Surgical Antibiotic Prophylaxis

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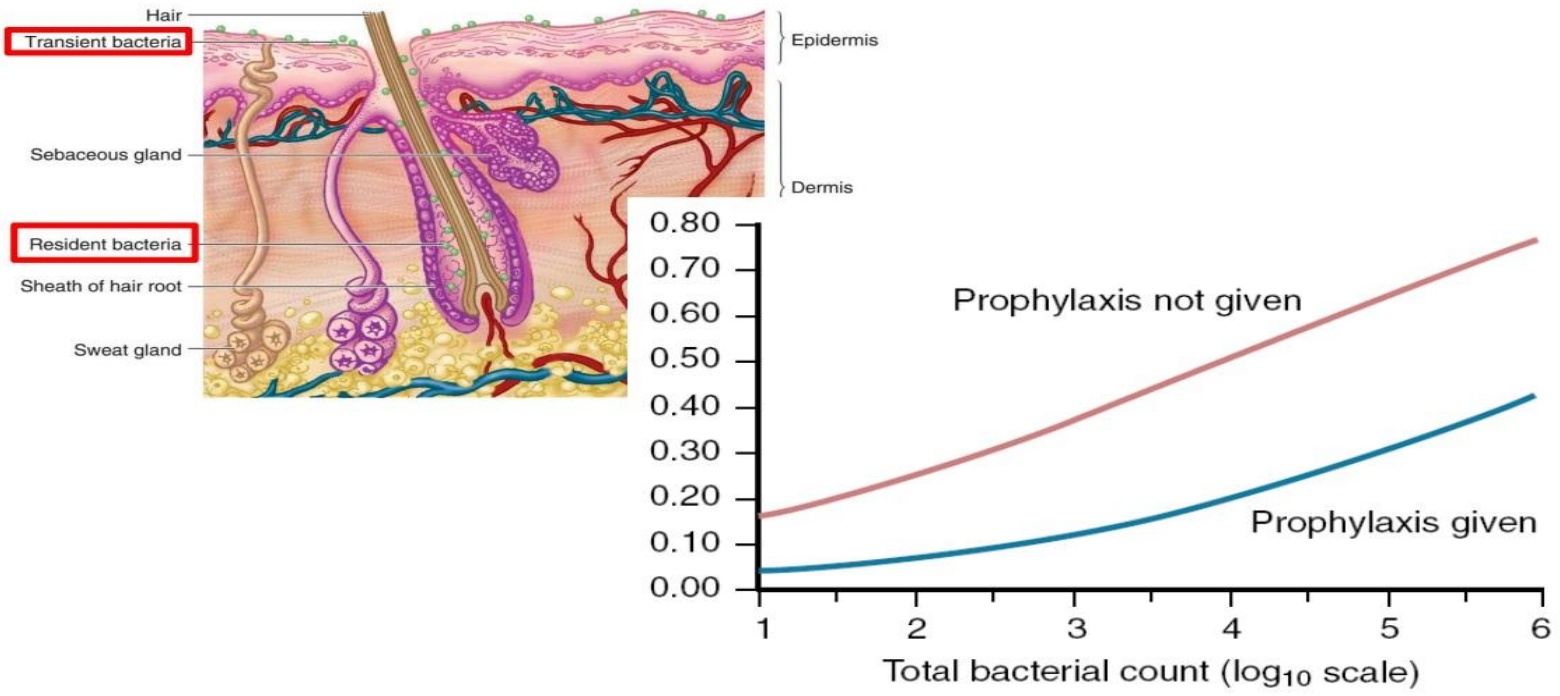
PICU

Contents

- Review
- Efficacy
- Recommendation
- Improve compliance
- Conclusions

Review

- Surgical antibiotic prophylaxis is defined as the use of antibiotics to prevent infections at the surgical site



Houang AT. J.Hos.Infect 1991; 19:181-189

Efficacy

Antibiotic Prophylaxis to Prevent Surgical Site Infections in Children: A Prospective Cohort Study

Amir Khoshbin, MD, MSc, Jeannette P. So, MSc,† Ilyas S. Aleem, MD,‡ Derek Stephens, MSc,§*

Annuals of Surgery 2015, vol 256, N 2

Results: Of 5309 patients for whom antibiotics were indicated, 3901 (73.5%) with complete compliance had an infection rate of 3.0%, whereas 1408 (26.5%) who were not compliant had an infection rate of 4.3% (adjusted relative risk: 0.7; 95% confidence interval: 0.5–0.9; $P = 0.02$). Of 4156 pa-

- **Conclusions:** In pediatric surgery, complete compliance with AP was associated with 30% decreased risk of SSI

Recommendations - Guidelines

- Type Antibiotic – doses
- Timing
- Prolongation

Table 1.

Recommended Doses and Redosing Intervals for Commonly Used Antimicrobials for Surgical Prophylaxis

Antimicrobial	Recommended Dose		Half-life in Adults With Normal Renal Function, hr[19]	Recommended Redosing Interval (From Initiation of Preoperative Dose), hr[c]
	Adults[a]	Pediatrics[b]		
Ampicillin–sulbactam	3 g (ampicillin 2 g/ sulbactam 1 g)	50 mg/kg of the ampicillin component	0.8–1.3	2
Ampicillin	2 g	50 mg/kg	1–1.9	2
Aztreonam	2 g	30 mg/kg	1.3–2.4	4
Cefazolin	2 g, 3 g for pts weighing ≥120 kg	30 mg/kg	1.2–2.2	4
Cefuroxime	1.5 g	50 mg/kg	1–2	4
Cefotaxime	1 g[d]	50 mg/kg	0.9–1.7	3
Cefoxitin	2 g	40 mg/kg	0.7–1.1	2
Cefotetan	2 g	40 mg/kg	2.8–4.6	6
Ceftriaxone	2 g[e]	50–75 mg/kg	5.4–10.9	NA
Ciprofloxacin[f]	400 mg	10 mg/kg	3–7	NA
Clindamycin	900 mg	10 mg/kg	2–4	6
Gentamicin[g]	5 mg/kg based on dosing weight (single dose)	2.5 mg/kg based on dosing weight	2–3	NA
Levofloxacin[f]	500 mg	10 mg/kg	6–8	NA
Metronidazole	500 mg	15 mg/kg Neonates weighing <1200 g should receive a single 7.5-mg/kg dose	6–8	NA
Moxifloxacin[f]	400 mg	10 mg/kg	8–15	NA
Piperacillin–tazobactam	3.375 g	Infants 2–9 mo: 80 mg/kg of the piperacillin component Children >9 mo and ≤40 kg: 100 mg/kg of the piperacillin component	0.7–1.2	2
Vancomycin	15 mg/kg	15 mg/kg	4–8	NA

ASHP – IDSA – SIS 2013- Am J Health-Syst Pharm—Vol 70 Feb 1, 2013

Table 2.

Recommendations for Surgical Antimicrobial Prophylaxis

Type of Procedure	Recommended Agents[a,b]	Alternative Agents in Pts With β-Lactam Allergy	Strength of Evidence[c]
Cardiac			
Coronary artery bypass	Cefazolin, cefuroxime	Clindamycin,[d] vancomycin[d]	A
Cardiac device insertion procedures (e.g., pacemaker implantation)	Cefazolin, cefuroxime	Clindamycin, vancomycin	A
Ventricular assist devices	Cefazolin, cefuroxime	Clindamycin, vancomycin	C
Thoracic			
Noncardiac procedures, including lobectomy, pneumonectomy, lung resection, and thoracotomy	Cefazolin, ampicillin–sulbactam	Clindamycin,[d] vancomycin[d]	A
Video-assisted thoracoscopic surgery	Cefazolin, ampicillin–sulbactam	Clindamycin,[d] vancomycin[d]	C
Gastroduodenal[e]			
Procedures involving entry into lumen of gastrointestinal tract (bariatric, pancreaticoduodenectomy[f])	Cefazolin	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i]	A
Procedures without entry into gastrointestinal tract (antireflux, highly selective vagotomy) for high-risk patients	Cefazolin	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i]	A

Am J Health-Syst Pharm—Vol 70 Feb 1, 2013

Biliary tract			
Open procedure	Cefazolin, cefoxitin, cefotetan, ceftriaxone,[k] ampicillin–sulbactam[h]	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i] Metronidazole + aminoglycoside[g] or fluoroquinolone[h,i]	A
Laparoscopic procedure			
Elective, low-risk[l]	None	None	A
Elective, high-risk[l]	Cefazolin, cefoxitin, cefotetan, ceftriaxone,[k] ampicillin–sulbactam[h]	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i] Metronidazole + aminoglycoside[g] or fluoroquinolone[h,i]	A
Appendectomy for uncomplicated appendicitis	Cefoxitin, cefotetan, cefazolin + metronidazole	Clindamycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i] Metronidazole + aminoglycoside[g] or fluoroquinolone[h,i]	A
Small intestine			
Nonobstructed	Cefazolin	Clindamycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i]	C

Continued on next page

Table 2 (*continued*)

Type of Procedure	Recommended Agents[a,b]	Alternative Agents in Pts With β-Lactam Allergy	Strength of Evidence[c]
Obstructed	Cefazolin + metronidazole, cefoxitin, cefotetan	Metronidazole + aminoglycoside[g] or fluoroquinolone[h,i]	C
Hernia repair (hernioplasty and herniorrhaphy)	Cefazolin	Clindamycin, vancomycin	A
Colorectal[m]	Cefazolin + metronidazole, cefoxitin, cefotetan, ampicillin–sulbactam,[h] ceftriaxone + metronidazole,[n] ertapenem	Clindamycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i], metronidazole + aminoglycoside[g] or fluoroquinolone[h,i]	A
Head and neck			
Clean	None	None	B
Clean with placement of prosthesis (excludes tympanostomy tubes)	Cefazolin, cefuroxime	Clindamycin[d]	C
Clean-contaminated cancer surgery	Cefazolin + metronidazole, cefuroxime + metronidazole, ampicillin–sulbactam	Clindamycin[d]	A
Other clean-contaminated procedures with the exception of tonsillectomy and functional endoscopic sinus procedures	Cefazolin + metronidazole, cefuroxime + metronidazole, ampicillin–sulbactam	Clindamycin[d]	B

Neurosurgery			
Elective craniotomy and cerebrospinal fluid-shunting procedures	Cefazolin	Clindamycin,[d] vancomycin[d]	A
Implantation of intrathecal pumps	Cefazolin	Clindamycin,[d] vancomycin[d]	C
Cesarean delivery	Cefazolin	Clindamycin + aminoglycoside[g]	A
Hysterectomy (vaginal or abdominal)	Cefazolin, cefotetan, cefoxitin, ampicillin–sulbactam[h]	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i] Metronidazole + aminoglycoside[g] or fluoroquinolone[h,i]	A
Ophthalmic	Topical neomycin–polymyxin B–gramicidin or fourth-generation topical fluoroquinolones (gatifloxacin or moxifloxacin) given as 1 drop every 5–15 min for 5 doses[o] Addition of cefazolin 100 mg by subconjunctival injection or intracameral cefazolin 1–2.5 mg or cefuroxime 1 mg at the end of procedure is optional	None	B
Orthopedic			
Clean operations involving hand, knee, or foot and not involving implantation of foreign materials	None	None	C
Spinal procedures with and without instrumentation	Cefazolin	Clindamycin,[d] vancomycin[d]	A

Table 2 (*continued*)

Type of Procedure	Recommended Agents[a,b]	Alternative Agents in Pts With β-Lactam Allergy	Strength of Evidence[c]
Hip fracture repair	Cefazolin	Clindamycin,[d] vancomycin[d]	A
Implantation of internal fixation devices (e.g., nails, screws, plates, wires)	Cefazolin	Clindamycin,[d] vancomycin[d]	C
Total joint replacement	Cefazolin	Clindamycin,[d] vancomycin[d]	A
Urologic			
Lower tract instrumentation with risk factors for infection (includes transrectal prostate biopsy)	Fluoroquinolone,[h,i] trimethoprim–sulfamethoxazole, cefazolin	Aminoglycoside[g] with or without clindamycin	A
Clean without entry into urinary tract	Cefazolin (the addition of a single dose of an aminoglycoside may be recommended for placement of prosthetic material [e.g., penile prosthesis])	Clindamycin,[d] vancomycin[d]	A
Involving implanted prosthesis	Cefazolin ± aminoglycoside, cefazolin ± aztreonam, ampicillin–sulbactam	Clindamycin ± aminoglycoside or aztreonam, vancomycin ± aminoglycoside or aztreonam	A
Clean with entry into urinary tract	Cefazolin (the addition of a single dose of an aminoglycoside may be recommended for placement of prosthetic material [e.g., penile prosthesis])	Fluoroquinolone,[h,i] aminoglycoside[g] with or without clindamycin	A
Clean-contaminated	Cefazolin + metronidazole, cefoxitin	Fluoroquinolone,[h,i] aminoglycoside[g] + metronidazole or clindamycin	A

Vascular[p]	Cefazolin	Clindamycin,[d] vancomycin[d]	A
Heart, lung, heart–lung transplantation[q]			
Heart transplantation[r]	Cefazolin	Clindamycin,[d] vancomycin[d]	A (based on cardiac procedures)
Lung and heart–lung transplantation[r,s]	Cefazolin	Clindamycin,[d] vancomycin[d]	A (based on cardiac procedures)
Liver transplantation[q,t]	Piperacillin–tazobactam, cefotaxime + ampicillin	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i]	B
Pancreas and pancreas–kidney transplantation[r]	Cefazolin, fluconazole (for patients at high risk of fungal infection [e.g., those with enteric drainage of the pancreas])	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i]	A
	Cefazolin	Clindamycin or vancomycin + aminoglycoside[g] or aztreonam or fluoroquinolone[h,i]	A

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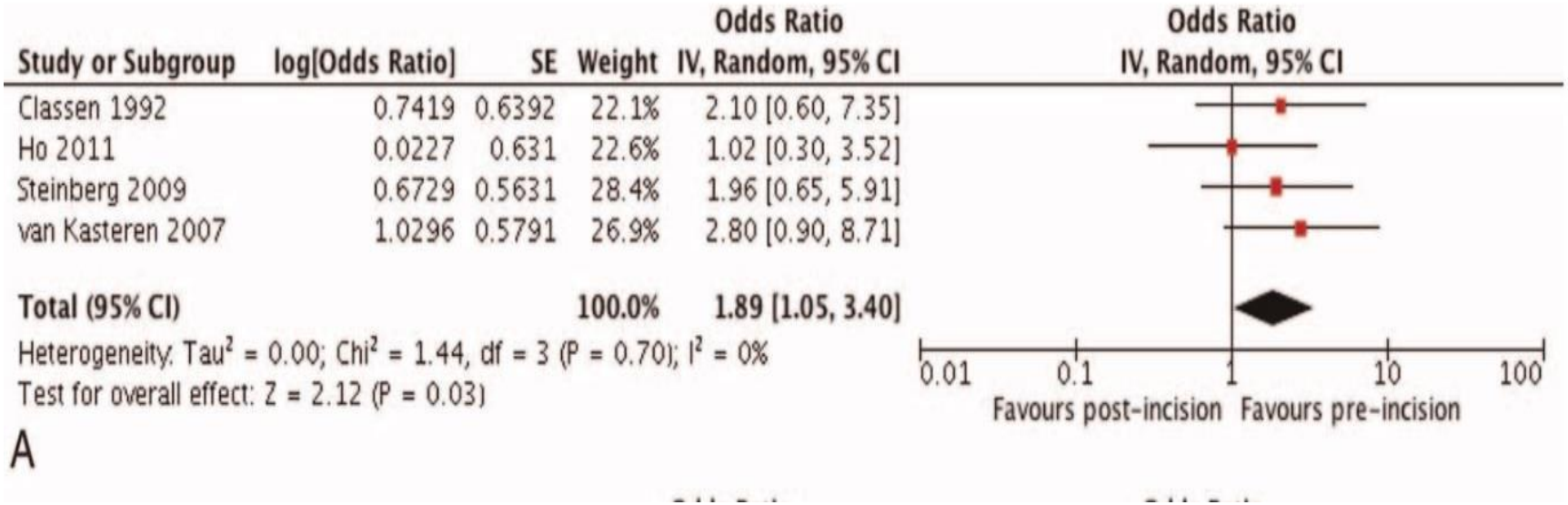
Timing of preoperative antibiotic prophylaxis in 54,552 patients and the risk of surgical site infection

A systematic review and meta-analysis

Stijn Willem de Jonge, MD[a], Sarah L. Gans, MD, PhD[a], Jasper J. Atema, MD, PhD[a], Joseph S. Solomkin, MD[b], Patchen E. Dellinger, MD[c], Marja A. Boermeester, MD, PhD[a,*]



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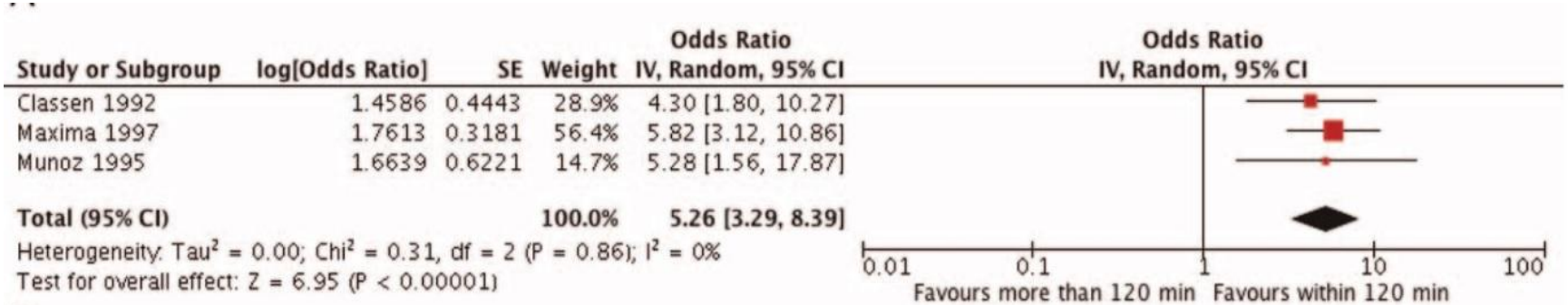

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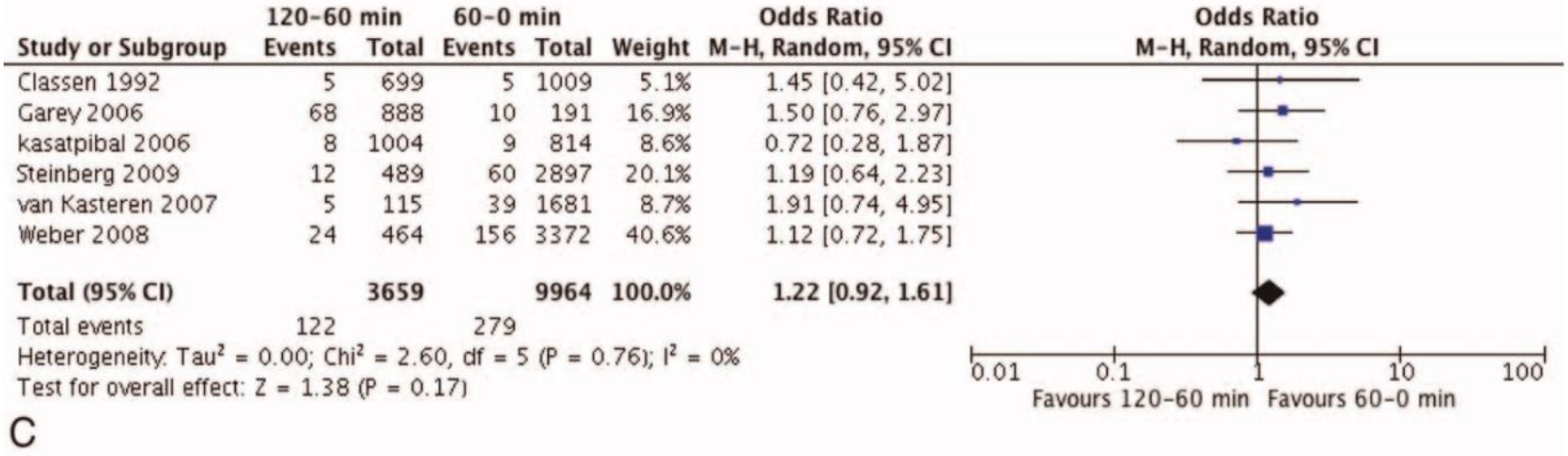


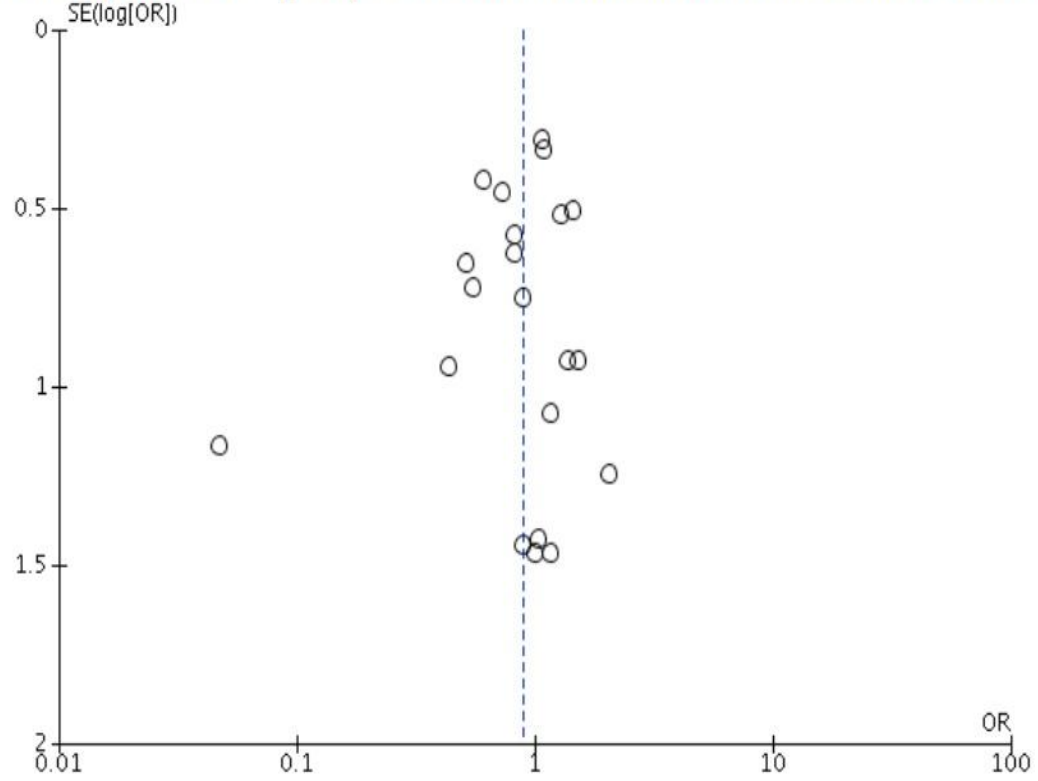
C

Summary of a systematic review on surgical antibiotic prophylaxis prolongation

WHO Surgical Site infection Prevention Guidelines 2017

Continuation 24hrs vs more than 24hrs

Funnel plot 3. SAP – postoperative continuation for more than 24 hours vs. continuation for up to 24 hours, outcome SSI

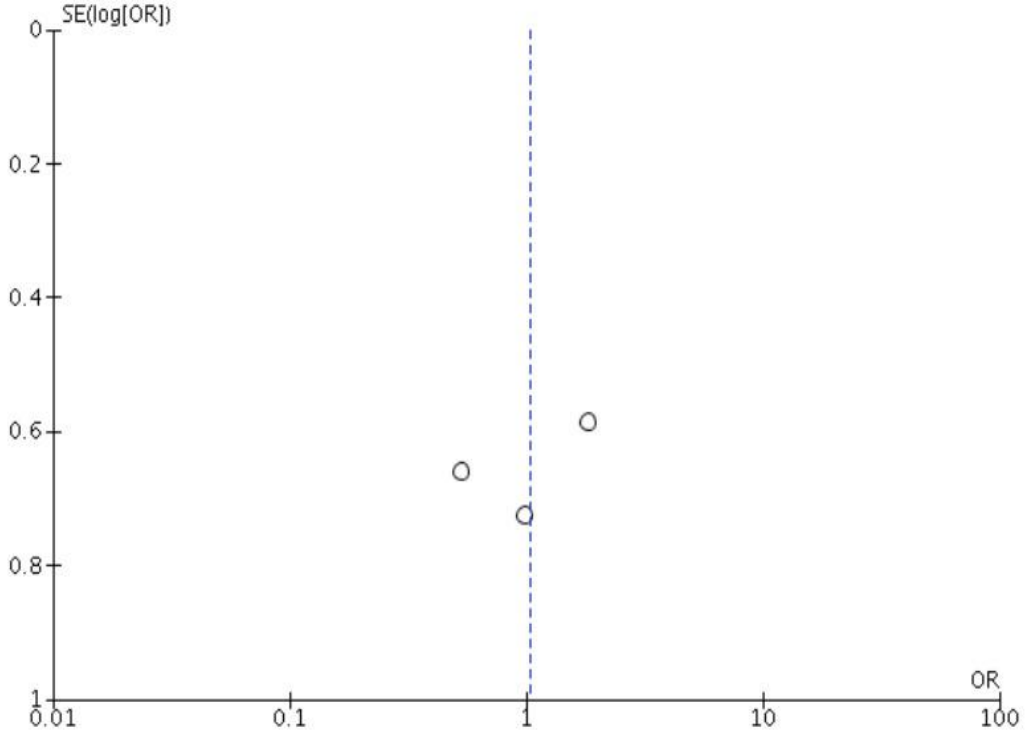


Summary of a systematic review on surgical antibiotic prophylaxis prolongation

WHO Surgical Site infection Prevention Guidelines 2017

Continuation 48hrs VS more than 48 hrs

Funnel plot 4. SAP – postoperative continuation for more than 48 hours vs. continuation for up to 48 hours, outcome SSI



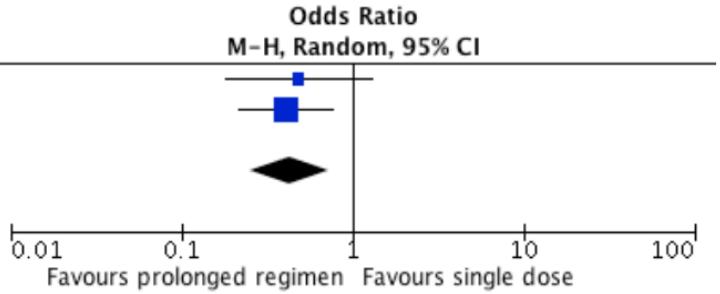
Comparison 5a: Types of procedure with a decreased risk of SSI with a prolonged antibiotic regimen: cardiac surgery

(i) Prolonged regimen vs. a single dose

Study or Subgroup	Prolonged regimen Events	Total	Single dose Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Nooyen 1994	6	425	12	419	28.2%	0.49 [0.18, 1.31]
Tamayo 2007	15	419	35	419	71.8%	0.41 [0.22, 0.76]
Total (95% CI)		**844**		**838**	**100.0%**	**0.43 [0.25, 0.72]**
Total events	21		47			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.09$, df = 1 (P = 0.77); $I^2 = 0\%$

Test for overall effect: Z = 3.16 (P = 0.002)



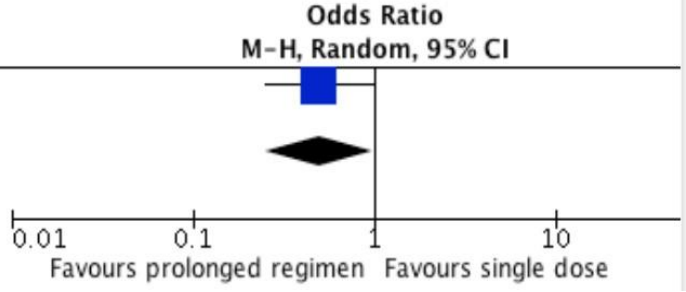
Comparison 5b: Types of procedure with decreased risk of SSI with a prolonged antibiotic regimen: vascular surgery

(i) Prolonged regimen vs. a single dose

Study or Subgroup	Prolonged regimen Events	Total	Single dose Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Hall 1998	15	149	28	153	100.0%	0.50 [0.25, 0.98]
Total (95% CI)		**149**		**153**	**100.0%**	**0.50 [0.25, 0.98]**
Total events	15		28			

Heterogeneity: Not applicable

Test for overall effect: Z = 2.02 (P = 0.04)



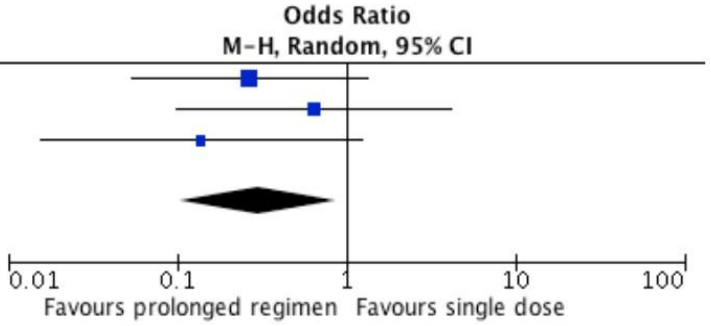
Comparison 5c: Types of procedure with decreased risk of SSI with a prolonged antibiotic regimen: orthognathic surgery

(i) Prolonged regimen vs. a single dose

Study or Subgroup	Prolonged regimen Events	Total	Single dose Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Danda 2010	2	75	7	75	43.9%	0.27 [0.05, 1.33]
Kang 2009	2	28	3	28	32.3%	0.64 [0.10, 4.17]
Wahab 2013	1	30	6	30	23.7%	0.14 [0.02, 1.23]
Total (95% CI)		**133**		**133**	**100.0%**	**0.30 [0.10, 0.88]**
Total events	5		16			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 1.15$, df = 2 (P = 0.56); $I^2 = 0\%$

Test for overall effect: Z = 2.20 (P = 0.03)



Compliance -> Improve ?

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Improving compliance with surgical antibiotic prophylaxis guidelines: A multicenter evaluation

Cristiane Schmitt PhD [a,*], Rubia Aparecida Lacerda PhD [a],

Results: Full compliance was 10% and was associated with weekly hours of infection control personnel per intensive care unit bed (95% CI, 0.2–0.1), hospital-wide dissemination of SAP guidelines (95% CI, 1.2–25.1), monitoring (95% CI, 1.2–25.1), and feedback of compliance rates (95% CI, 3.8–25.2). Daytime procedures had greater compliance regarding drug dose (odds ratio [OR], 3.38; 95% confidence interval [CI], 1.72-6.65) and initial time (OR, 2.30; 95% CI, 1.24-4.25). Spinal procedures achieved greater compliance with initial time (OR, 1.83; 95% CI, 1.12-3.01) and duration (OR, 1.59; 95% CI, 1.7-2.16).

Conclusions: A low level of compliance was identified, which pointed out the need for an innovative stewardship approach to improve adherence to SAP guidelines. Targeted training programs need to be developed to ensure dissemination of guidelines among surgeons. Monitoring, feedback, and closer interaction between the infection control personnel and the surgical team are key factors for better compliance rates of SAP.

Increasing Compliance With an Antibiotic Prophylaxis Guideline to Prevent Pediatric Surgical Site Infection

Before and After Study

Jeannette P. So, MSc, Ilyas S. Aleem, MD,† Derek S. Tsang, MD,‡ Anne G. Matlow, MD, MSc, FRCPC,§ and James G. Wright, MD, MPH, FRCSC*¶; for The SickKids Surgical Site Infection Task Force*

Methods: evidence-based AP guideline.

Guideline posted in operating rooms and the online formulary,

only recommended antibiotics were available in operating rooms,

incoming trainees received orientation,

antibiotic verification was included in time-out,

computerized alerts were set for inappropriate postoperative prophylaxis, and surgeons received e-mails when guideline was not followed.

Results: AP 43.9% (187/426) **-> 62.0%** (124/200) **.** Improve:

appropriate antibiotic use (51.6%–67.0%), complete (26.2%–53.2%), *correct dosage (77.5%–90.7%) timing* (83.3%–95.8%*), redosing (62.5%–95.8%,), and duration* (47.1%–65.3%*). (P<0.01)*

Ann Surg 2015;262:403–408

Hiệu quả Chương trình Giám sát sử dụng kháng sinh dự phòng - BVCR

TS Phạm Thị Ngọc Thảo-2017

và tỷ lệ nhiễm khuẩn vết mổ khi tuân thủ sử dụng [illegible]

Đối tượng và phương pháp nghiên cứu: Tiến hành nghiên cứu mô tả cắt ngang 311 bệnh nhân được phân loại phẫu thuật sạch, sạch nhiễm trong tháng 6 năm 2016 tại 6 khoa Ngoại, bệnh viện Chợ Rẫy và hồi cứu 301 bệnh nhân được phẫu thuật sạch, sạch nhiễm trong tháng 6/2015 để so sánh hiệu quả can thiệp

Những can thiệp thực hiện trong năm 2016

1. Ra quy định về việc tuân thủ hướng dẫn sử dụng kháng sinh dự phòng trong phẫu thuật
2. Quy định phân tầng nguy cơ nhiễm khuẩn vết mổ
3. Xây dựng bảng kiểm sử dụng kháng sinh dự phòng
4. Giám sát hồ sơ bệnh nhân phẫu thuật sạch, sạch nhiễm và báo cáo trong họp kháng sinh định kỳ.

Kết quả: Tuổi trung bình của hai nhóm nghiên cứu là 48,4 ± 19,1 tuổi (2015) và 50,1 ± 18,4 tuổi (2016). Nam nữ có tỷ lệ tương đương nhau. Tỷ lệ tuân thủ hướng dẫn sử dụng kháng sinh dự phòng trong phẫu thuật trước giám sát (2015) là 14 % và sau giám sát một năm (2016) là 62,4% . Số ngày sử dụng kháng sinh giảm 40.000 ngày, số tiền tiết kiệm khoảng 4 tỷ đồng. Thời gian nằm viện giảm trung bình 2,1 ngày. Tỷ lệ nhiễm khuẩn vùng mổ là 4% (2016) so với 6% (2015). Các yếu tố làm tăng nguy cơ nhiễm khuẩn vết mổ là phẫu thuật sạch nhiễm (OR = 3,47) và sử dụng kháng sinh dự phòng không đúng liều hoặc không đúng thời điểm (OR = 6,75).

Kết luận: Chương trình giám sát sử dụng kháng sinh trong sử dụng kháng sinh dự phòng trong phẫu thuật mang lại nhiều hiệu quả. Tỷ lệ tuân thủ hướng dẫn sử dụng kháng sinh của bệnh viện tăng lên, thời gian điều trị hậu phẫu rút ngắn, hiệu quả kinh tế rõ rệt đặc biệt không làm tăng tỷ lệ nhiễm khuẩn vùng mổ.

Conclusions

Surgical antibiotic prophylaxis : Decrease surgical site infection (SSI)

- Type : freq. Cefazolin/ vancomycin - Redose
- Timing: 120 -60 minutes pre-incision
- Duration: 24h -48h
- Improving Compliance : (Guideline + training)

-> Manage SSI, Economic efficiency

Thanks for Your Attentions!