Impact des programmes de bon usage des anti-infectieux

P. Lesprit

Infectiologie transversale, Service de Biologie Clinique

Hôpital Foch

Antimicrobial stewardship ?

- Intraduisible …
- Programme de bon usage, police des antibiotiques (terme assumé)
- ‘Objective : The primary goal is to achieve **optimum clinical outcomes** and ensure cost-effectiveness of therapy while keeping to a **minimum unintended consequences of anti microbial use**, including toxic effects, selection of pathogenic organisms, and the emergence of resistance.’

Dellit TH., Clin Infect Dis 2007

Actions à mettre en place

- Répondre aux demandes d’avis
- Alertes générées par le laboratoire de microbiologie
- Alertes générées par la pharmacie
- Education des prescripteurs

Comment démontrer la valeur d'un AMS
(notamment à votre direction)

- Impact clinique

Mortalité, durée de séjour, réadmission

- Impact sur la qualité de la prise en charge

Exposition aux antibiotiques

Délai antibiothérapie efficace, durée

Infection à *C. difficile,* contrôle de la résistance bactérienne

- Impact économique

Coûts antibiotiques, prise en charge globale

- Indicateurs de qualité

Prévention des infections associées aux soins, infections à BMR

Nagel JL., Clin Infect Dis 2014

C’est écrit dans la bible ! 368 pages …

Cochrane Library

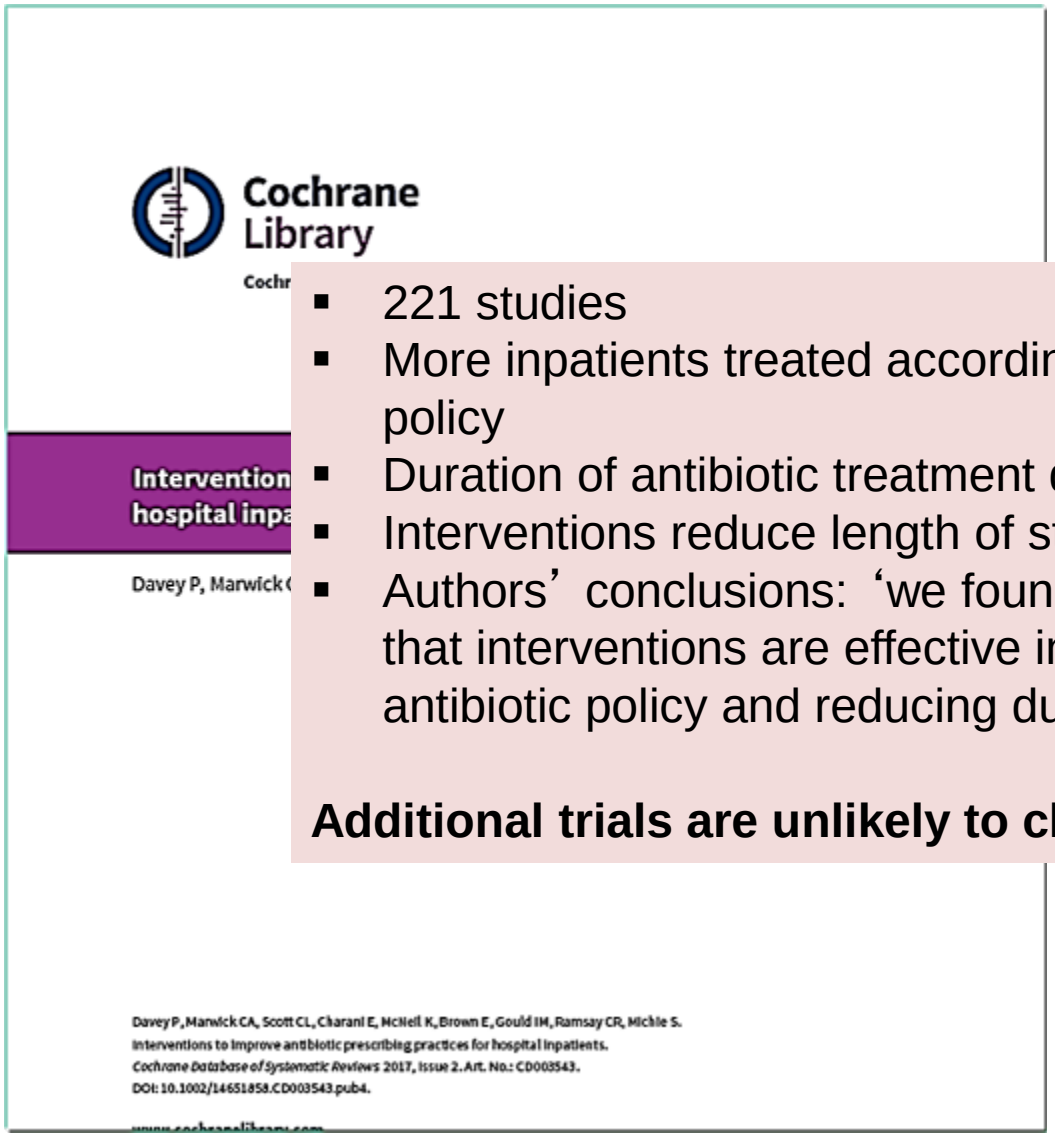
Cochrane Database of Systematic Reviews

Interventions to improve antibiotic prescribing practices for hospital inpatients (Review)

Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, Gould IM, Ramsay CR, Michie S

Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, Gould IM, Ramsay CR, Michie S.
Interventions to improve antibiotic prescribing practices for hospital inpatients.
Cochrane Database of Systematic Reviews 2017, Issue 2. Art. No.: CD003543.
DOI: 10.1002/14651858.CD003543.pub4.

Pourquoi investir dans un programme de bon usage ?



- 221 studies
- More inpatients treated according to antibiotic prescribing policy
- Duration of antibiotic treatment decreased by 1.95 days
- Interventions reduce length of stay by 1.12 days
- Authors' conclusions: 'we found **high-certainty evidence** that interventions are effective in increasing compliance with antibiotic policy and reducing duration of antibiotic treatment.

Additional trials are unlikely to change our conclusions'

Meilleure prise en charge des bactériémies

	Suivi +	Suivi -	P
N	112 (46%)	132 (54%)	
Guérison	89 (79.5%)	85 (64.4%)	0.01
Rechute	7 (6.3%)	24 (18.2%)	< 0.01
Mortalité attribuable	9 (8%)	9 (6.8%)	NS

Fowler VG, Clin Infect Dis 1998

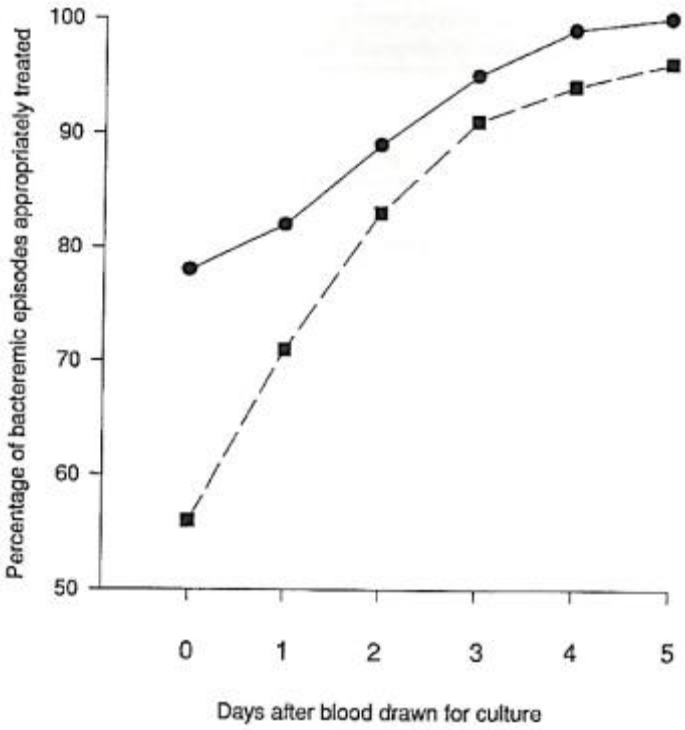


Figure 1. Proportion of bacteremic episodes appropriately treated by infectious disease specialists (*circles*) and other physicians (*squares*) over time. The difference between the two curves is statistically significant during the first 2 days ($P < .05$ [χ^2]).

Byl B, Clin Infect Dis 1999

Notamment pour les bactériémies graves

Bactériémies à *S. aureus* : réduction de la mortalité de 66%

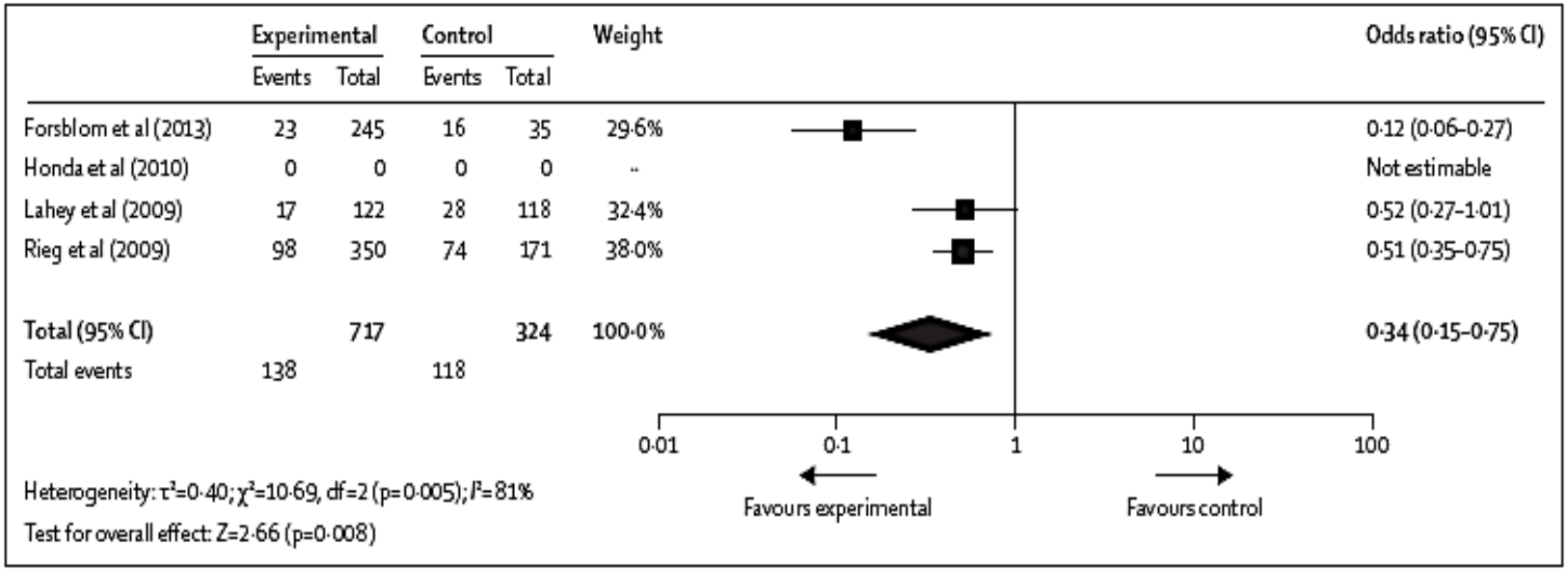


Figure 4: Effect of bedside consultation for *Staphylococcus aureus* bacteraemia on mortality

Schuets E.C. Lancet Infect Dis 2016

Impact of an intervention in the management and outcome of *S. aureus* bacteremia

Table 4. Adherence to Quality-of-Care Indicators

Quality-of-Care Indicator	Preintervention Period	Intervention Period	Median Improvement in Percentage of Adherence to QCI (IQR)	Relative Risk for Adherence to CQI (95% CI)	*P* Value	Adjusted OR for Adherence to QCI (95% CI)[a]	*P* Value
Follow-up blood culture	131/214 (61.2)	159/198 (80.3)	25 (5.9–54.4)	1.31 (1.15–1.49)	<.001	2.83 (1.78–4.49)[b]	<.001
Source control	86/122 (70.2)	105/115 (91.3)	22 (10.2–50)	1.29 (1.13–1.49)	<.001	4.56 (2.12–9.79)[c]	<.001
Echocardiography	76/144 (52.8)	74/101 (73.3)	18.8 (0–65.7)	1.38 (1.13–1.68)	.001	2.50 (1.42–4.41)[d]	.002
Early cloxacillin in MSSA	120/211 (56.9)	124/174 (71.3)	11.1 (0–51.1)	1.25 (1.07–1.45)	.014	1.79 (1.15–2.78)[e]	.009
Vancomycin dosing	23/49 (46.9)	30/54 (55.6)	20 (0–54.3)	1.18 (.80–1.73)	.38	1.42 (.65–3.10)[f]	.38
Treatment duration	151/207 (72.9)	161/189 (85.2)	10.2 (2–20.2)	1.16 (1.05–1.29)	.003	2.13 (1.24–3.64)[g]	.006

Table 7. Multivariate Analyses of Variables Associated With 14- and 30-Day Mortality Among Patients With *Staphylococcus aureus* Bacteremia

Variables	OR (95% CI)	*P* Value
14-day mortality		
Age >60 y	2.97 (1.51–5.87)	.002
Pitt score >2	3.04 (1.74–5.33)	<.001
High-risk source[a]	2.80 (1.32–5.92)	.007
Intervention	0.49 (.28–.87)	.016
30-day mortality		
Age >60 y	3.48 (1.89–6.41)	<.001
Pitt score >2	2.34 (1.40–3.92)	.001
High-risk source[a]	3.11 (1.54–6.26)	.001
Intervention	0.59 (.36–.97)	.04

López-Cortés LE. et al, Clin Infect Dis 2013

Meilleure prise en charge du sepsis aux urgences

	Pre	Post	p
N	195	187	
Avis	15 (7,7%)	187 (100%)	
Compliance*	9 (4,6%)	59 (32%)	<0.001
ATB appropriée	58 (30%)	148 (79%)	<0.001
Modification antibiothérapie	86 (44%)	110 (59%)	0.004
Mortalité J14	77 (39%)	53 (29%)	0,02

* Survival Sepsis Campaign bundle

Viale P, Clin Infect Dis 2017

Meilleure prise en charge du sepsis aux urgences

Mortalité à J14 : multivariée

	aHR (95% CI)	p
Age	1.01 (1.00-1.03)	0.05
qSOFA ≥ 2	1.68 (1.15-2.45)	0.007
Lactate > 2	2.13 (1.39-3.25)	<0.001
Source de l'infection	2.07 (1.42-3.02)	<0.001
Post phase	0.64 (0.43-0.94)	0.026

Mais moyens … hôpital 1420 lits; 13 IDP, 24/24 7 jours sur 7

Viale P, Clin Infect Dis 2017

Contrôle de la résistance aux antibiotiques

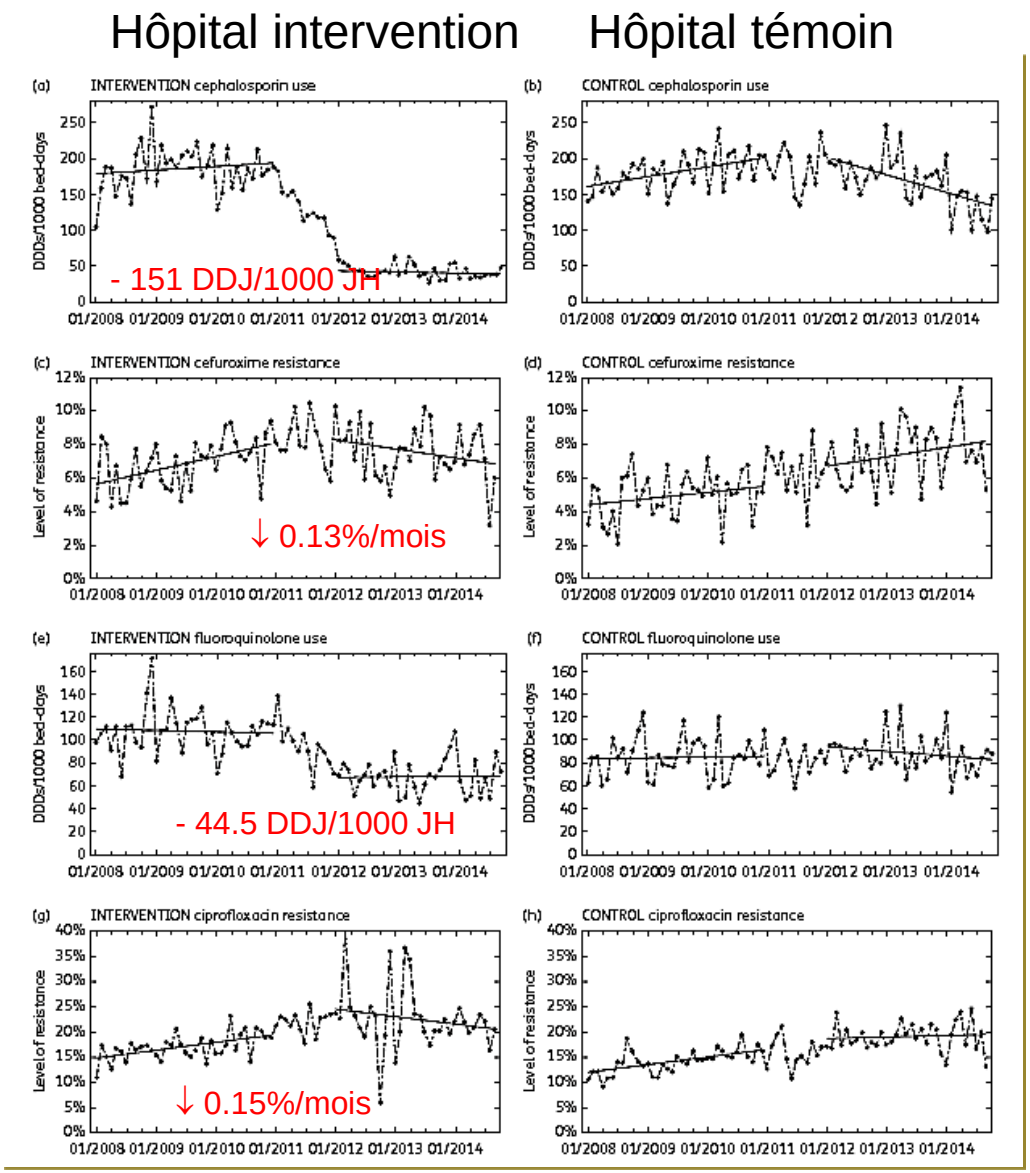
Danemark : hôpital intervention (736 lits)

Mise en place du programme	Phases
Audit	Audit des prescriptions : binôme infectiologue/microbiologiste
Présentation des résultats	Ecrit/oral
Nouvelles recommandations antibiothérapie curative et prophylaxie	Remplacement des céphalosporines et FQ : pénicillines G, A, M et gentamicine Phase test : médecine et urgences
Mise en place d'une équipe mobile	Infectiologue, microbiologiste, pharmaciens
Retrait des molécules cibles	Suppression du formulaire et du stock des services, dispensation contrôlée
Audits	Audits mensuels dans les services
Feedback	Feedback mensuel des consommations des céphalosporines et FQ

Boel J, J Antimicrob Chemother 2016

Contrôle de la résistance aux antibiotiques

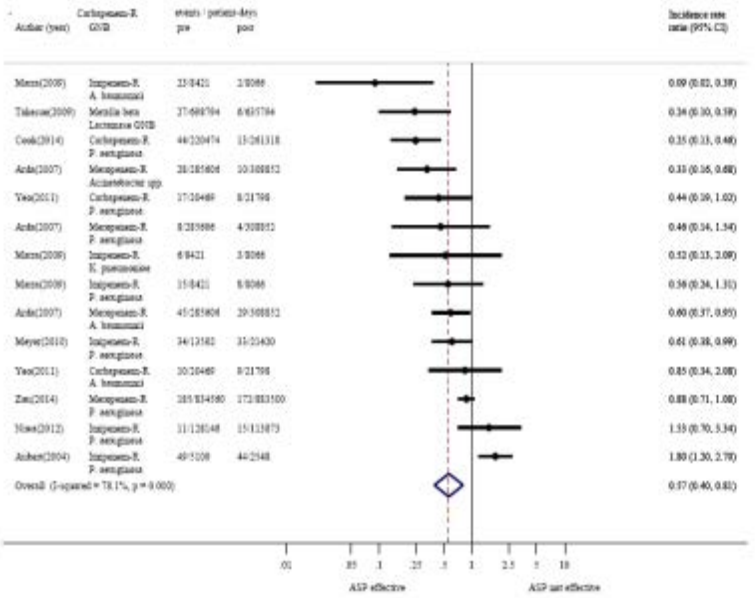
- Danemark
- Intervention sur céphalosporines et fluoroquinolones



Boel J, J Antimicrob Chemother 2016

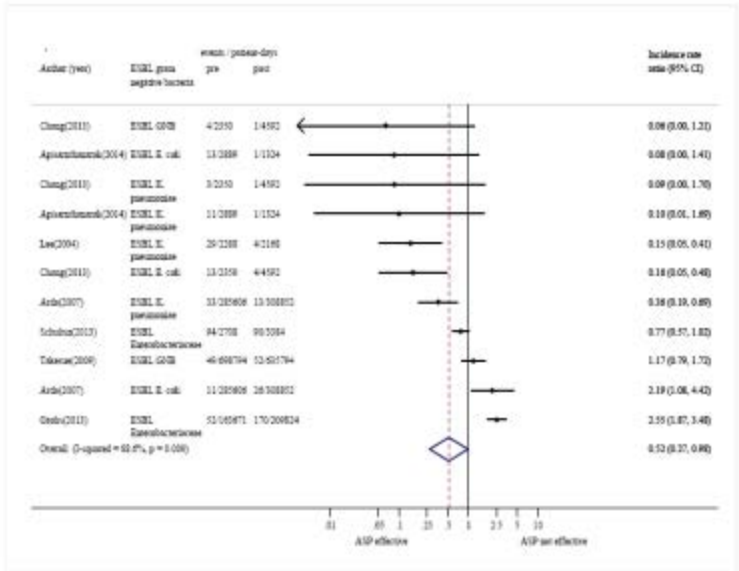
Contrôle de la résistance aux antibiotiques

Figure 4: Forest plot of the incidence rate ratios among studies targeting the effect of antibiotic stewardship on the incidence of carbapenem-resistant Gram negative bacteria



BGN R aux carbapénèmes
Incidence rate ratio 0,57 (0-40-0,81)

Figure 5: Forest plot of the incidence rate ratios among studies targeting the effect of antibiotic stewardship on the incidence of ESBL-producing Gram negative bacteria



E-BLSE
Incidence rate ratio 0,52 (0-27-0,98)

Baur D, Lancet Infect Dis 2017

CI = confidence interval; ESBL = extended spectrum ß-lactamase producer; GNB = gram-negative bacteria; ASP = Antimicrobial stewardship programme

Contrôle de la résistance aux antibiotiques

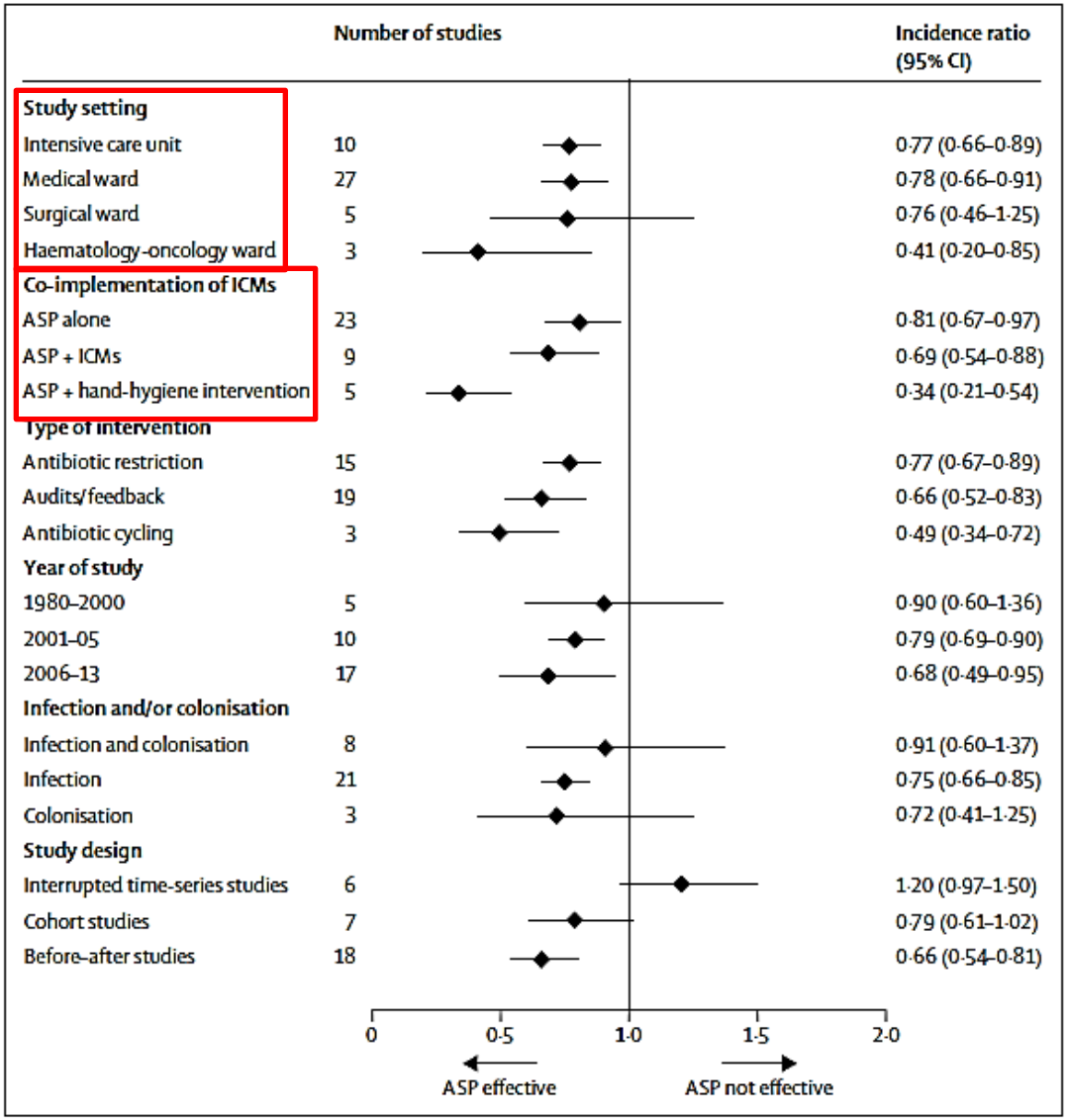


Figure 5: **Summary forest plot of the incidence ratios for studies investigating the effect of ASPs on antibiotic resistance, according to study characteristics**
ICM=infection control measure. ASP=antibiotic stewardship programme.

Baur D, Lancet Infect Dis 2017

J Antimicrob Chemother 2014; **69**: 1748–1754
doi:10.1093/jac/dku046 Advance Access publication 14 March 2014

Journal of Antimicrobial Chemotherapy

Effect of antibiotic stewardship programmes on *Clostridium difficile* incidence: a systematic review and meta-analysis

Leah M. Feazel[1], Ashish Malhotra[1,2], Eli N. Perencevich[1,2], Peter Kaboli[1,2], Daniel J. Diekema[1] and Marin L. Schweizer[1,2]*

Infections à *C. difficile* : réduction 52%

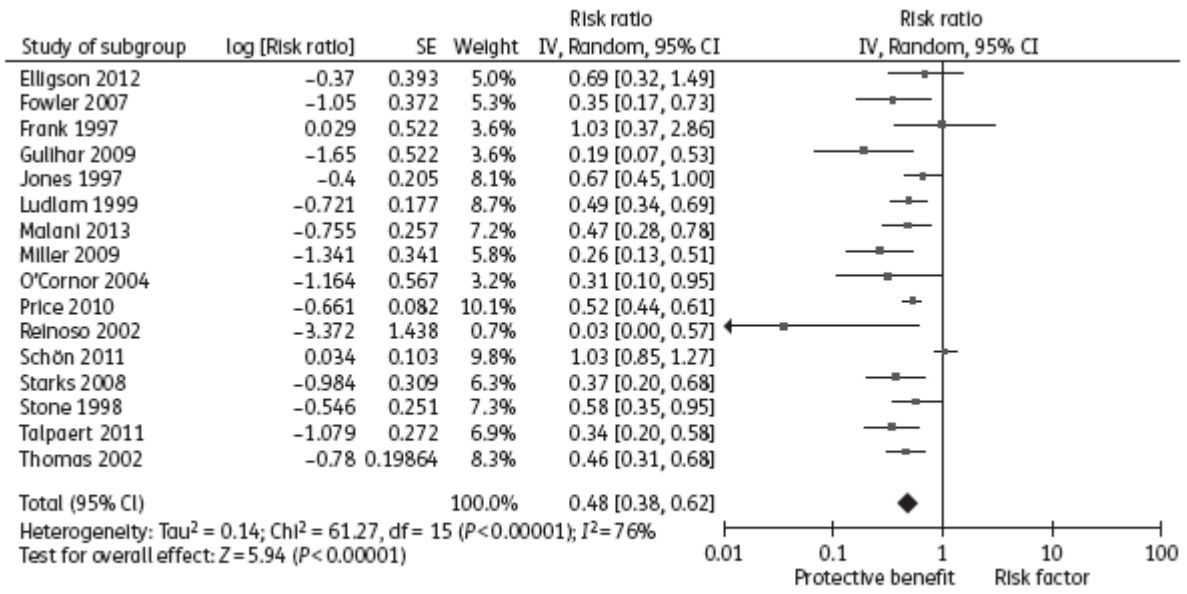
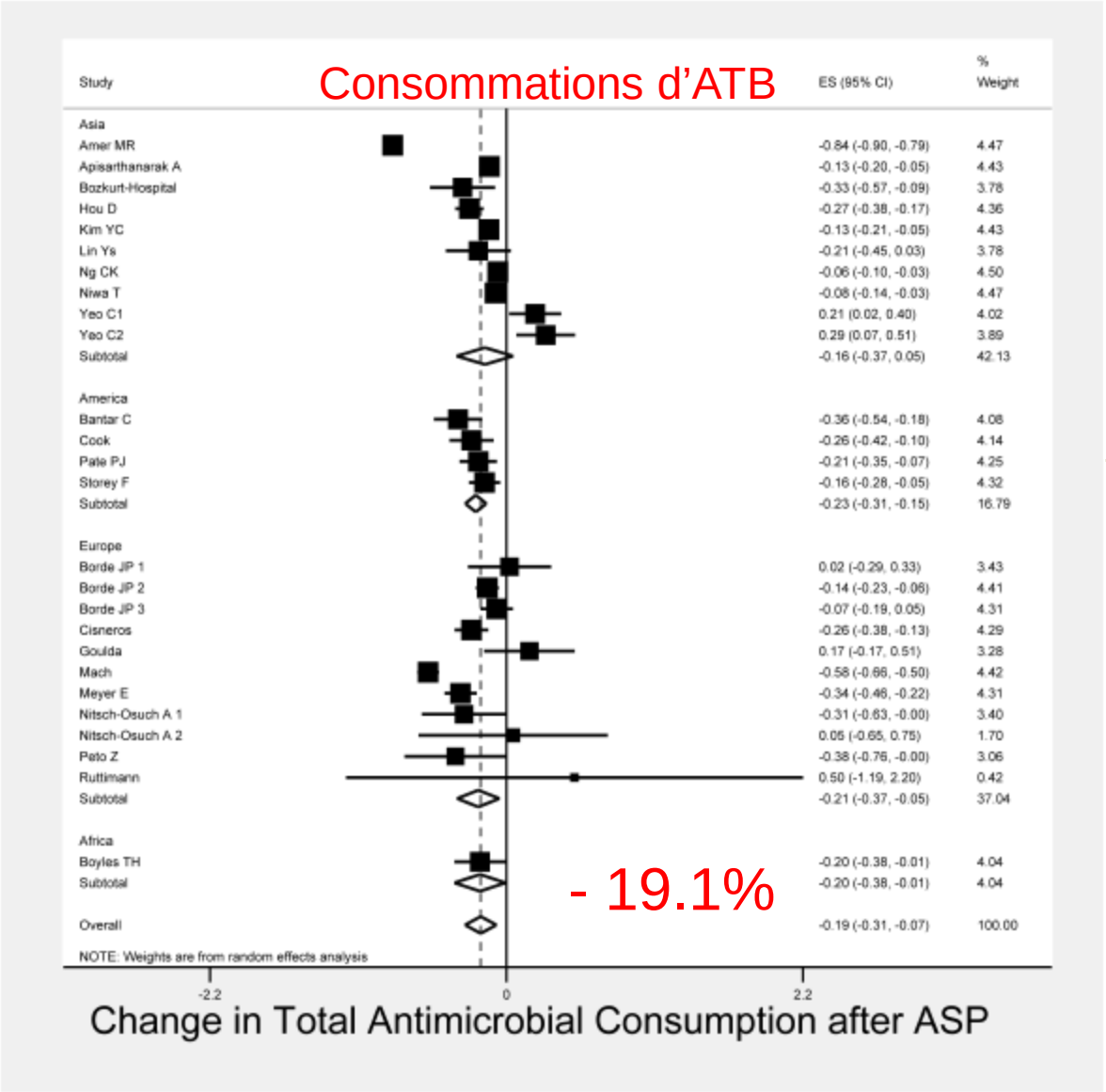
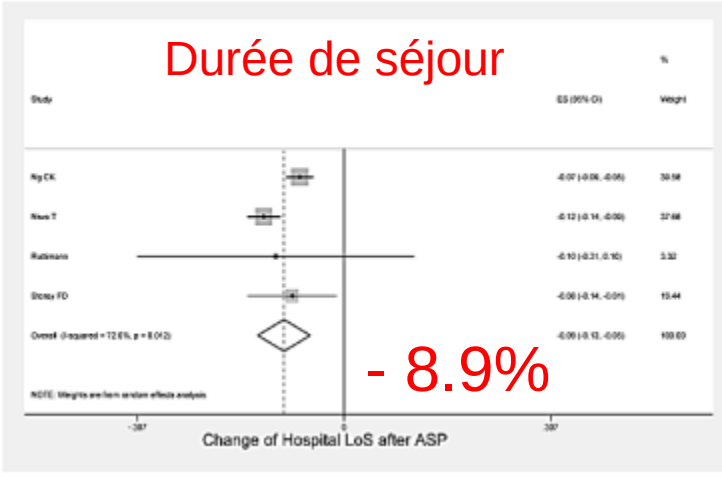
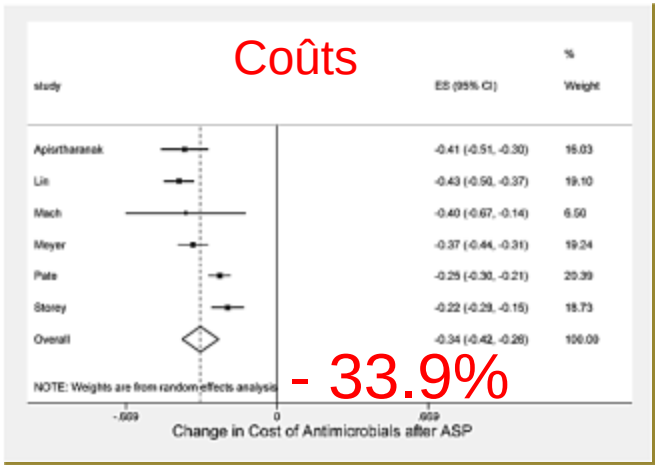


Figure 4. Forest plot of all included studies. IV, inverse variance.

Impact : consommations, durée de séjour et coûts







Karanika S,
Antimicrob Agents Chemother 2016

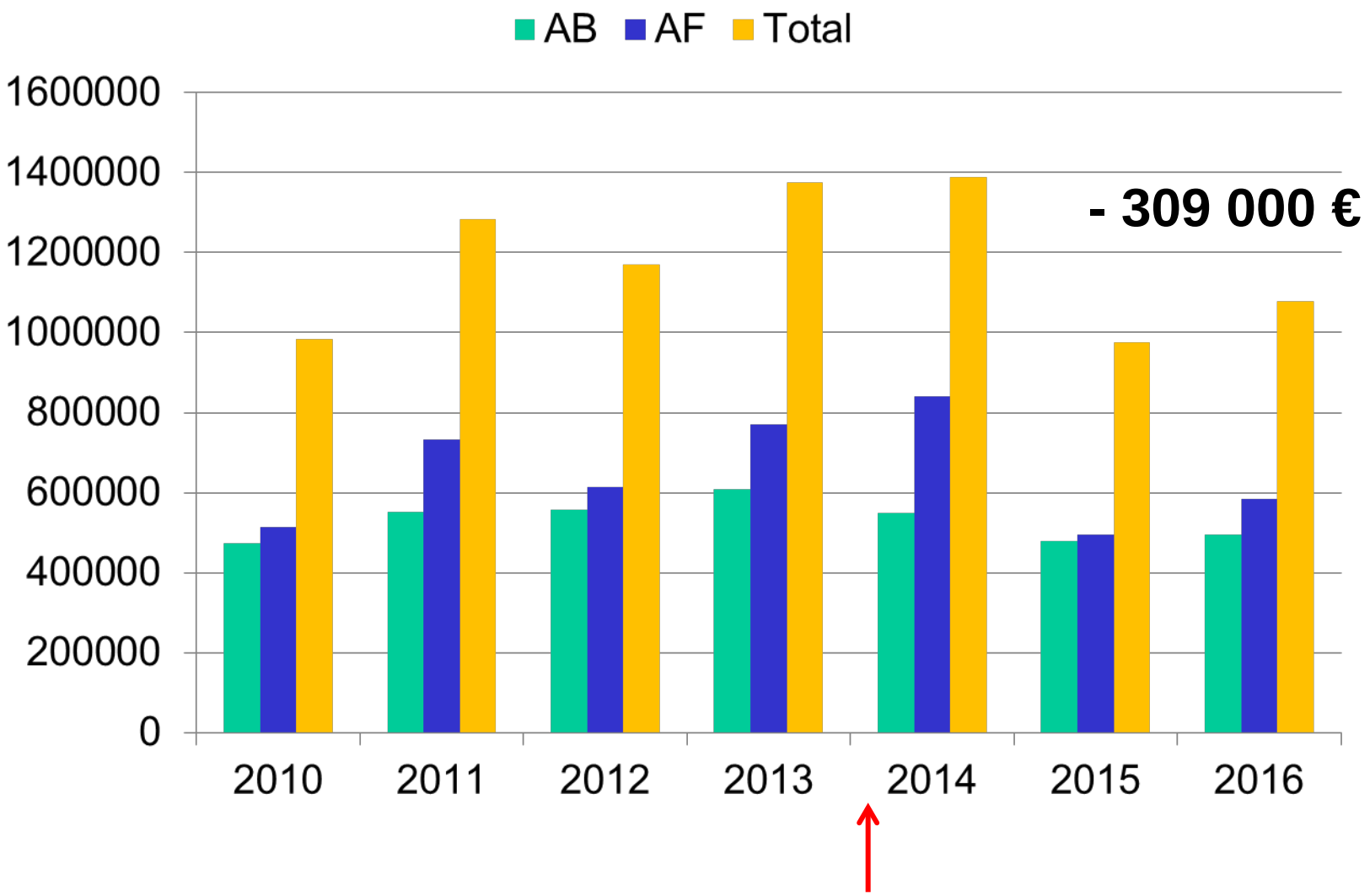
problème : comment financer un poste de praticien hospitalier sur cette activité?

- Étude prospective sur 3 mois en réanimation médicale à Grenoble
- intervention quotidienne d'un référent
- 191 patients : 92 observés et 99 ITV
- Économie : **22,4%**

	Consommation période Contrôle	Consommation période intervention	Gains/pertes	Ecart-moyen par patient	IC95%
Anti-infectieux	81 468.15€	65 529.85€	**-15 938.30€**	**- 216.8€**	[-568.4-1002.0]
Antibiotiques	21 888.20€	21 741074€	**- 146.46€**	**-16€**	[-104.9-136.9]
Antifongiques	57 175.11€	40 860.46€	**-16 314.65€**	**-204.6€**	[-498.8-908.0]
Antiviraux	2404.84€	2927.65€	+522.81€	+3.8€	[-31.4-43.8]

P Pavese. Réanimation 14 (2005) 281–287

Dépenses en anti-infectieux (ESPIC)



Valorisation du codage

- Hôpital St Louis, Paris
- Procédure d'aide au codage DIM à partir de la consultation de l'EMI
- Codage PMSI des infections prises en charge par l'EMI
- Revue des séjours avec sous codage par le service
- Bilan année 2016 :

Séjours = 1813

GHM modifiés = 271(niveau 4 = 121)

Recette moyenne = 3700 €

Total recettes = 1 002 782 €

Données M. Lafaurie

Comment développer un programme de bon usage

- **Equipe multidisciplinaire :**

Infectiologue + pharmacien (A-II)
± microbiologiste, informaticien, hygiéniste, épidémiologiste (A-III)
Collaboration avec la pharmacie et l'EOH (A-III)
Soutien de l'administration (A-III)
Programme qualité et sécurité du patient (A-III)

- **Deux types de stratégies :**

Audit prospectif avec intervention et retour au prescripteur :
↓ des prescriptions inappropriées (A-I)

Restriction et validation des prescriptions :
↓ de l'utilisation et du coût (A-II)
une des mesures efficaces en cas d'épidémie (B-II)

- **Autres mesures :**

Education
- **Appropriation du programme (A-III)**
- **Modification des pratiques (B-II)**

Guides
- **Utilisation des antibiotiques (A-I)**

Rotation
- **Non recommandée pour la maîtrise de la résistance (C-II)**

Association d'antibiotiques
- **Non recommandée pour la maîtrise de la résistance (C-II)**

Désescalade
- **↓ exposition aux ATB et du coût (A-II)**

Optimisation des posologies (A-II)

Relais oral
- **↓ durée hospitalisation et coût (A-I)**

Dellit TH, Clin Infect Dis 2007

What is the More Effective Antibiotic Stewardship Intervention: Pre-Prescription Authorization or Post-Prescription Review with Feedback?

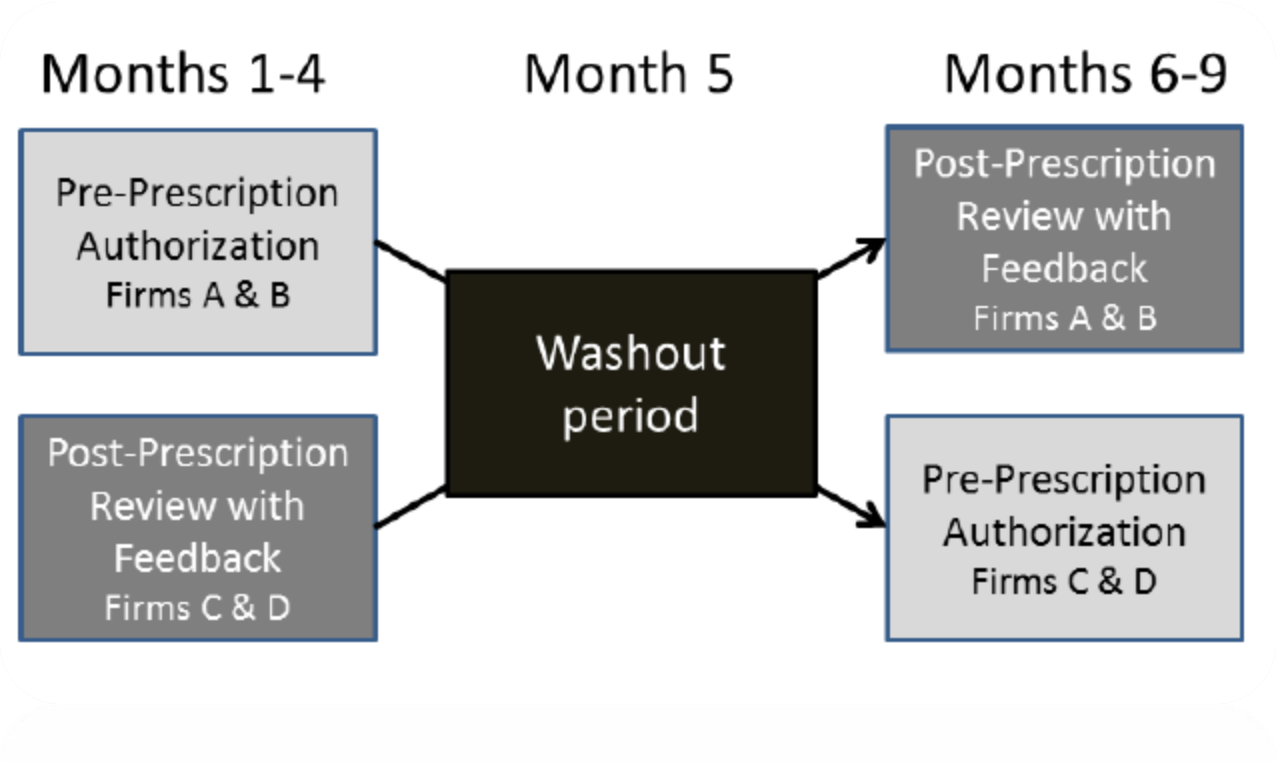


Figure 2: Study design comparing antibiotic use among providers receiving pre-prescription authorization versus post-prescription review with feedback antibiotic stewardship strategies

Tamma P.D, Clin Infect Dis 2016

What is the More Effective Antibiotic Stewardship Intervention: Pre-Prescription Authorization or Post-Prescription Review with Feedback?

Figure 3

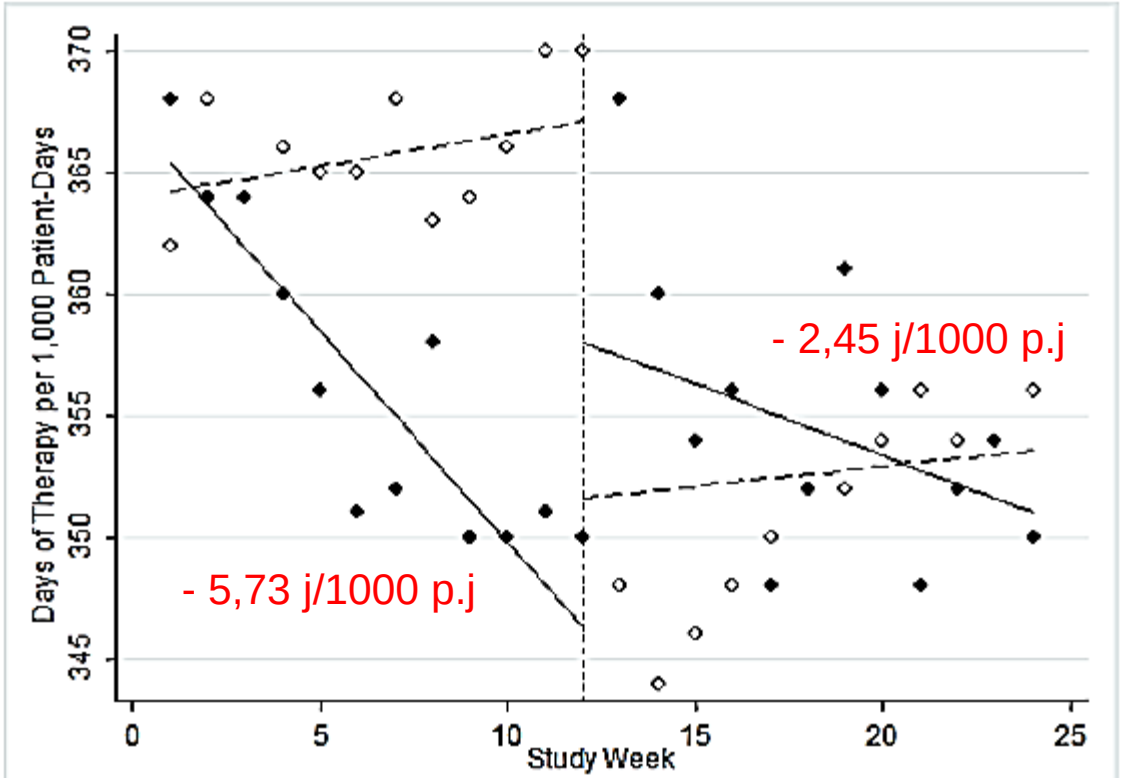


Figure 3: Time-series analyses comparing days of antibiotic therapy per 1,000 patient-days during the study period. Dotted line indicates pre-prescription authorization and solid line indicates post-prescription review with feedback. Dotted vertical line represents the wash-out period, during which antibiotics were not adjudicated.

Tamma P.D, Clin Infect Dis 2016

Réévaluation systématique de l'antibiothérapie

	Intervention group* (n=376)	Control group (n=377)	P
ATB modification (%)			
▪ **Any**	288 (76.6)	97 (25.7)	**<.001**
▪ **Stopping therapy**	78 (20.7)	15 (0.4)	**<.001**
▪ **Shortening duration**	91 (24.2)	24 (6.3)	**<.001**
▪ **De-escalating**	90 (23.9)	9 (0.2)	**<.001**
▪ Oral switch	57 (15.2)	47 (12.4)	0.28
▪ Other	66 (17.5)	24 (6.3)	**<.001**

* Compliance rate was 85.0%

Lesprit P., Clin Microbiol Infect 2012

Sans impact clinique négatif

	Intervention group (n=376)	Control group (n=377)	P
Length of stay, median (IQR)			
Overall	15 (9-25)	15 (9-27)	0.95
Community-acquired inf.	5 (3-10)	6 (3-14)	**0.06**
In-hospital mortality (%)	37 (9.8)	38 (10.1)	0.91
ICU admission within 7 days (%)	7 (1.9)	6 (1.6)	0.78
New course of antibiotic therapy (%)	17 (4.5)	25 (6.6)	0.21
Antibiotic treatment for **relapsing infection** (%)	13 (3.4)	30 (7.9)	**0.01**

Lesprit P., Clin Microbiol Infect 2012

Dans les hôpitaux « de petite taille »

Table 3 Characteristics of 313 AST audits with one or more recommendations

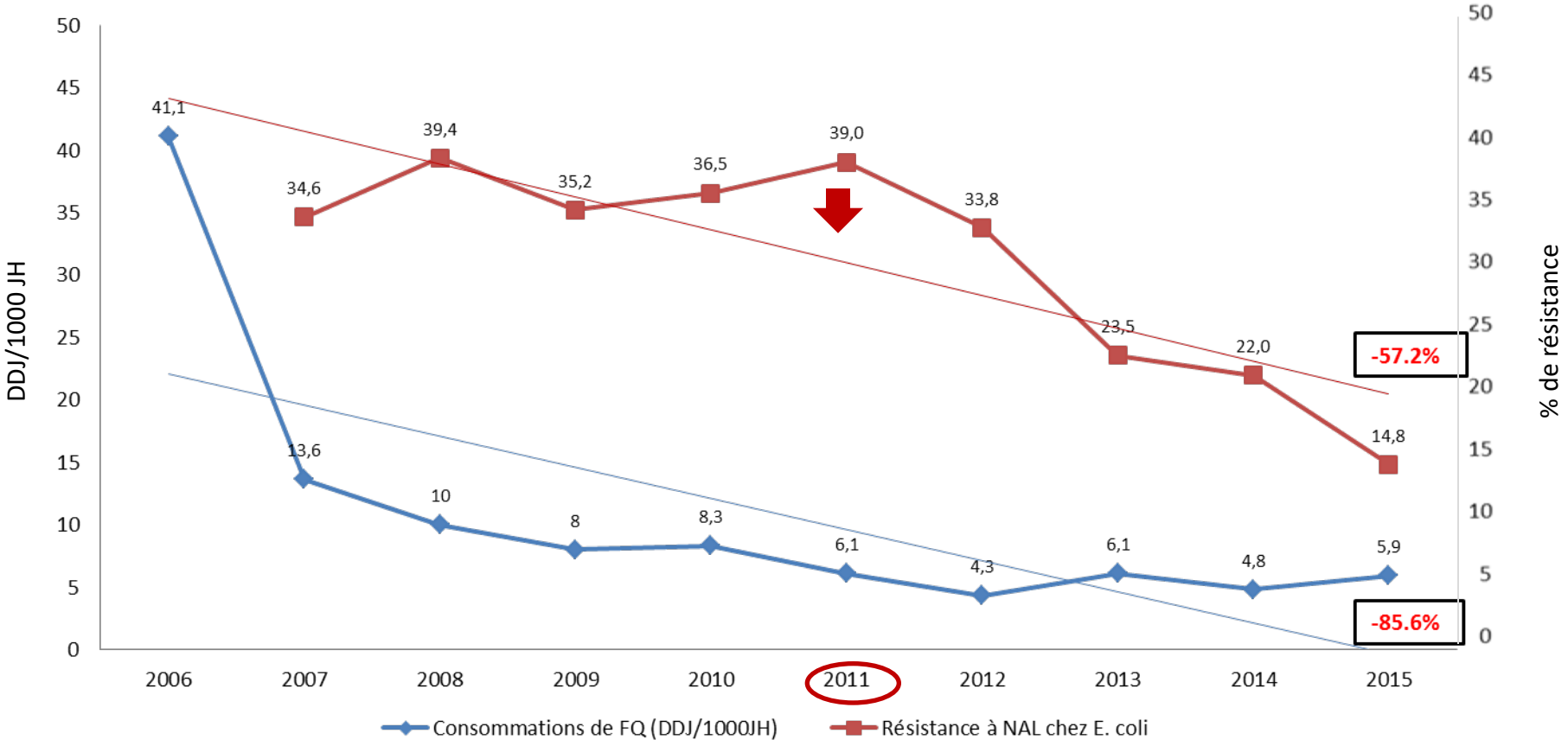
Recommendation category	Number of audits	Implemented recommendations	Implementation rate (%)
All	313	234	75
Discontinue all agent(s)	115	85	74
De-escalate[a]	65	53	82
Limit duration[b]	21	13	62
Consult infectious diseases	19	16	84
Optimize dose	14	7	50
Broaden [c]	5	3	60
Convert parenteral to oral[d]	3	3	100
More than 1 category	71	54	76

- DDJ/100 admissions - 22% (P = .006)
- Coût ATB/admission - 32% (P = .013)

Storey *et al. Antimicrobial Resistance and Infection Control* 2012, **1**:32

Résultats

Evolution des consommations et de la résistance de FQ au CH de Morteau



Muller A, RICAI 2017

Audit and Feedback to Reduce Broad-Spectrum Antibiotic Use among Intensive Care Unit Patients: A Controlled Interrupted Time Series Analysis

- 3 ICU, 48 lits
- Audit : > 3 jours d'ATB spectre large (C3G, pénicillines + inhibiteurs, carbapénèmes, quinolones, vancomycine)
- J3 et J10
- EMA : binôme pharmacien/infectiologue
- Sur 12 mois : 717 prescriptions, modification 34%, compliance 82%
- Modifications : arrêt 56%, changement 26%, autres 8%

Elligsen M, Infect Control Hosp Epidemiol 2012

Même chez les patients les plus graves

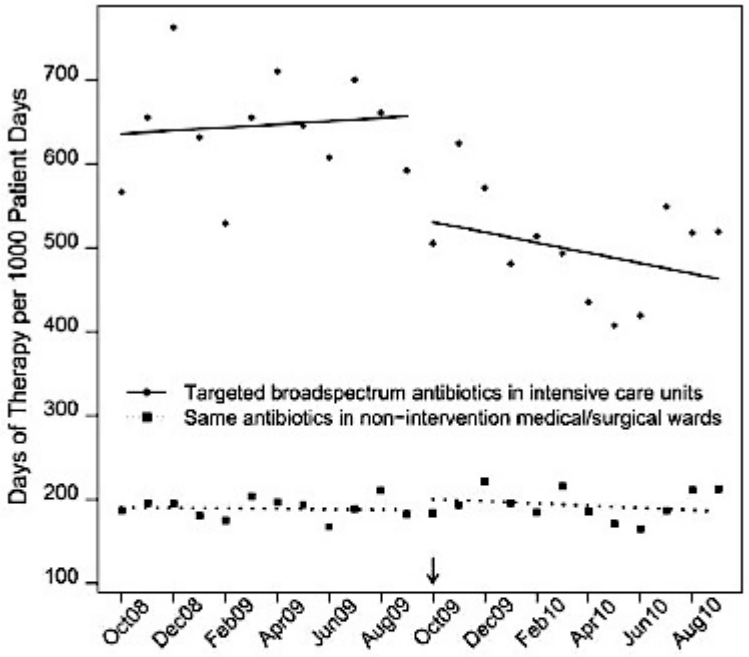


FIGURE 1. Monthly use of broad-spectrum antibiotics in critical care patients and control medical and surgical ward patients. This autoregressive integrated moving average model demonstrated a significant decrease of −119 days of therapy per 1,000 patient-days (standard error, 37.9; $P = .0054$) in the use of targeted antimicrobials immediately after the audit and feedback intervention was implemented in October 2009. The use of these same targeted antimicrobials did not change in those medical and surgical units that did not receive the audit and feedback intervention (dotted line).

- Consommation globale :

1134 -> 985 j/1000 pts (p=0.003)

- Mortalité :

13.1% -> 14.4% (p=0.20)

- Coût ATB :

- 95 000 $ (-23.7%)

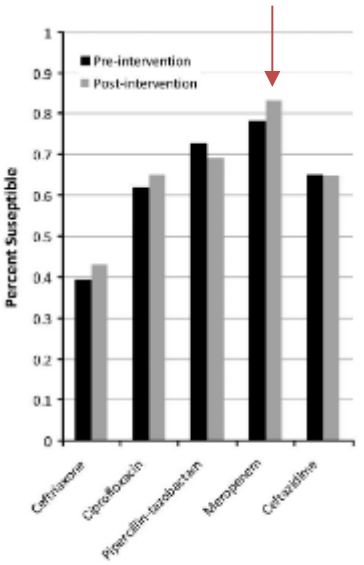


FIGURE 3. Overall susceptibility of gram-negative bacteria isolated from intensive care unit patients during the preintervention period versus during the postintervention period. The increase in meropenem susceptibility (from 78.2% to 83.4% of isolates) was statistically significant ($P = .03$).

Elligsen M, Infect Control Hosp Epidemiol 2012

Contrôle de la prescription des carbapénèmes

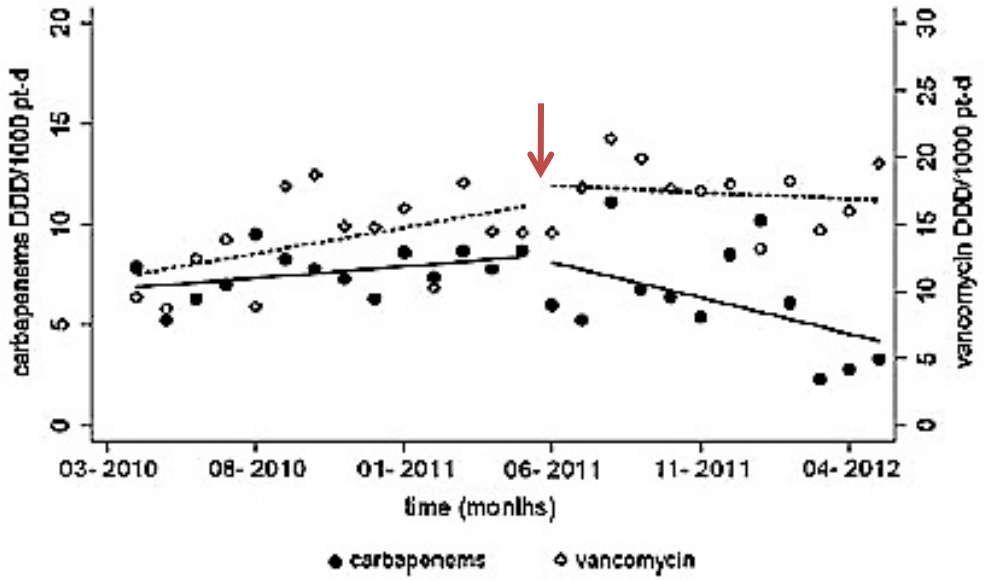


Fig. 1 Intervention effect on carbapenems and vancomycin consumptions. Carbapenems consumption is represented by *filled symbols* and vancomycin consumption is represented by *open symbols*. Consumption trends are represented by *lines*. The diffusion period was from May to July 2011. Only carbapenems consumption was affected by the intervention with a direct and sustained decreasing effect: (1) change in mean (−1.66 DDD/1,000 pt-d, p=0.048) corresponding to the global consumption change between the pre- and intervention periods; (2) change in level (−5.34 DDD/1,000 pt-d, p=0.049) corresponding to the consumption change at the start of the intervention; (3) change in slope (−2.66 DDD/1,000 pt-d, p=0.02) corresponding to the consumption change during the intervention period

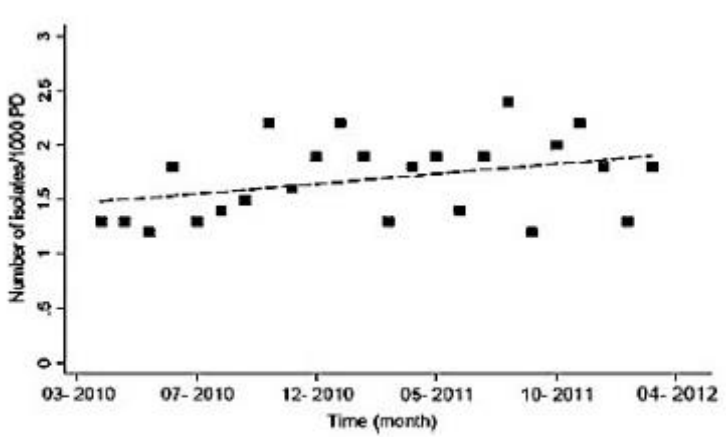


Fig. 2 ESBL-PE evolution among study. Trend (*dashed line*) to a linear increase in the monthly incidence of ESBL-PE (0.02/1,000 pt-d; p=0.093)

Delory T. et al, Eur J Clin Microb Infect Dis 2012

Réévaluation des prescriptions de carbapénèmes

Réévaluation	Globale, nb (%)	Service, nb (%)	Référent, nb (%)
Désescalade*	176 (52.2)	63 (18.7)	113 (33.5)
Réduction durée	24 (7.1)	0 (0)	24 (7.1)
Relai per-os	20 (6.0)	15 (14.5)	5 (1.5)
Arrêt	51 (15.1)	32 (9.5)	19 (5.6)
Autre	7 (2.1)	0 (0)	7 (2.1)
Total	258 (76.6)	95 (28.2)	163 (48.4)

* céfoxitine, céfotaxime/ceftriaxone, céfépime, n=83 (47.2%); pip/taz, n= 48 (27.3%)

76.6% de modifications thérapeutiques, délai médian de 2 jours [1;4]

Delory T. et al, Eur J Clin Microb Infect Dis 2012

Clinical Infectious Diseases

MAJOR ARTICLE

The Impact of a Reported Penicillin Allergy on Surgical Site Infection Risk

Kimberly G. Blumenthal,[1,2,3,4] Erin E. Ryan,[5,6] Yu Li,[1,2] Hang Lee,[4,7] James L. Kuhlen,[8] and Erica S. Shenoy[2,4,5,6]

DOI: 10.1093/cid/cix794

- 8385 patients, 9004 interventions
- Allergie pénicilline n=922 (11%)
- ISO n=241 (2,7%)
- Antibioprophylaxie céfazoline : 12% vs. 92% (p <0,001)
- Multivariée

Allergie pénicilline augmente de 51% le risque d'ISO

J Antimicrob Chemother 2017; **72**: 2657–2660
doi:10.1093/jac/dkx171 Advance Access publication 10 June 2017

Journal of Antimicrobial Chemotherapy

Optimizing preoperative prophylaxis in patients with reported β-lactam allergy: a novel extension of antimicrobial stewardship

Alon Vaisman[1]*, Janine McCready[2], Sandy Hicks[3] and Jeff Powis[2]

- Evaluation allergie : binôme pharmacien/infectiologue
- 485 patients : allergie type I 24%, autre réaction grave 18%
- Céfazoline recommandée n=306 (63%)

Céfazoline prescrite n=267 (87%)

Effet secondaire n=0

- Céfazoline non recommandée n=179 (37%)

Céfazoline prescrite n=0

Effet secondaire vancomycine n=3

Collaboration avec la microbiologie

Table 3. Clinical and Treatment-Related Outcomes

Outcome	Total		
	Preintervention (n = 256)	Intervention (n = 245)	*P* Value
Clinical outcomes			
30-day all-cause mortality	52 (20.3)	31 (12.7)	.021
Time to microbiological clearance, d	3.3 ± 4.8	3.3 ± 5.7	.928
Length of hospitalization, d[a]	14.2 ± 20.6	11.4 ± 12.9	.066
Length of ICU stay, d[a]	14.9 ± 24.2	8.3 ± 9.0	.014
Recurrence of same BSI	15 (5.9)	5 (2.0)	.038
30-day readmission with same BSI	9 (3.5)	4 (1.6)	.262
Treatment-related outcomes			
Time to effective therapy, h	30.1 ± 67.7	20.4 ± 20.7	.021
Time to optimal therapy, h	90.3 ± 75.4	47.3 ± 121.5	<.001

Data are No. (%) or mean ± standard deviation.

Abbreviations: BSI, bloodstream infection; ICU, intensive care unit.

[a] Length of hospitalization and ICU stay were defined as time from blood culture positivity to discharge.

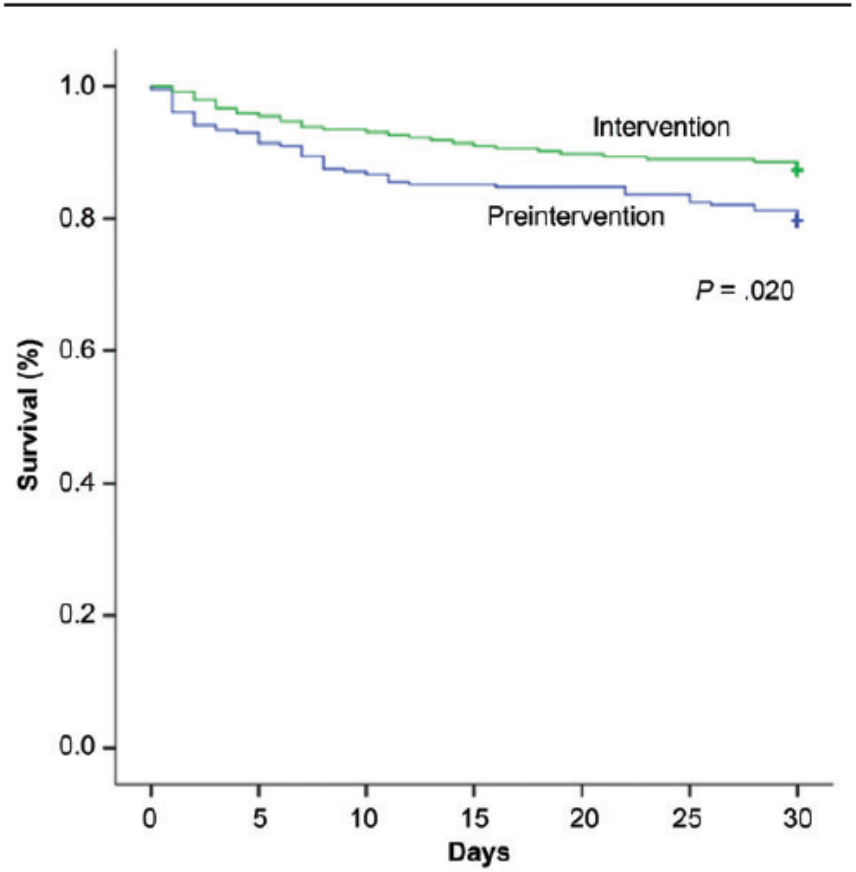


Figure 3. Kaplan-Meier survival analysis: overall survival in both study groups, censored for patients discharged prior to 30 days.

Huang AM. et al, Clin Infect Dis 2013

Bactériémies à Entérobactéries, hôpital Foch

	Contrôle	Test rapide	P
N	42	41	
Sepsis grave/choc	13 (31)	8 (20)	0,51
Urosepsis	22 (52)	23 (56)	1
C3G-R	8* (19)	5** (12)	0,54
Délai identification	47 [42-53]	22 (20-27]	< 0,001
ATB efficace J0	31 (74%)	34 (83%)	0,43
ATB appropriée J0	23 (55%)	29 (71%)	0,17
Mortalité	4 (10%)	2 (5%)	0,67
Durée séjour	10 [6-16]	7 [5-12]	0,27

ATB efficace à J0 = * 3/8; ** 5/5

→ Utilisation ciblée sur les patients à risque : concertation avec le microbiologiste +++ antécédent de colonisation/IU à EBLSE < 6 mois; amox-clav/C2G-C3G/FQ < 6 mois; voyage en zone d'endémie EBLSE; hospitalisation < 3 mois; vie en institution de long séjour, choc septique, traitement par carbapénème

Clinical Infectious Diseases

MAJOR ARTICLE

The Effect of Molecular Rapid Diagnostic Testing on Clinical Outcomes in Bloodstream Infections: A Systematic Review and Meta-analysis

DOI: 10.1093/cid/ciw649

Tristan T. Timbrook,[1,4] Jacob B. Morton,[1,4] Kevin W. McConeghy,[2] Aisling R. Caffrey,[1,2,4] Eleftherios Mylonakis,[3] and Kerry L. LaPlante[1,2,4]

Clinical Infectious Diseases

MAJOR ARTICLE

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DOI: 10.1093/cid/ciw649

Study or Subgroup	mRDT Events	mRDT Total	Conventional Testing Events	Conventional Testing Total	Weight, %	OR (95%CI)
1.1.1 mRDT with ASP						
Bauer et al [17] (2010)	15	82	19	74	5.6	0.65 (.30–1.39)
Bias et al [19] (2015)	3	37	7	55	1.8	0.61 (.15–2.51)
Box et al [20] (2015)	6	64	10	103	3.0	0.96 (.33–2.79)
Forrest et al [24] (2006)	2	119	2	84	0.9	0.70 (.10–5.08)
Forrest et al [23] (2006)	19	72	20	76	6.0	1.00 (.48–2.09)
Forrest et al [25] (2008)	17	95	37	129	7.4	0.54 (.28–1.04)
Heil et al [27] (2012)	5	21	19	61	2.7	0.69 (.22–2.16)
Huang et al [29] (2013)	31	245	52	256	11.8	0.57 (.35–.92)
Lockwood et al [30] (2016)	11	241	14	149	4.9	0.46 (.20–1.04)
Macvane et al [32] (2015)	5	63	5	50	2.1	0.78 (.21–2.84)
Macvane et al [33] (2016)	6	23	16	45	2.8	0.64 (.21–1.95)
Nagel et al [36] (2014)	11	117	19	129	5.3	0.60 (.27–1.32)
Pardo et al [39] (2016)	5	84	37	252	3.6	0.37 (.14–.97)
Perez et al [15] (2013)	6	107	12	112	3.3	0.50 (.18–1.37)
Revolinksi et al [40] (2015)	8	95	13	133	4.0	0.85 (.34–2.14)
Sango et al [42] (2013)	11	28	7	46	2.8	3.61 (1.19–10.89)
Sothoron et al [43] (2015)	5	67	4	59	1.9	1.11 (.28–4.34)
Suzuki et al [44] (2015)	3	88	19	147	2.3	0.24 (.07–.83)
Walker et al [45] (2016)	8	97	19	98	4.3	0.37 (.16–.90)
Subtotal		**1745**		**2058**	**76.5**	**0.64 (.51–.79)**
Total events	177		331			
Heterogeneity: $\tau^2 = 0.01$ $\chi^2 = 19.00$ ($df = 18$; $P = .39$); $I^2 = 5\%$						
Test for overall effect: $z = 4.14$ ($P < .001$)						
1.1.2 mRDT without ASP						
Beuving et al [18] (2015)	14	114	8	109	4.1	1.77 (.71–4.40)
Felsenstein et al [22] (2016)	5	189	11	194	3.0	0.45 (.15–1.33)
Frye et al [26] (2012)	14	110	17	134	5.7	1.00 (.47–2.14)
Ly et al [31] (2008)	8	101	17	101	4.2	0.43 (.17–1.04)
Maslonka et al [34] (2014)	6	55	10	55	2.9	0.55 (.19–1.64)
Neuberger et al [37] (2008)	1	42	4	42	0.7	0.23 (.02–2.17)
Wang et al [46] (2013)	8	48	8	38	2.9	0.75 (.25–2.23)
Subtotal		**659**		**673**	**23.5**	**0.72 (.46–1.12)**
Total events	56		75			
Heterogeneity: $\tau^2 = 0.08$ $\chi^2 = 7.74$ ($df = 6$; $P = .26$); $I^2 = 23\%$						
Test for overall effect: $z = 1.46$ ($P = .15$)						
Total (95% CI)		**2404**		**2731**	**100.0**	**0.66 (.54–.80)**
Total events	233		406			
Heterogeneity: $\tau^2 = 0.02$ $\chi^2 = 27.22$ ($df = 25$; $P = .34$); $I^2 = 8\%$						
Test for overall effect: $z = 4.27$ ($P < .001$)						
Test for subgoup differences: $\chi^2 = 0.25$ ($df = 1$; $P = .62$); $I^2 = 0\%$						

Figure 2. Mortality outcomes with molecular rapid diagnostic testing (mRDT) versus conventional testing in bloodstream infection. Odds ratios (ORs) were determined with the Mantel-Haenszel random-effects method. Abbreviations: ASP, antimicrobial stewardship program; CI, confidence interval.

Clinical Infectious Diseases

MAJOR ARTICLE

Long-Term Impact of an Educational Antimicrobial Stewardship Program on Hospital-Acquired Candidemia and Multidrug-Resistant Bloodstream Infections: A Quasi-Experimental Study of Interrupted Time-Series Analysis

José Molina,[1] Germán Peñalva,[1] María V. Gil-Navarro,[2] Julia Praena,[1] José A. Lepe,[1] María A. Pérez-Moreno,[2] Carmen Ferrándiz,[3] Teresa Aldabó,[3] Manuela Aguilar,[1] Peter Olbrich,[4] Manuel E. Jiménez-Mejías,[1] María L. Gascón,[3] Rosario Amaya-Villar,[3] Olaf Neth,[4] María J. Rodríguez-Hernández,[1] Antonio Gutiérrez-Pizarraya,[1] José Garnacho-Montero,[5] Cristina Montero,[6] Josefina Cano,[6] Julián Palomino,[1] Raquel Valencia,[1] Rocío Álvarez,[1] Elisa Cordero,[1] Marta Herrero,[1] and José M. Cisneros[1]; for the PRIOAM team

Departments of [1]Infectious Diseases, Microbiology and Preventive Medicine, [2]Pharmacy, [3]Critical Care, and [4]Pediatric Infectious Diseases and Immunodeficiency, Institute of Biomedicine of Seville, University Hospital Virgen del Rocio, Spanish National Research Council, University of Seville, and [5]Department of Critical Care, University Hospital Virgen Macarena, University of Seville and [6]Department of Pediatric Critical Care and Emergency, University Hospital Virgen del Rocio, Seville, Spain

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Le top !

Clinical Infectious Diseases
MAJOR ARTICLE

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Analysis

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Departments of [1]Infectious Diseases, Microbiology and Preventive Me
Seville, University Hospital Virgen del Rocio, Spanish National Researc
and [6]Department of Pediatric Critical Care and Emergency, University H

Méthodes :

1. Equipe multidisciplinaire
2. Tirage au sort des prescriptions : interview des prescripteurs
3. Actualisation et diffusion du guide antibiotiques
4. Bilan trimestriel des consommations d'antibiotiques des services
5. Bilan annuel de la résistance bactérienne des services
6. Bilan annuel du programme dans chaque service

Support de l'institution et signature d'une convention entre les services et la direction

La preuve du concept : impact clinique et écologique

Consommation antibiotiques
↓ 18,3-21,5%

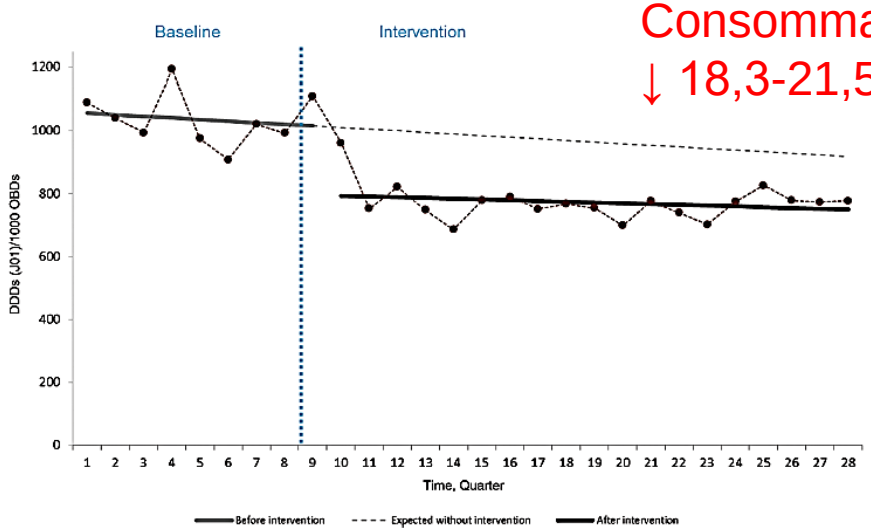


Figure 1. Changes in antibiotic consumption. ATC group J01 (antibacterials for systemic use); DDDs, defined daily doses; OBDs, occupied bed days.

Mortalité bactériémies BMR

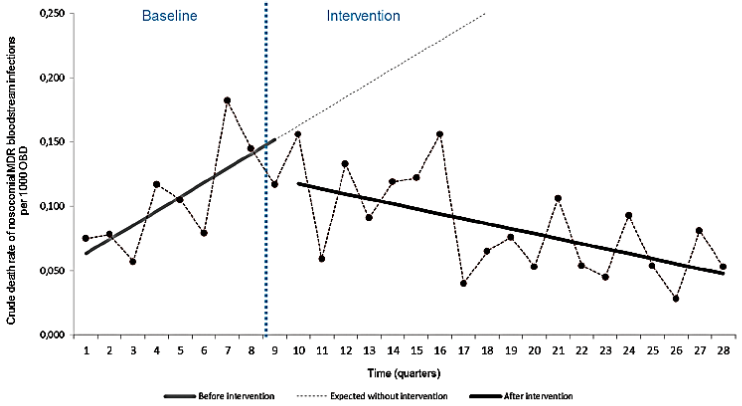
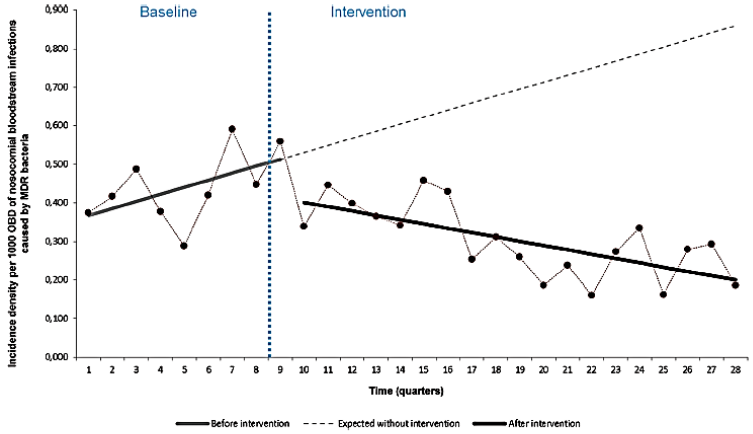


Figure 4. Changes in crude death rate for hospital-acquired multidrug-resistant (MDR) bacterial bloodstream infections (BSIs). OBDs, occupied bed days.

Incidence bactériémies BMR et candidémies



2. Impact on incidence of hospital-acquired candidemia and multidrug-resistant (MDR) bacterial bloodstream infections (BSIs). OBDs, occupied bed days.

Molina J. et al, Clin Infect Dis 2017

Pour que ça marche, il faut des moyens

Table 1. Core Elements of Hospital Antibiotic Stewardship Programs

Leadership commitment	Dedicating necessary human, financial, and information technology resources
Accountability	Appointing a single leader responsible for program outcomes and accountable to an executive-level or patient quality–focused hospital committee. Experience with successful programs shows that a physician or pharmacist leader is effective
Drug expertise	Appointing a single pharmacist leader responsible for working to improve antibiotic use
Action	Implementing at least 1 recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (ie, antibiotic "time-out" after 48 h)
Tracking	Monitoring process measures (eg, adherence to facility-specific guidelines, time to initiation or de-escalation), impact on patients (eg, *Clostridium difficile* infections, antibiotic-related adverse effects and toxicity), antibiotic use and resistance
Reporting	Regular reporting of the above information to doctors, nurses, and relevant staff
Education	Educating clinicians about disease state management, resistance, and optimal prescribing

Source: Centers for Disease Control and Prevention [4].

Pollack LA. et al, Clin Infect Dis 2014