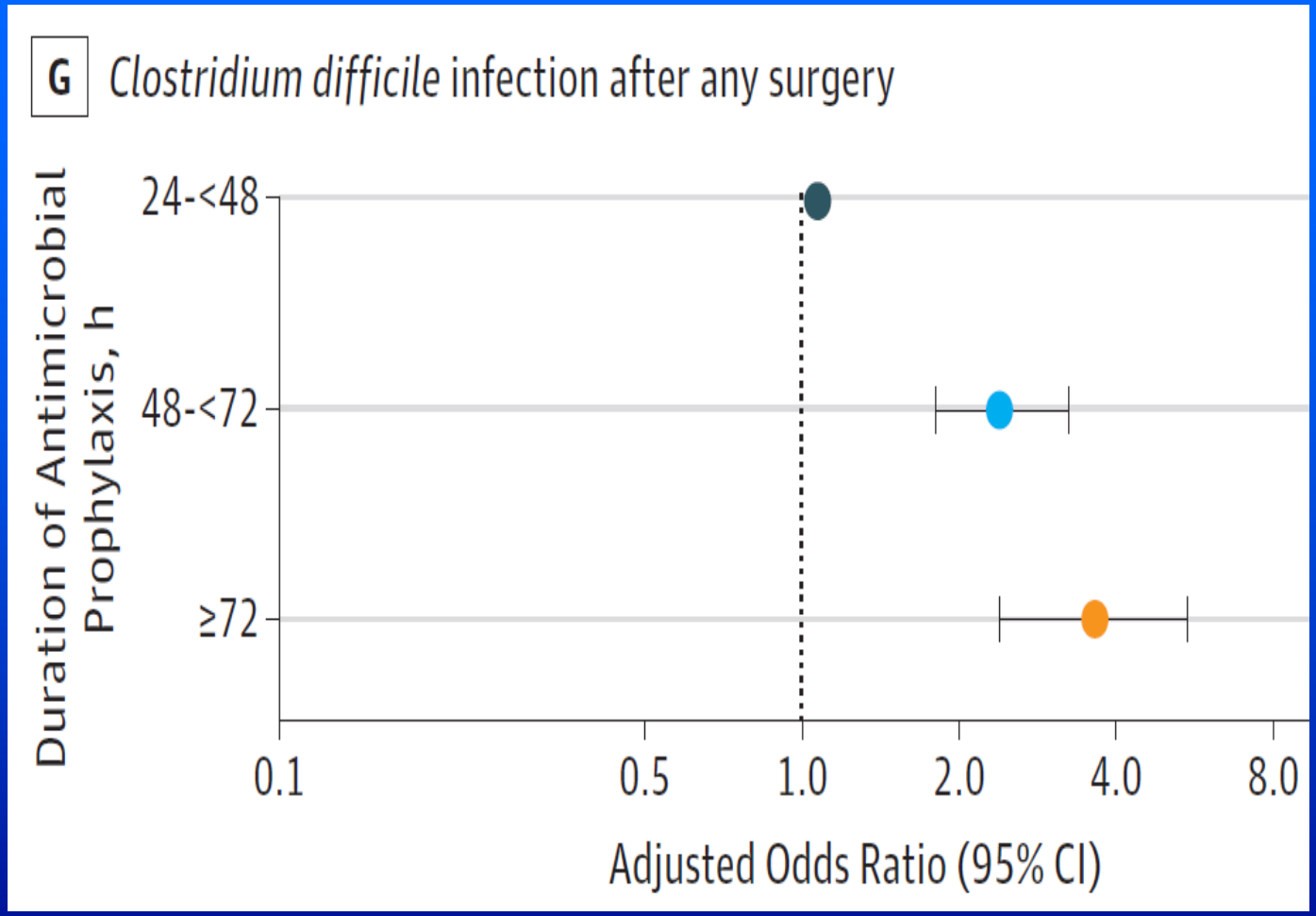
Duration of Prophylaxis and *C. difficile* – Cardiac Surgery

Duration Prophylaxis	Odds Ratio for C. difficile	Prob
0 – 24 hrs	0.692	
24 – 48 hrs	1.0 (ref)	0.0001
> 48 hrs	10.03	

Kirkwood. J Thoracic Cardiovasc Surg 2018; 155: 670-8

Prophylaxis Duration & *C. difficile*

Cardiac, Ortho, Vascular, Colorectal, Hysterectomy



Branch-Elliman. JAMA Surg 2019; 154:590-8

Prophylactic Antibiotics

1. Risk is reduced for all procedures. Benefit depends on baseline risk and morbidity of SSI
2. Choose a drug that is effective against bugs that show up in SSI for that procedure
3. If you're going to give some, give a lot
4. Give it very shortly before the procedure
5. Repeat for long cases (2 half-lives)
6. Stop when the operation is over

Happy to Take Questions

Happy to share references

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