

Innovative and multidisciplinary approach for HAI prevention & control

Anna Sara Levin



IFIC - APECIH 2017
17th Congress of the International
Federation of Infection Control
27 - 30 September
Centro de Convenções Rebouças



Abordagens inovadoras e multidisciplinares para a prevenção e controle de IRAS

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Nothing to disclose

Outline

- **Negative-pressure wound therapy to prevent SSI**
- **Bundles**
- **Human difficulties and infection control**
- **Serious electronic games**

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Negative-pressure wound therapy to prevent SSI



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Prophylactic (or closed incision) negative pressure wound therapy (pNPWT)

Prophylactic use of NPWT to prevent SSI.



pNPWT

NPWT has been used since late 1990s:

- open bone fractures,
- diabetic ulcers,
- Management of the open abdomen

(Journal of Plastic, Reconstructive & Aesthetic Surgery 2017; 70: 1028-37)

pNPWT is relatively new.

- Objective of metaanalysis: systematically review the available literature on pNPWT in terms of reducing SSI in all types of surgery.

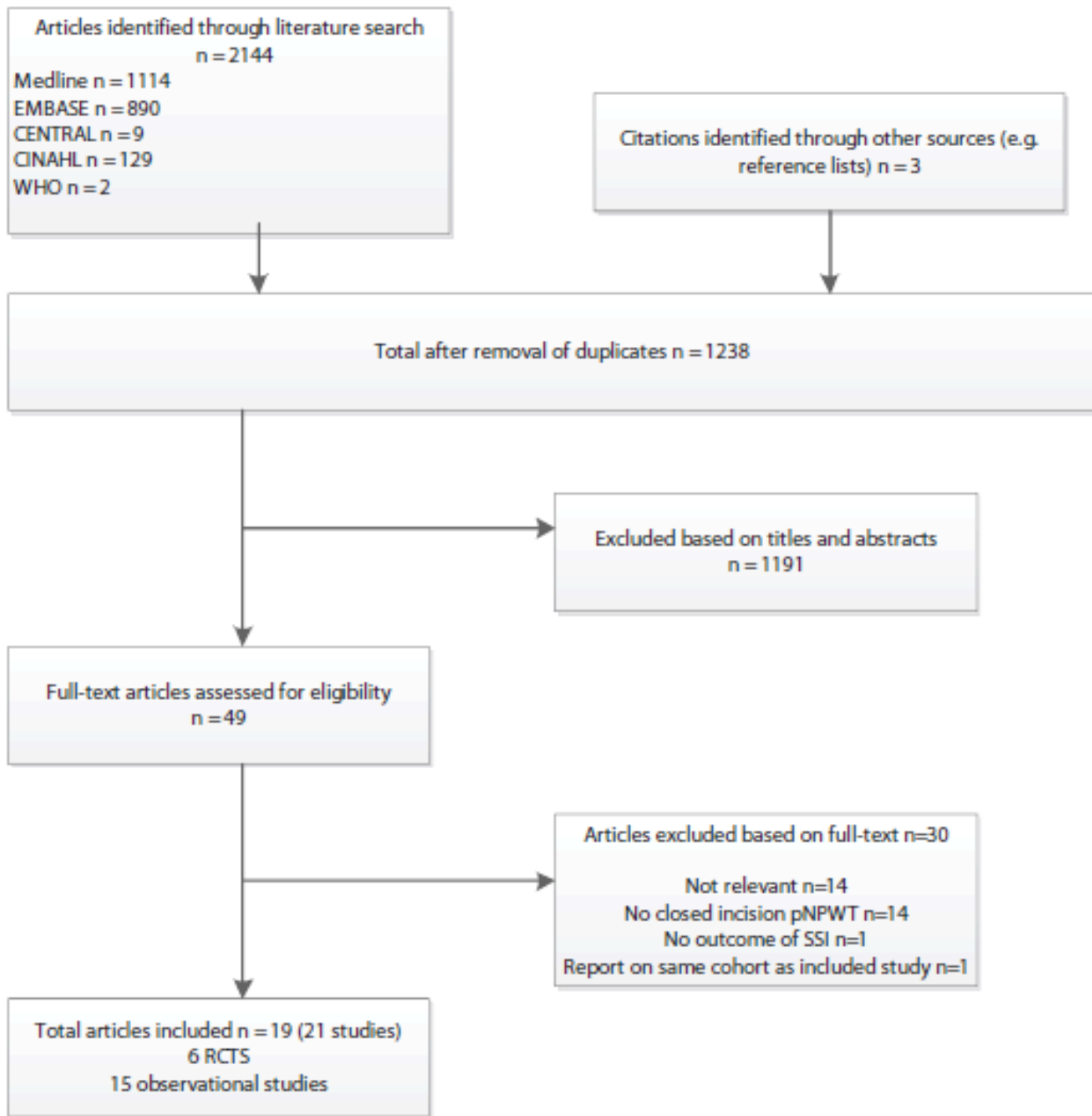


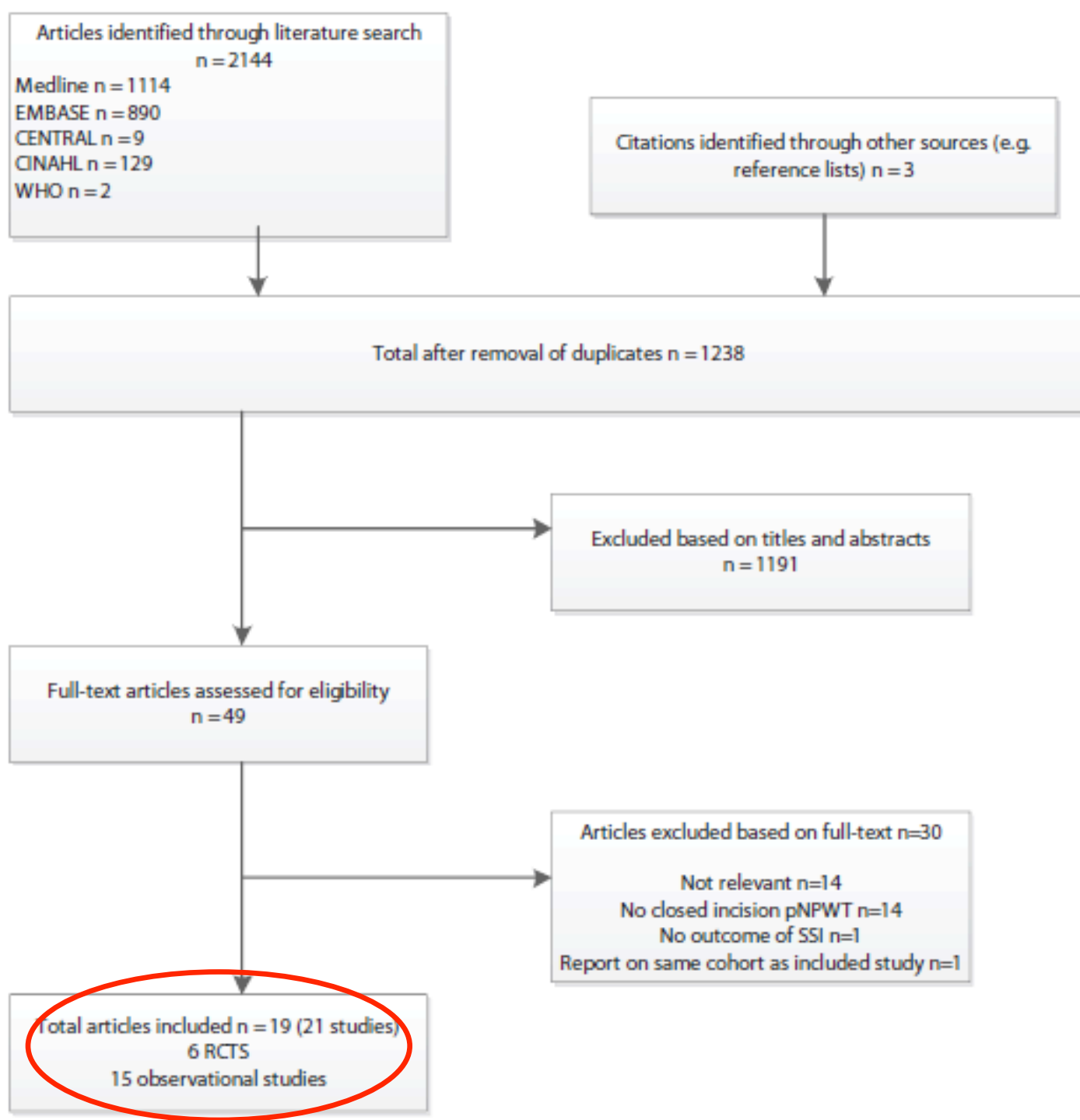
Fig. 1 A negative-pressure wound therapy dressing *in situ*

included. Studies that used NPWT devices designed for open wounds and surgical incisions, as well as studies that used home-made NPWT devices, were accepted for inclusion. The standard dressings were any dressing used for surgical incisions, such as a sterile gauze dressing. The outcomes were wound complications, with wound infection, wound dehiscence and seroma as primary outcomes. No restrictions were made according to authors' definitions of outcome. Studies investigating the effect of iNPWT on other kinds of wound were excluded from the review.

Search strategy

The search strategy used the medical subject headings (MeSH) terms and free text words: 'incisions', 'surgical





OR: 0.56 (95% CI: 0.32–0.96; P=0.04)

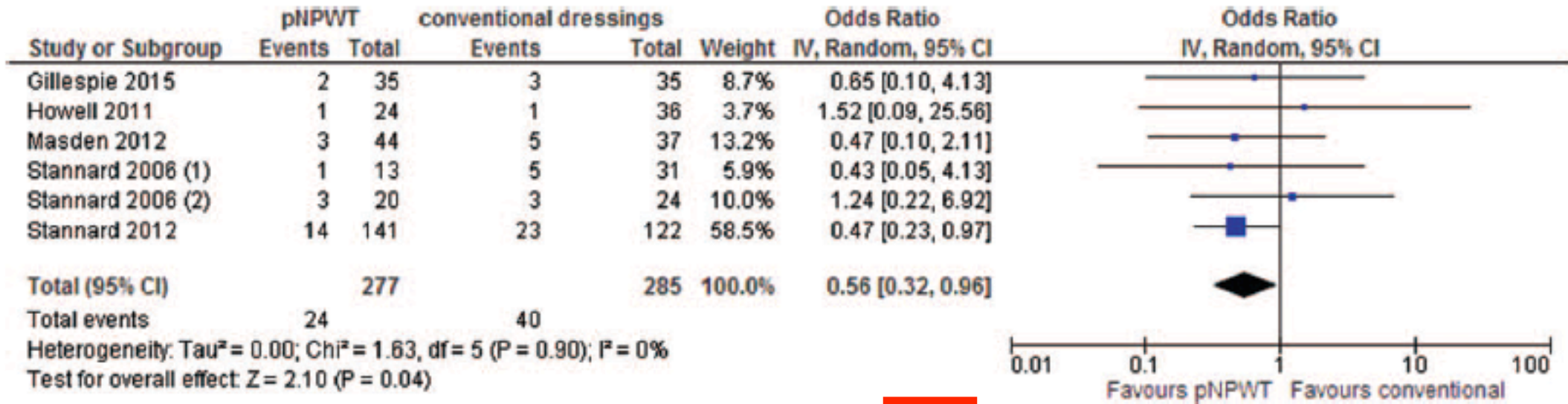


Figure 2. Overall effect of pNPWT on SSI compared to conventional wound dressings in RCTs. pNPWT = prophylactic negative pressure wound therapy, RCT = randomized controlled trial, SSI = surgical site infections.

OR: 0.30 (95% CI: 0.22–0.42; P<0.0001)

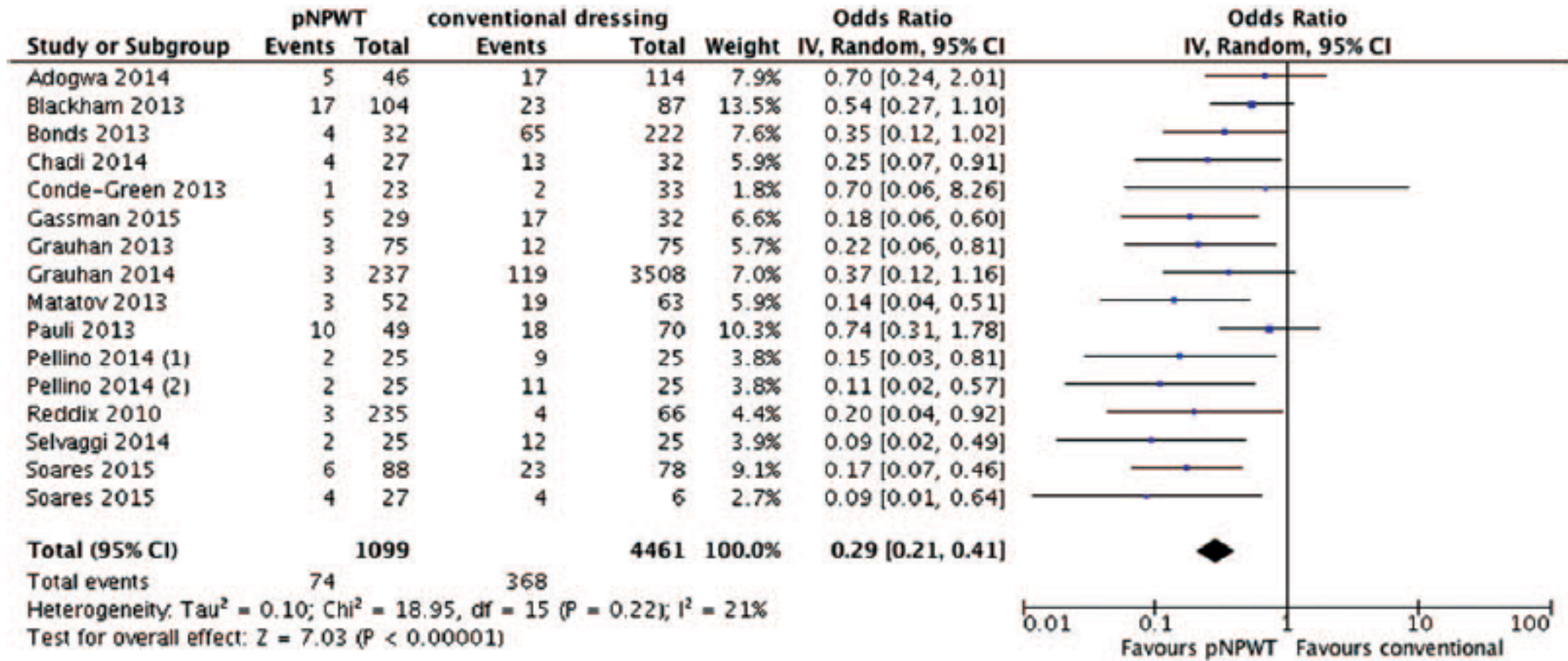


Figure 3. Overall effect of pNPWT on SSI compared to conventional wound dressings in observational studies. pNPWT = prophylactic negative pressure wound therapy, SSI = surgical site infections.

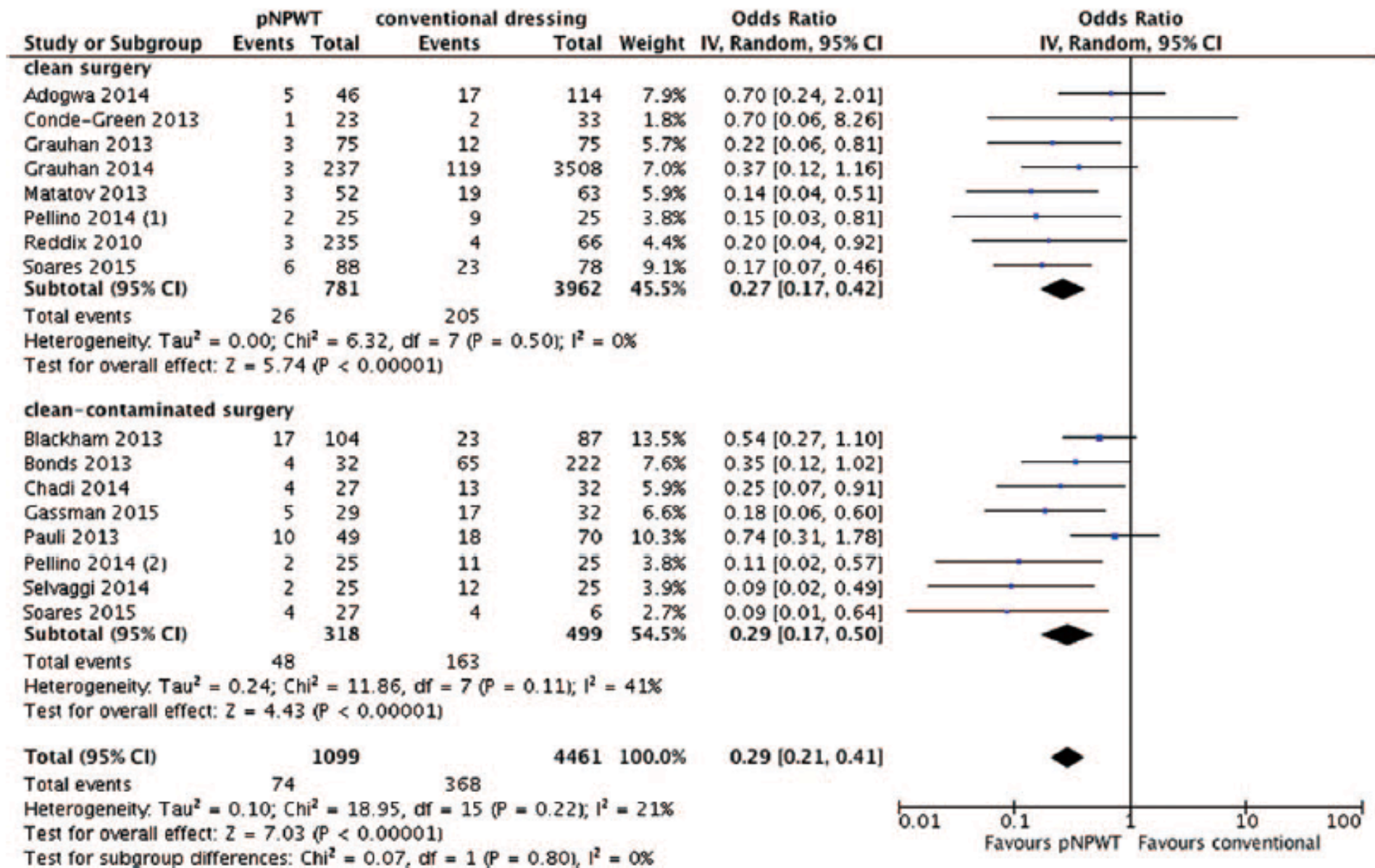
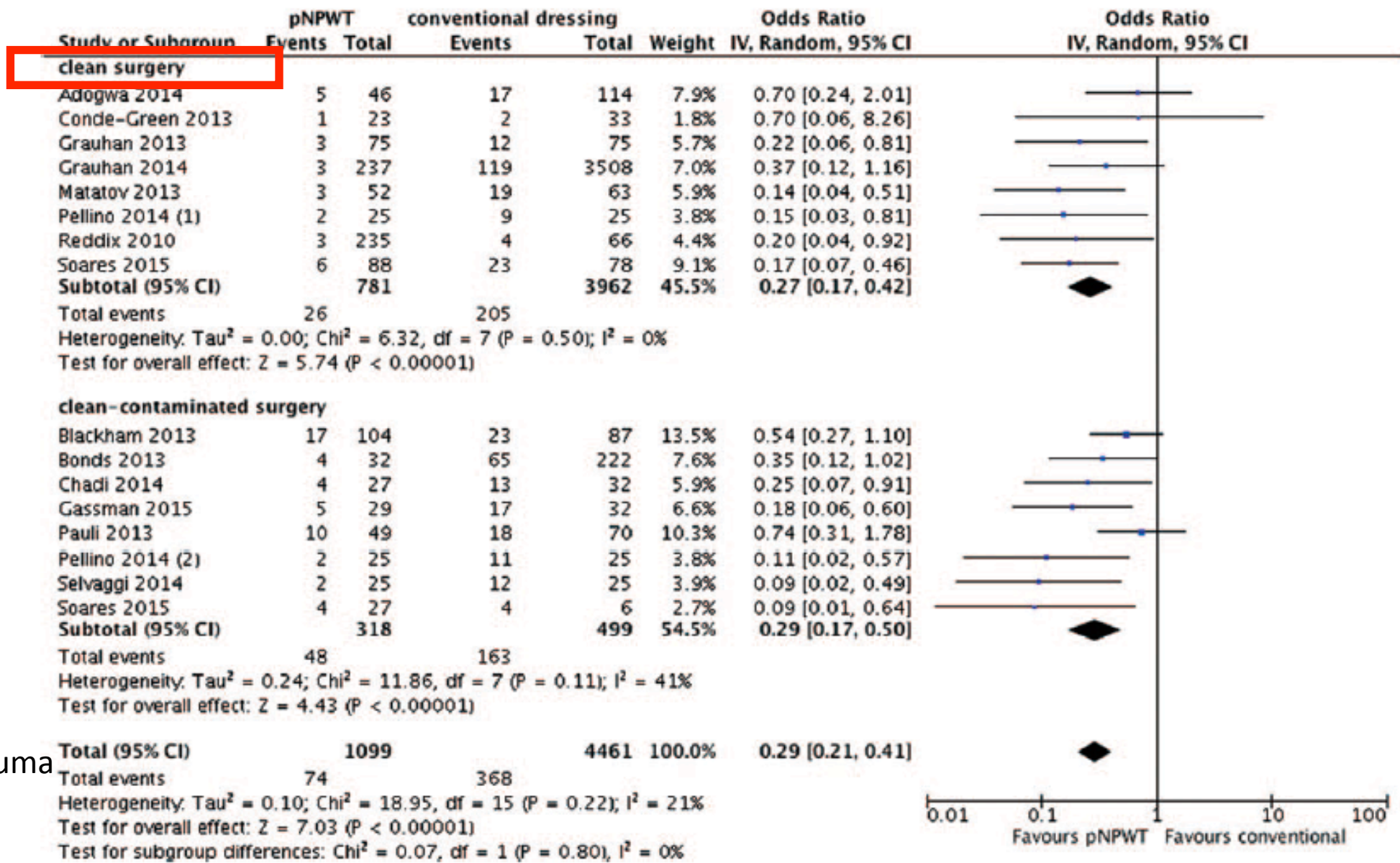
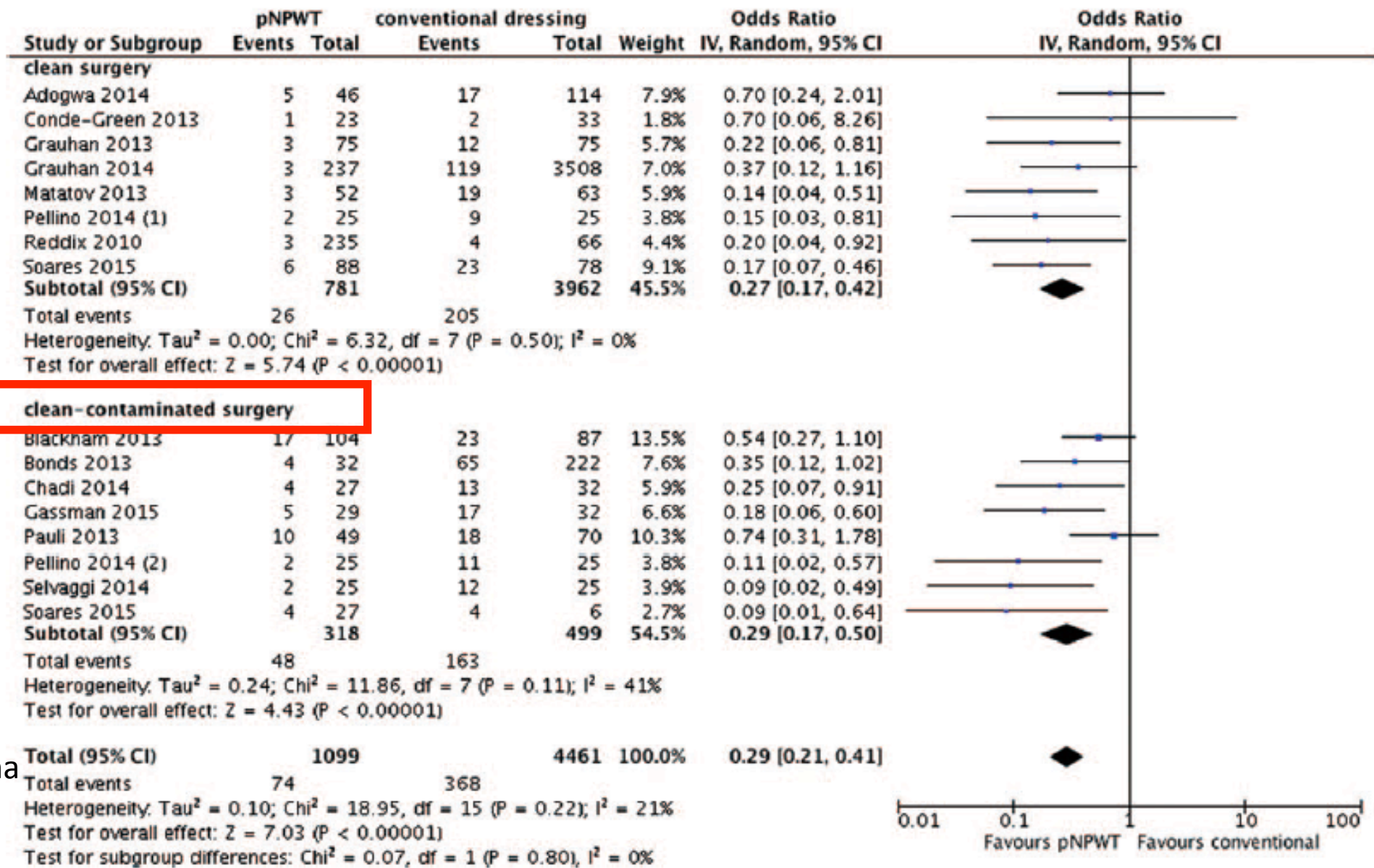


Figure 4. Stratification by wound class (all observational studies).



Not valid for orthopedic/trauma surgery

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GLOBAL GUIDELINES
FOR THE PREVENTION OF
SURGICAL SITE INFECTION



Global Guidelines for prevention of SSIs
Commissioned by WHO

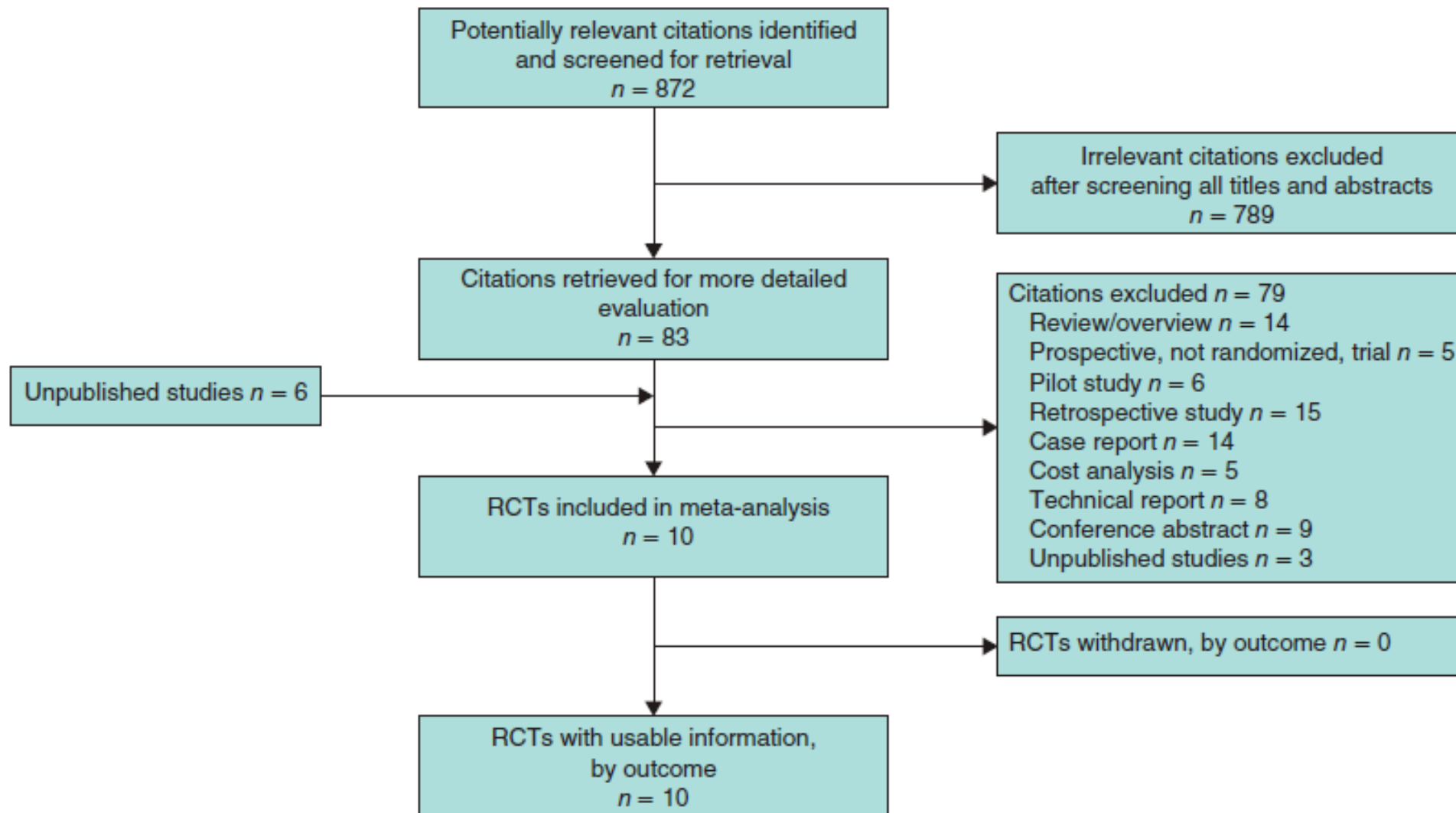


Fig. 2 PRISMA diagram showing the selection of articles. RCT, randomized clinical trial

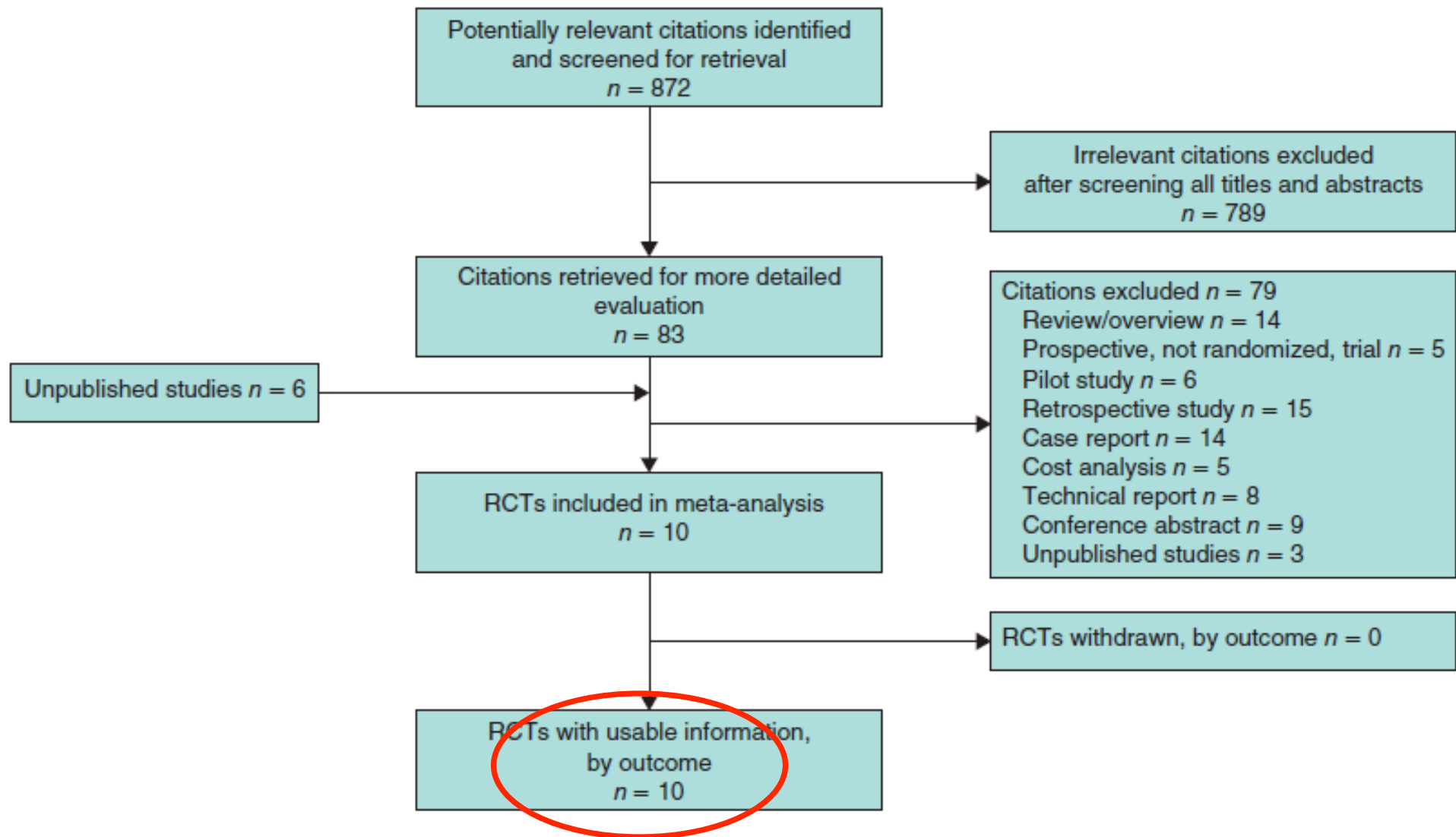


Fig. 2 PRISMA diagram showing the selection of articles. RCT, randomized clinical trial

Table 2 Summary of findings: incisional negative-pressure wound therapy *versus* standard dressing for prevention of postoperative wound complications

Outcome	Anticipated absolute effect (per 100)*		Relative risk	No. of incisions	Quality of evidence†	NNT
	Risk with standard dressing	Risk with iNPWT				
Wound infection	9	5 (3, 8)	0.54 (0.33, 0.89)	1251 (7 RCTs)	Moderate‡	25 (17, 93)
Wound dehiscence	20	14 (9, 21)	0.69 (0.47, 1.01)	892 (4 RCTs)	Low‡§	17 (10, -500)
Seroma	85	41 (23, 71)	0.48 (0.27, 0.84)	40 (2 RCTs)	Moderate‡¶	3 (2, 8)

Values in parentheses are 95 per cent c.i. *The risk in the intervention group (incisional negative-pressure wound therapy, iNPWT) is based on the assumed risk in the comparison group (standard dressing) and the relative risk of the intervention. †Evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system³⁰ (see text for full details); ‡moderate risk of bias in study; §inconsistency of direction of effect; ¶imprecision owing to small sample size. NNT, number needed to treat; RCT, randomized clinical trial.

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Prophylactic (or closed incision) negative pressure wound therapy (pNPWT)

4.19. Prophylactic negative pressure wound therapy

Recommendation

The panel suggests the use of prophylactic negative pressure wound therapy (pNPWT) in adult patients on primarily closed surgical incisions in high-risk wounds, for the purpose of the prevention of SSI, while taking resources into account.

(Conditional recommendation, low quality of evidence)



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Bundles?



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What is a bundle?

“Bundle” is an evidence-based process of providing care that typically includes 3 to 5 specific practices that, if performed collectively and reliably, have been proven to improve patient outcomes.

Boque & Boque. Crit Care Nurs Clin North Am. 2017 Jun;29(2):217-231

**What works in a
bundle?**

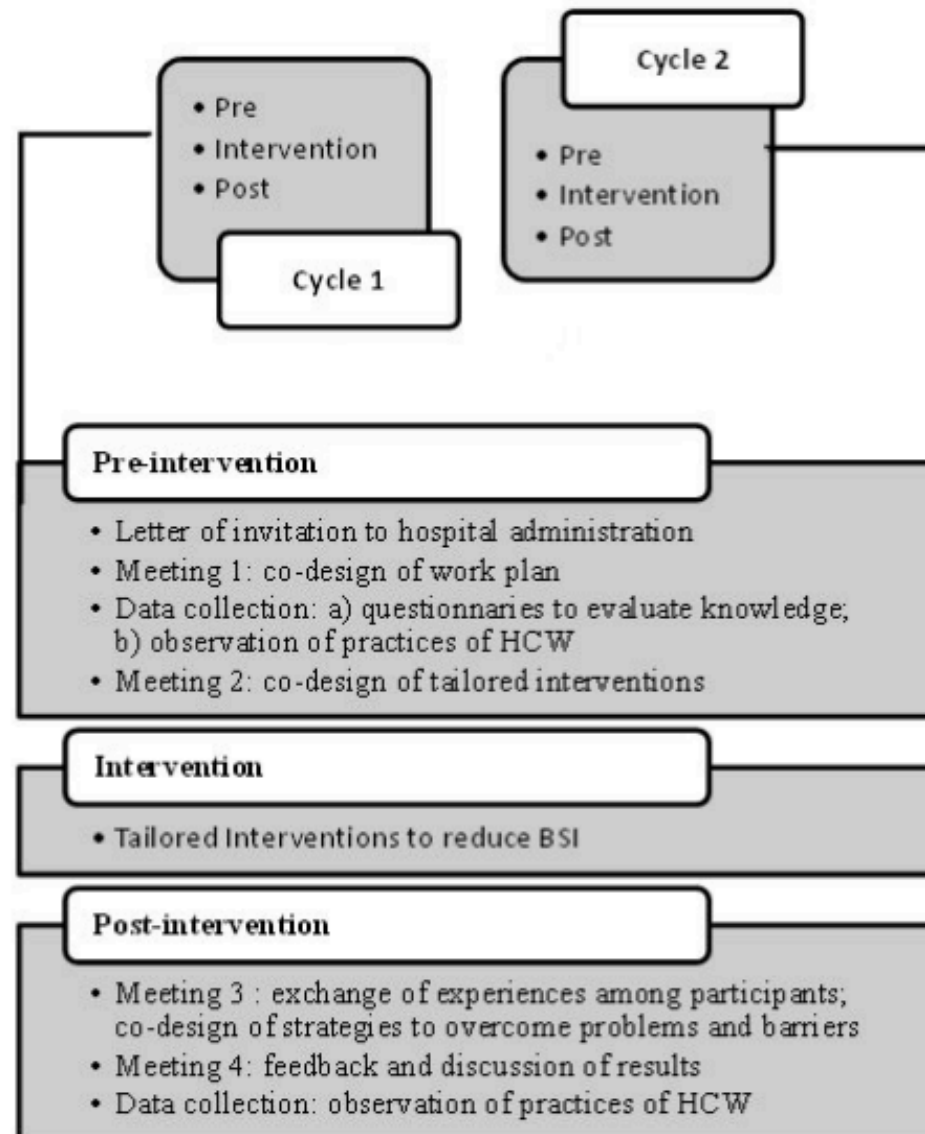
The experience of São Paulo State Health Department

2 cycles:

Cycle 1: a representative sample of hospitals (2011)

Cycle 2: the hospitals with worst BSI rates (2015)

Based on the results of Cycle 1

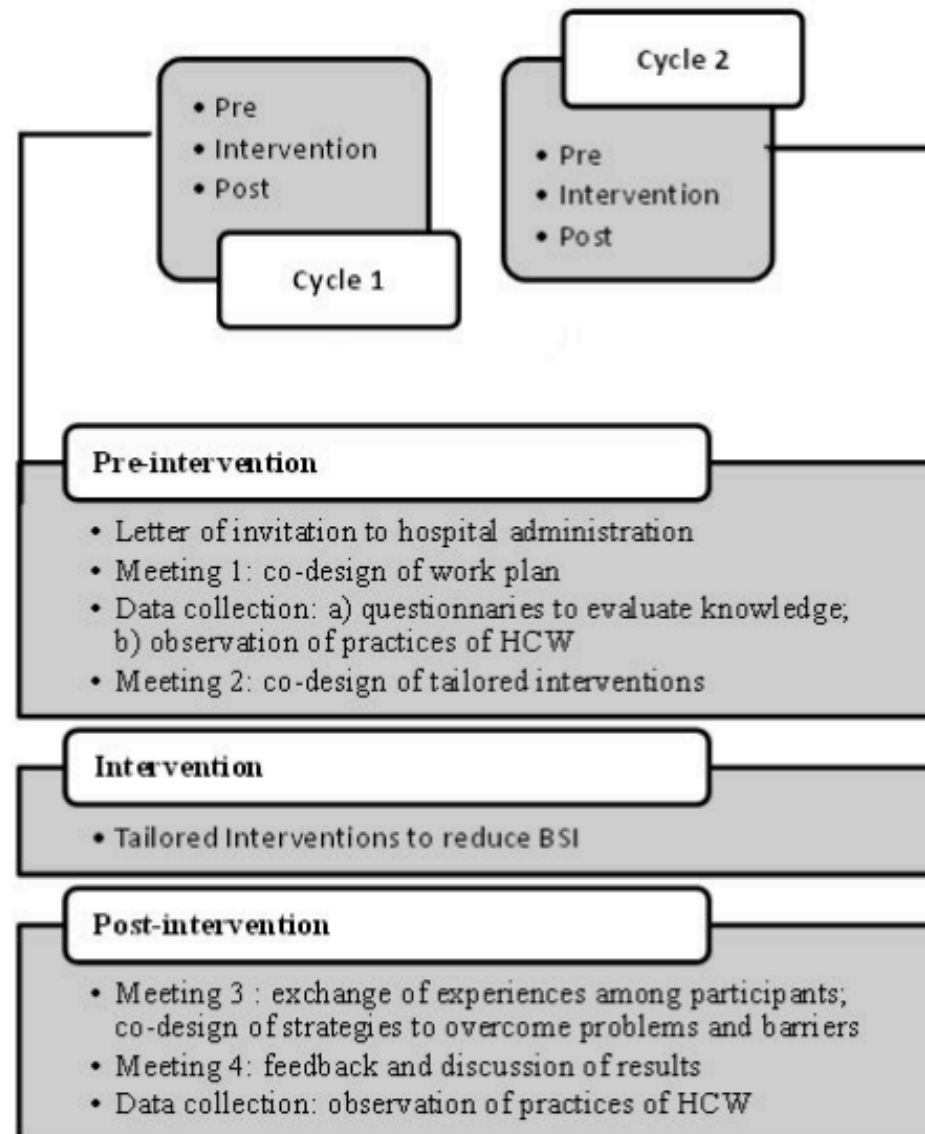


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The experience of São Paulo State Health Department

Questionnaires

2,186 HCWs (nurses, physicians, nursing trainees and medical residents)

CLC insertion, correct answers:

- 99% for questions on hand hygiene;
- 70% on skin preparation;
- 96% on the use of mask, sterile gown, sterile gloves;
- 85% on the use of sterile full body drapes;
- 74% on the choice of insertion site.

CLC care, correct answers:

- 96% for questions on hand hygiene;
- 92% on hub disinfection;
- 61% on early catheter removal

The experience of São Paulo State Health Department

<u>Practices observed</u>	<u>Cycle 1</u>			<u>Cycle 2</u>		
	Percentage of Compliance (number of observations)		<i>P</i>	Percentage of Compliance (number of observations)		<i>P</i>
	<u>Pre</u>	<u>Post</u>	<i>value</i>	<u>Pre</u>	<u>Post</u>	<i>value</i>
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<u>Insertion</u>						
<u>Performed subclavian insertion</u>	49 (1,864)	57 (1,434)	<0.0001	46 (1,201)	53 (1,439)	<0.0001
Performed hand hygiene before CLC insertion	96 (1,739)	97 (1,288)	0.18	100 (1,265)	99 (1,617)	0.14
Used alcoholic solution for skin preparation	98 (1,503)	84 (1,146)	<0.0001	97 (1,235)	97 (1,666)	0.91
Used sterile full-body drapes	90 (1,586)	92 (1,166)	0.048	98 (1,240)	99 (1,596)	0.15
Used cap, mask, sterile gown, sterile gloves	93 (1,554)	93 (1,174)	0.51	95 (1,219)	96 (1,593)	0.12
<u>CLC handling</u>						
<u>Performed hub disinfection</u>	63 (4,017)	79 (4,395)	<0.0001	74 (4,612)	82 (2,836)	<0.0001

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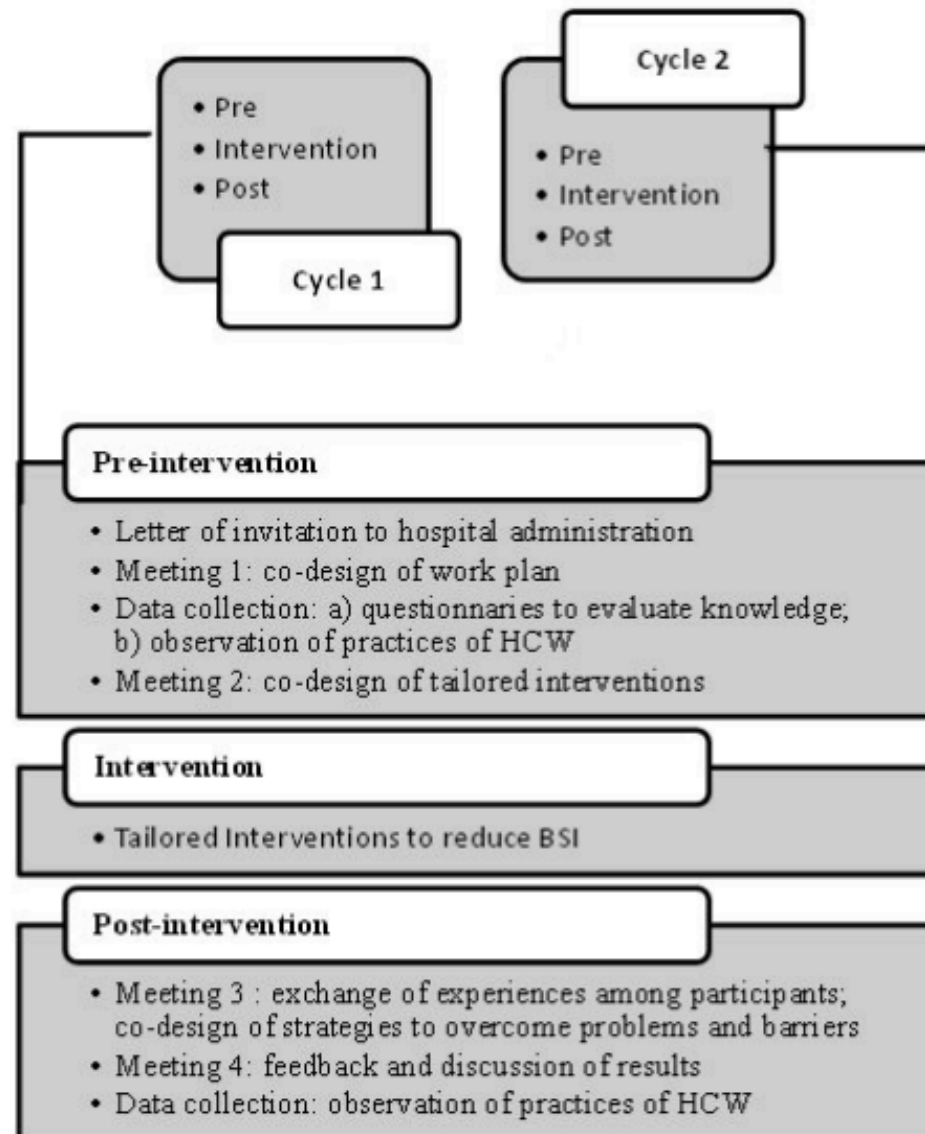
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The experience of São Paulo State Health Department

Interventions suggested by the hospitals

1. provisioning and reinforcement of use of alcohol hand rubs;
2. implementation of catheter insertion kits;
3. provision of alcohol wet wipes for disinfection of catheter's hub;
4. training of HCW on the appropriate choice of insertion site, skin preparation and catheter care;
5. implementation of routine use of peripherally inserted central catheters (PICC)

The experience of São Paulo State Health Department

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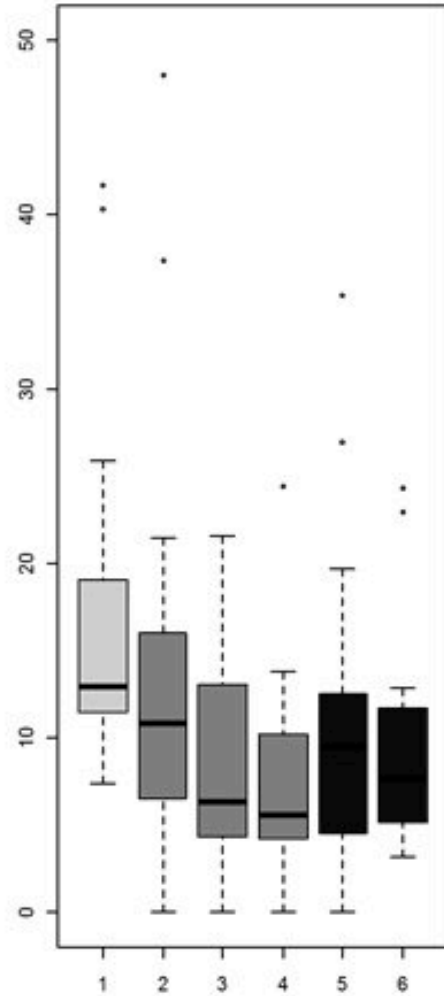
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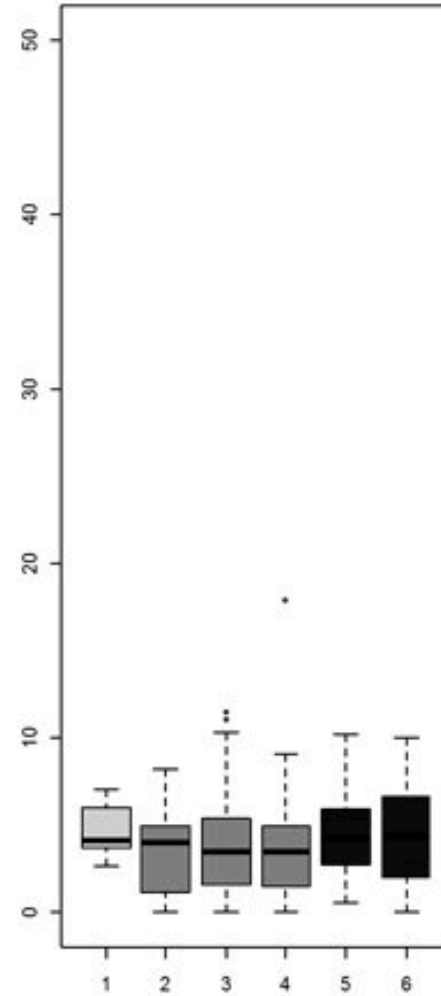
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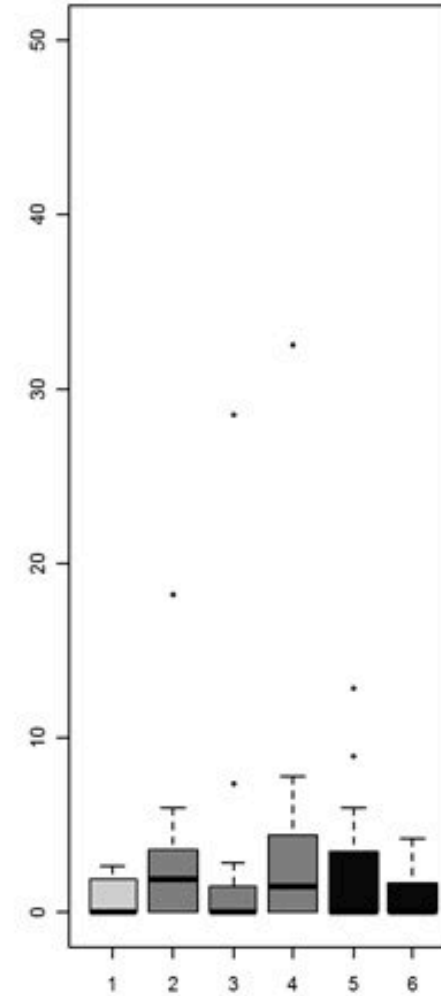
The experience of São Paulo State Health Department



High initial rates (n=18)

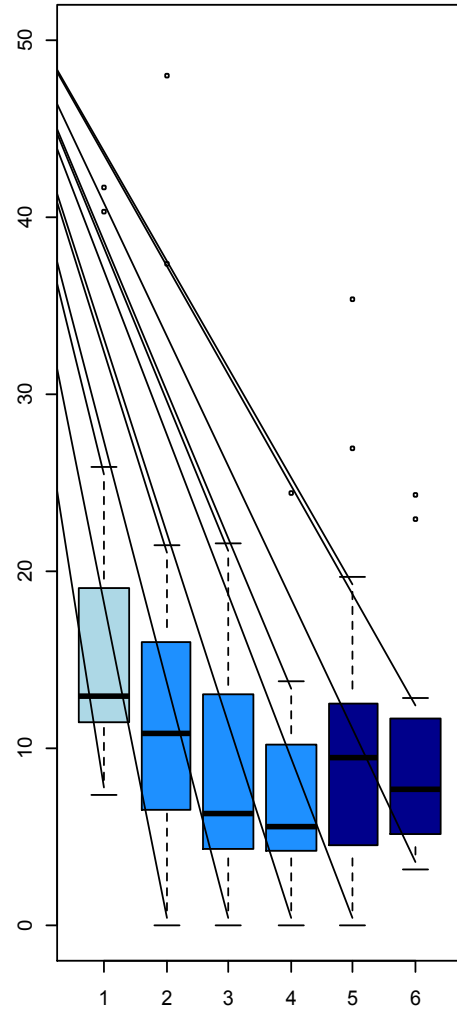


Medium initial rates (n=19)

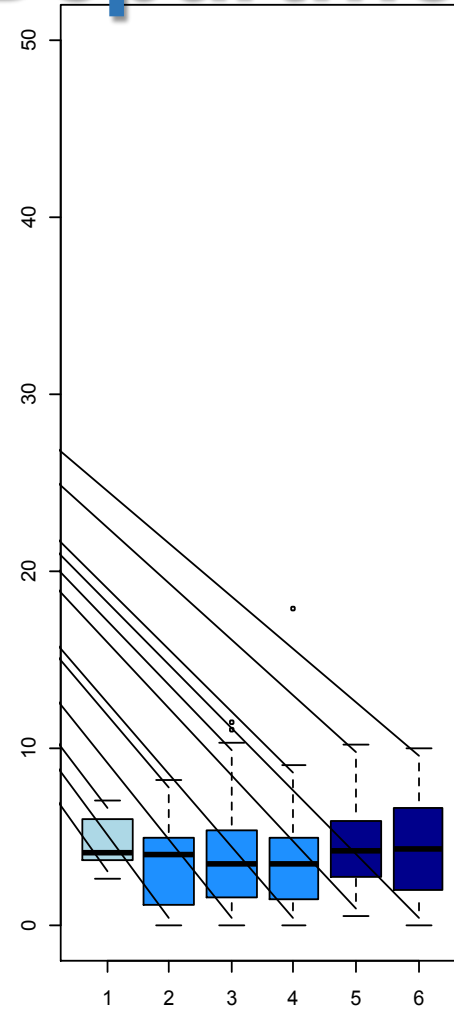


Low initial rates (n=19)

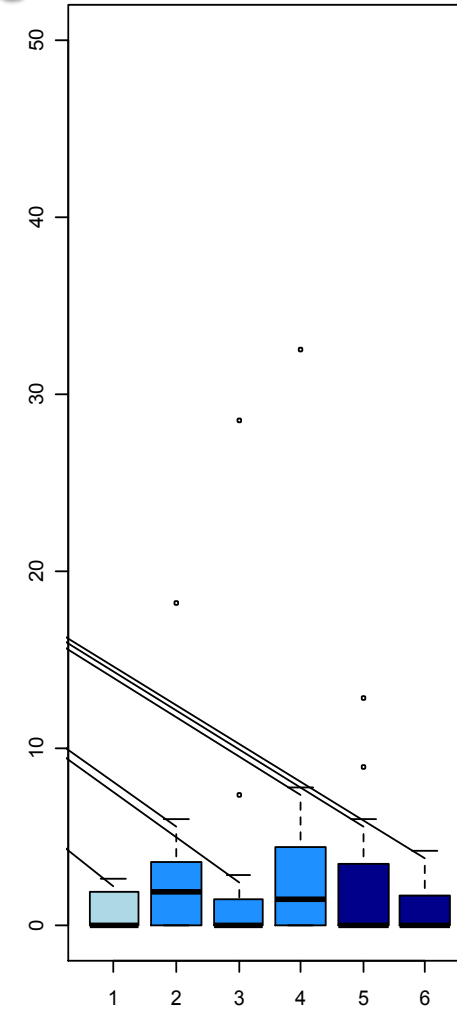
The experience of São Paulo State Health Department



High initial rates



Medium initial rates



Low initial rates

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Factors associated with reduction of BSI rates:

1. observation period ($p < 0.001$),
2. initial CLABSI rates ($p < 0.001$), and
3. implementation of the use of the PICC ($p < 0.01$)

Additional dispensers of alcohol hand rubs was not associated with reduction of rates ($p = 0.38$).

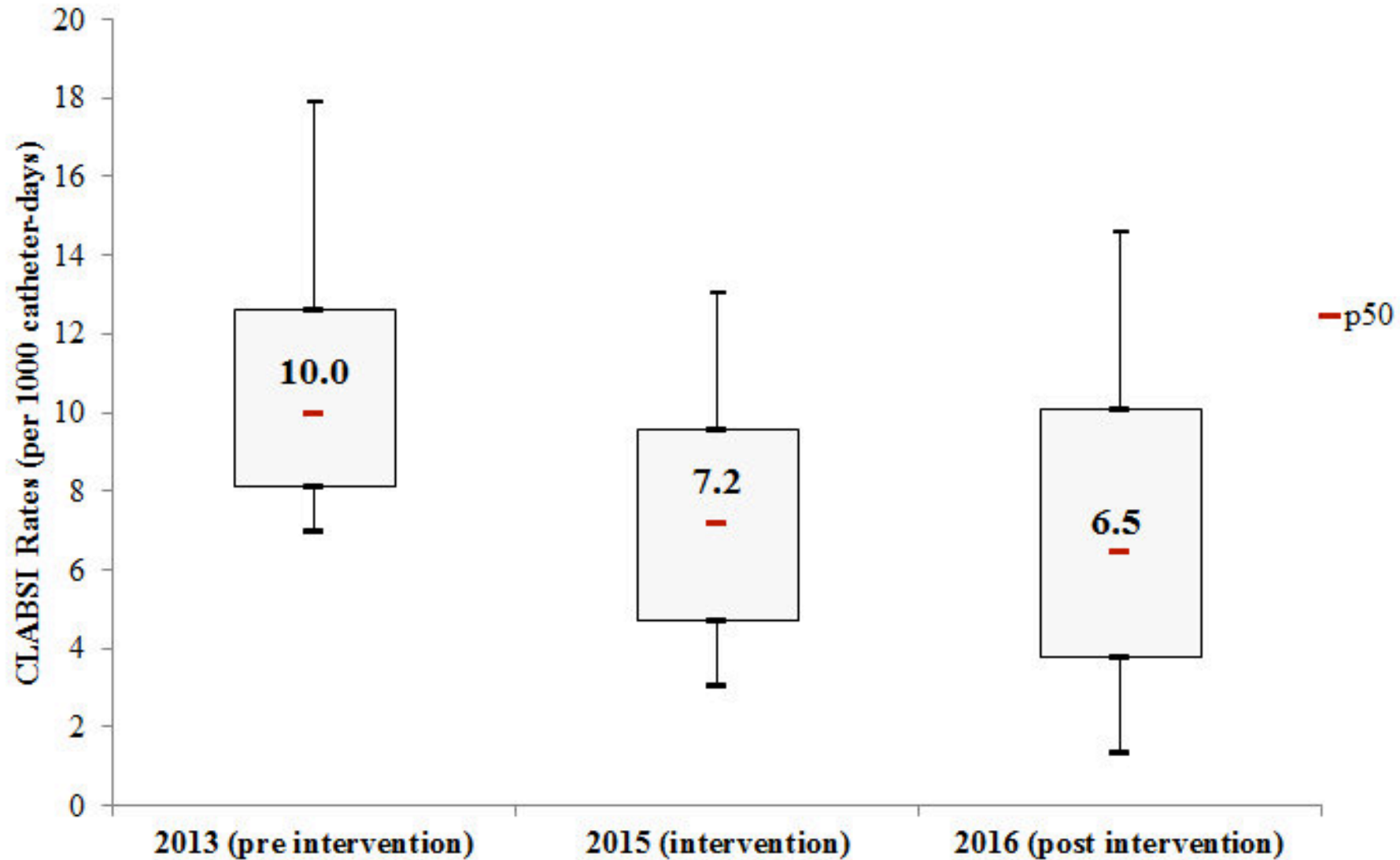
Initial	Implementation	Number of dispensers	Period	Estimated CLABSI
CLABSI	of the use of	of alcohol hand rub	Period	rate
rate	PICC	installed		[95%CI]
			Pre	12.1 [8.9-16.4]
High	No	0	Intervention	7.7 [4.7-12.1]
			Post	7.8 [4.8-12.2]
			Variation Post/Pre (%)	-36% [-63-(-)9]
			Pre	11.7 [7.8- 17.3]
High	Yes	5	Intervention	7.4 [4.2-12.5]
			Post	7.5 [4.3-12.6]
			Variation Post/Pre %	-36% [-63- (-)9]
			Pre	9.2 [5.6-14.6]
Medium	Yes	5	Intervention	8.0 [4.4-14.0]
			Post	9.5 [5.2-16.8]
			Variation Post/Pre %	3% [-38-46]
			Pre	4.5 [2.9-6.9]
Medium	No	10	Intervention	3.9 [2.1-6.7]
			Post	4.7 [2.6-8.2]
			Variation Post/Pre %	4% [-41-51]
			Pre	1.6 [0.6-3.3]
Low	Yes	0	Intervention	3.9 [1.8-7.5]
			Post	2.9 [1.2-5.9]
			Variation Post/Pre %	81% [1-162]

Initial CLABSI rate	Implementation of the use of PICC	Number of dispensers of alcohol hand rub installed	Period	Estimated CLABSI rate [95%CI]
High	No	0	Pre	12.1 [8.9-16.4]
			Intervention	7.7 [4.7-12.1]
			Post	7.8 [4.8-12.2]
Variation Post/Pre (%)				-36% [-63-(-)9]
Medium	Yes	5	Intervention	8.0 [4.4-14.0]
			Post	9.5 [5.2-16.8]
			Variation Post/Pre %	3% [-38-46]
Medium	No	10	Pre	4.5 [2.9-6.9]
			Intervention	3.9 [2.1-6.7]
			Post	4.7 [2.6-8.2]
Variation Post/Pre %				4% [-41-51]
Low	Yes	0	Pre	1.6 [0.6-3.3]
			Intervention	3.9 [1.8-7.5]
			Post	2.9 [1.2-5.9]
Variation Post/Pre %				81% [1-162]



The experience of São Paulo State Health Department

Cycle 2



The experience of São Paulo State Health Department

Lesson:

Implementation strategy may have had an effect independently of the specific interventions.

Outline

- Negative-pressure wound therapy to prevent SSI
- Bundles
- **Human difficulties and infection control**
- Serious electronic games

Human difficulties and infection control



IFIC - APECIH 2017

17th Congress of the International
Federation of Infection Control

27 - 30 September

Centro de Convenções Rebouças



Why do HCW know infection control practices but do not adhere?

Objective

To investigate a potential correlation between:

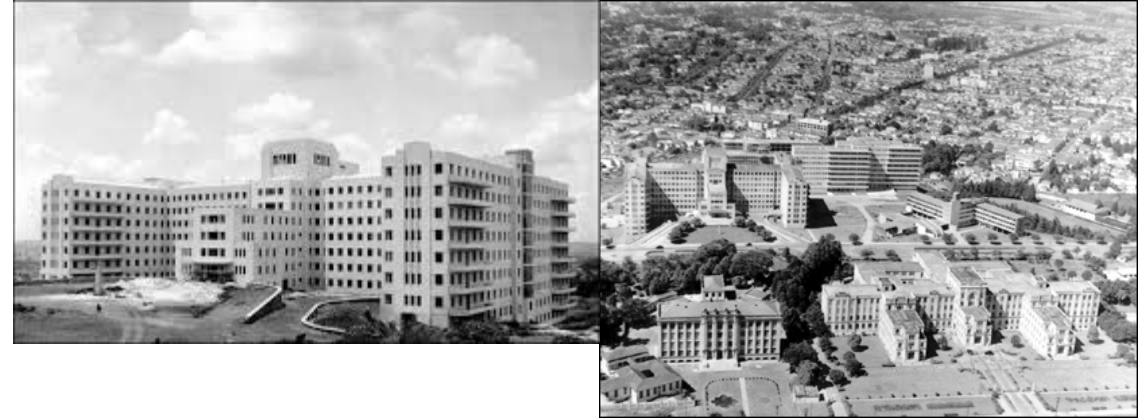
- Compliance with infection control practices by ICU HCW

and

- psychological characteristics

Search for potential targets for intervention

Hospital das Clínicas



4 ICUs:

- Surgical (16 beds),
- Infectious Diseases (ID) (7 beds),
- Medical/Pneumology (8 beds),
- Clinical Emergency (13 beds)



3 months: observation of practices

Nursing professionals

- During CVC manipulation:
 - Hand hygiene before the procedure;
 - Use of gloves during the procedure;
 - Disinfection of the hub with alcohol;
 - Hand hygiene after the procedure
- During CVC dressing:
 - Hand hygiene before;
 - Use of sterile gloves
 - Antisepsis of the dressing site;
 - Hand hygiene after procedure.

3 months: observation of practices

Doctors

Hand hygiene during WHO's 5 moments:

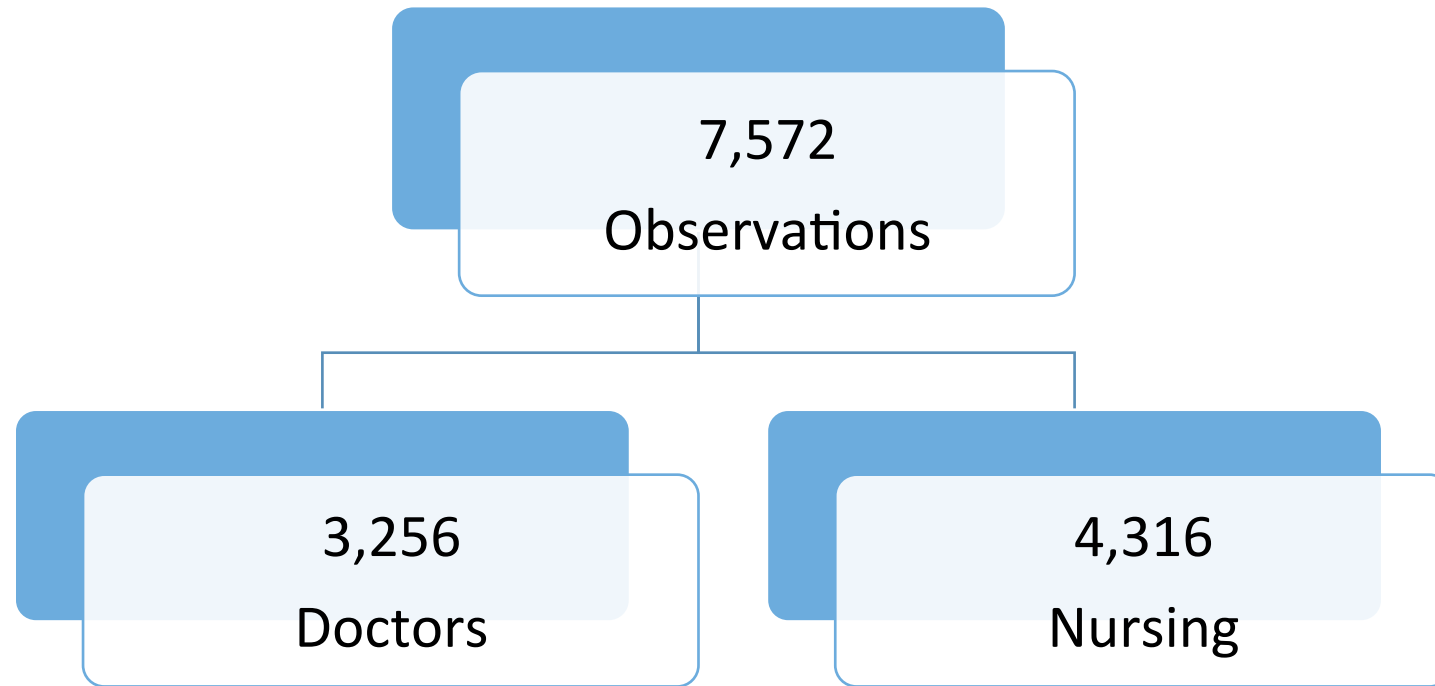
- Before touching a patient;
- Before clean/aseptic procedure;
- After body fluid exposure;
- After touching a patient;
- After touching patient's surroundings.

Next: psychological evaluation

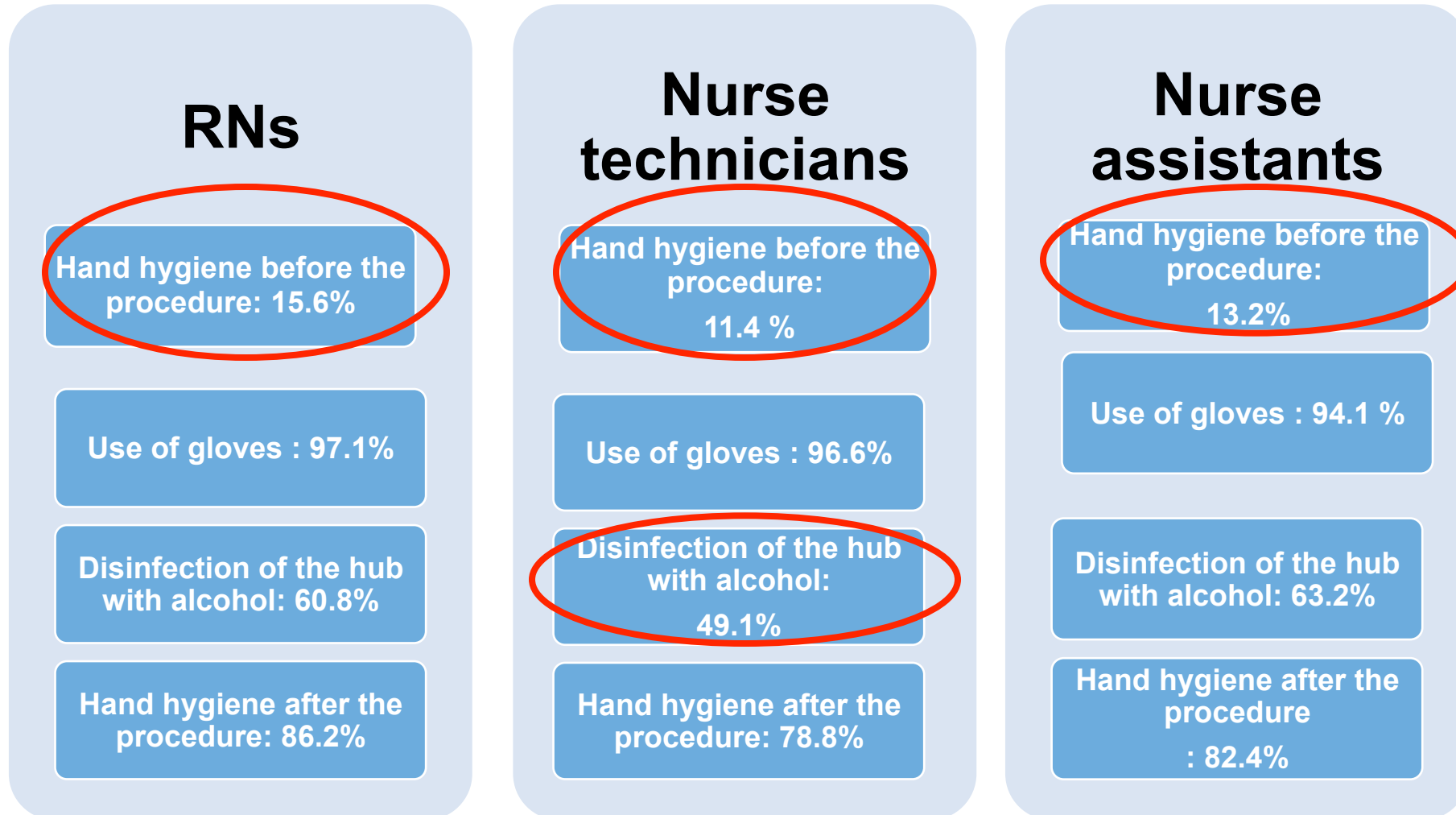
- Rational and intuitive thinking styles;
- Self-esteem evaluation;
- Quality of life assessment;
- Stress assessment;
- Personality assessment.

Done by professional psychologists

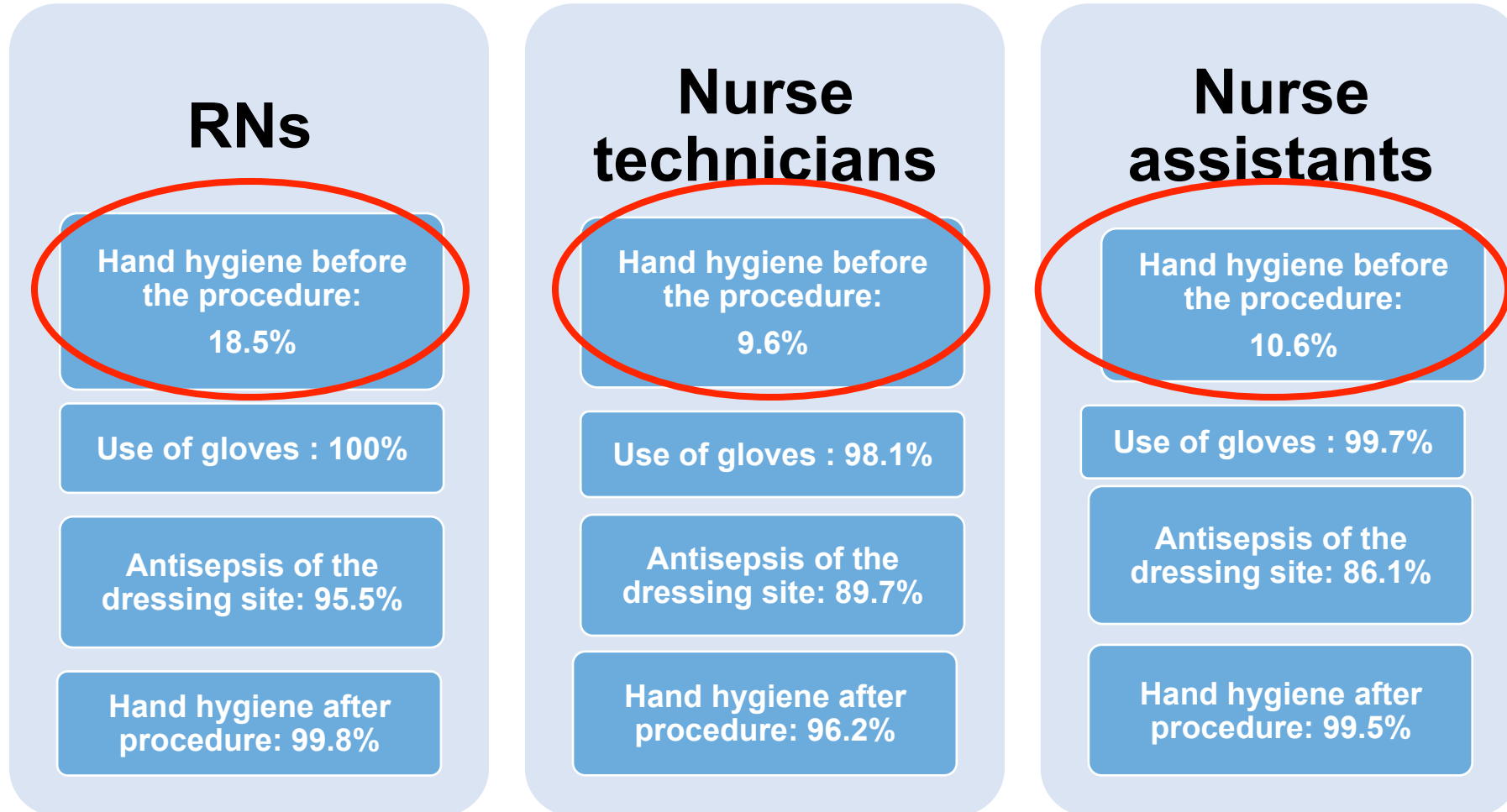
248 HCWs



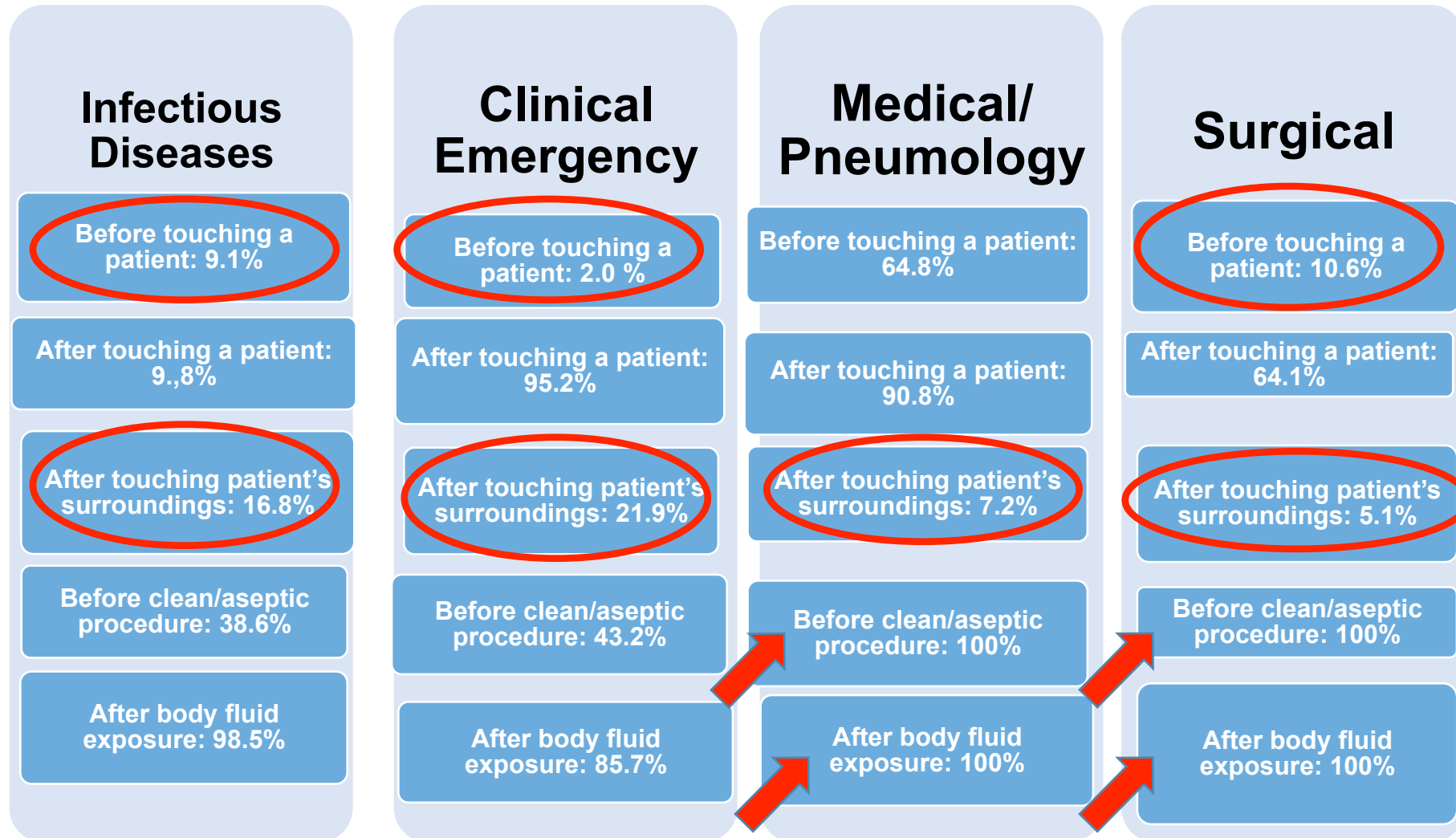
Compliance during CVC handling (Nursing personnel)



Compliance during CVC dressing (Nursing personnel)



Compliance with hand hygiene during WHO's 5 moments



Factors associated with compliance among doctors

- Unit (Medical/Pneumology ICU was superior)
- WHO's HH Moment (Compliance after patient/fluids was superior)
- High self esteem
- Age

Factors associated with compliance among doctors

Idade mediana = 30 anos (exp(coef) = 1,11)

Agressão mediana = 27 (exp(coef) = 1,06)

Unidade	Auto-estima	Procedimento	Chance	IC(95%)
UTI (9, PS4 e MI)	Baixa/Normal	Antes do paciente	0,02	(0,01 ; 0,04)
		Antes de procedimentos assépticos	0,96	(0,59 ; 1,58)
		Após proximidade	0,11	(0,07 ; 0,18)
		Após fluídos corpóreos e após paciente	22,26	(13,27 ; 37,32)
	Alta	Antes do paciente	0,04	(0,02 ; 0,08)
		Antes de procedimentos assépticos	1,83	(1,02 ; 3,28)
		Após proximidade	0,21	(0,12 ; 0,36)
		Após fluídos corpóreos e após paciente	42,17	(22,89 ; 77,68)



IME-USP

Factors associated with compliance among doctors

Idade mediana = 30 anos ($\exp(\text{coef}) = 1,11$)

Agressão mediana = 27 ($\exp(\text{coef}) = 1,06$)

Unidade	Auto-estima	Procedimento	Chance	IC(95%)
UTI 6	Baixa/Normal	Antes do paciente	0,19	(0,07 ; 0,51)
		Antes de procedimentos assépticos	8,04	(2,97 ; 21,79)
		Após proximidade	0,91	(0,35 ; 2,39)
		Após fluídos corpóreos e após paciente	185,59	(66,98 ; 514,26)
	Alta	Antes do paciente	0,36	(0,14 ; 0,91)
		Antes de procedimentos assépticos	15,24	(5,66 ; 41,02)
		Após proximidade	1,72	(0,67 ; 4,4)
		Após fluídos corpóreos e após paciente	351,62	(127,29 ; 971,33)

Factors associated with compliance among doctors

Unit	Self esteem	Moment	Odds	95%CI
ICU (Surgical, Clinical Emergency and ID)	Low/Normal	Before touching patient	0.02	0.01; 0.04
		Before clean/aseptic procedure	0.96	0.59; 1.58
		After touching patient's surroundings	0.11	0.07 ; 0.18
		After touching patient/fluids	22.26	13.27 ; 37.32
	High	Before touching patient	0.04	0.02; 0.08
		Before clean/aseptic procedure	1.83	1.02; 3.28
		After touching patient's surroundings	0.21	0.12; 0.36
		After touching patient/fluids	42.17	22.89; 77.68

Calculate Odds Ratios

Example: "Before touching a patient"

Comparing high self esteem with low/normal self esteem

OR: $0.04/0.02 = 2$

Median age: 30 years (exp(coef)= 1.11)

Median aggression score: 27 (exp(coef)= 1.06)

Factors associated with compliance among doctors

Unit	Self esteem	Moment	Odds	95%CI
Medical/Pneumology ICU	Low/Normal	Before touching patient	0.19	0.07; 0.51
		Before clean/aseptic procedure	8.04	2.97; 21.79
		After touching patient's surroundings	0.91	0.35; 2.39
		After touching patient/fluids	185.59	66.98; 514.26
	High	Before touching patient	0.36	0.14; 0.91
		Before clean/aseptic procedure	15.24	5.66; 41.02
		After touching patient's surroundings	1.72	0.67; 4.4
		After touching patient/fluids	351.62	127.29; 971.33

Calculate Odds Ratios

Example: "After touching patient/fluids"

Comparing high self esteem with low/normal self esteem

OR: $351.62/185.59 = 1.89$

Median age: 30 years ($\exp(\text{coef}) = 1.11$)

Median aggression score: 27 ($\exp(\text{coef}) = 1.06$)

Outline

- Negative-pressure wound therapy to prevent SSI
- Bundles
- Human difficulties and infection control
- **Serious electronic games**

Serious games

Games with the objective of learning and/or changing behaviour



Serious games – Cpias Nouvelle Aquitaine experience

- 2012 ...**Sarcoptes invasion** (*scabies*)
- 2013 ...**Flu.0** (*Flu*)
- 2014 ...**Dojo résistance** (*XDR bacteria*)
- 2015...**Code Name UTI** (*urinary tract infection*)
- 2017...**I control** (*universal precautions*)

OUTILS > SERIOUS GAME

Nos autres catégories d'outils : Vidéo Evaluation Gestion des risques Recommandation



NOM DE CODE IUAS

Les infections urinaires sont les infections associées aux soins les plus fréquentes et leur impact...

→ en savoir plus



DOJO RÉSISTANCE

Les bactéries hautement résistantes aux antibiotiques émergentes gagnent du terrain en France et...

→ en savoir plus



GRIPPE.0

La grippe saisonnière touche plusieurs millions de personnes tous les ans, mais la connaissez-vous...

→ en savoir plus



SARCOPTES INVASION

La gale fait son grand retour dans le milieu hospitalier et au-delà. Ce jeu de sensibilisation va...

→ en savoir plus

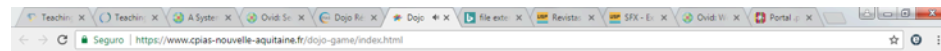
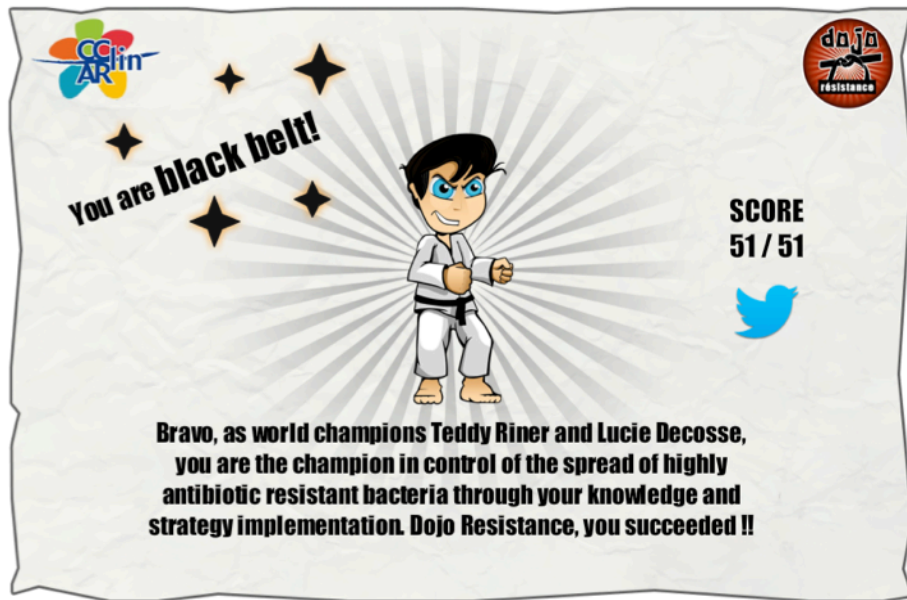


DOJO RÉSISTANCE

Les bactéries hautement résistantes aux antibiotiques émergentes gagnent du terrain en France et dans le monde. Êtes-vous prêt à mener le combat au sein de votre établissement afin de stopper leur diffusion ? Testez-vous avec Dojo résistance et en 12 questions vous saurez si vous êtes un redoutable judoka, maître dans l'art du contrôle des BHRé ou si un retour sur le tatami s'impose pour reprendre les bases !

Jouer en ligne

Télécharger pour Windows



What was the experien

INNOVATION ACADEMY PRESENTATION

Open Access

Teaching good infection control practices with fun: impact of the serious game Flu.0

A-G Venier^{1*}, S Marie², T Duroux¹, C Bervas¹, P Parneix¹

From 3rd International Conference on Prevention and Infection Control (ICPIC 2015)
Geneva, Switzerland. 16-19 June 2015

- Flu.0
- 95% learnt at least something
- Main points learned: rapid test for influenza (32%) and additional precautions (19%)
- Thanks to the game, 47% of physician/senior nurses and 80% of nurses students declared they would perform better.

Results



264 physicians (213 fellows), 62 senior nurses, 577 nurse students

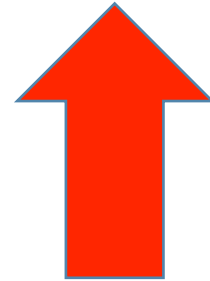
Rate given to the game 7.9/10

	Physicians / Senior nurses		Nurse students	
	Before the game	After the game	Before the game	After the game
Seasonal flu = benign disease	156 (48%)	113 (35%)	207 (36%)	68 (12%)
Flu vaccination of health care workers = useful	302 (93%)	322 (99%)	496 (86%)	567 (99%)
I know the indications of the antiviral treatment	201 (62%)	280 (86%)	234 (41%)	423 (74%)
I feel well prepared to face a flu case	257 (79%)	309 (95%)	433 (75%)	556 (97%)
Well prepared to perform rapid flu diagnostic test	95 (29%)	280 (86%)	140 (24%)	433 (75%)

p=0.001

Does it work?

- Systematic review
- 48 articles evaluating 42 games
- 4 games and 2 genres in 2007
- 42 games and 8 genres in 2014
- Many fields: administrative management, pediatrics, nursing, geriatrics, clinical/preclinical education, pathology, resuscitation, radiology, surgery, neurology, pharmacy, obstetrics/gynecology



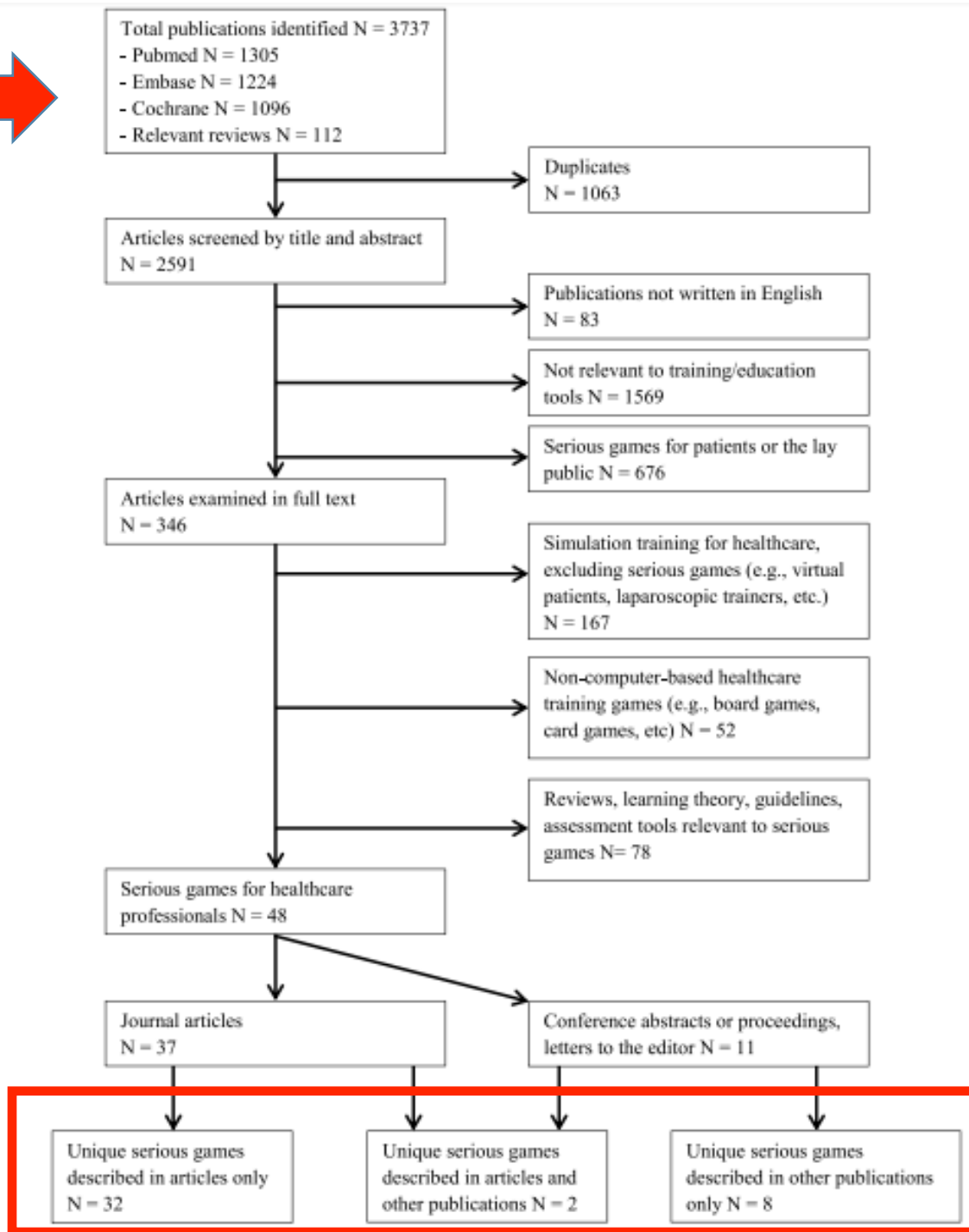


TABLE 1. Brief Definitions of Relevant Game Genres, Adapted From Wolf²¹

Genre	Definition	Examples
Adaptation	Game imported from another medium	NBA 2K15
Adventure	Set in a specific place and time open to exploration; objectives often completed as a series of quests	The Oregon Trail
Board game	Adapted from an existing board game	Monopoly video games
Management simulation	Game requires balanced use of limited resources to achieve in-game objectives	SimCity
Platform	Goal is to move across a series of platforms; a graphical sense of up and down is implied	Super Mario Bros.
Puzzle	Goal is to figure out a solution, often by using different tools and manipulating objects; usually contains visual elements	Tetris
Quiz	Goal is to gain points by successfully answering questions	Trivial Pursuit
Training simulation	Gameplay occurs in situations realistic for skill to be trained; can improve physical skills	Flight Simulator

NBA 2K15 (2K Sports, Inc, New York, NY); Oregon Trail (The Learning Co, Boston, MA); Monopoly video games, SimCity, Trivial Pursuit, (Electronic Arts, Inc, Redwood City, CA); Super Mario Bros. (Nintendo Co, Ltd, Kyoto, Japan); Tetris (The Tetris Company, LLC, Honolulu, HI); Microsoft Flight Simulator (Microsoft Corp, Redmond, WA). Adaptations are themselves works protected by copyright. So in order to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of copyright in the translation or adaptation.

Does it work?

- 19 studies evaluated if the games improved skills or knowledge
- Only 2 did not find a significant improvement.
- Heterogeneity of studies did not allow analysis

For Infection Control

Table 3 Descriptive overview of studies selected

Authors, Year, Ref	Study 1 Sax and Longtin 2011 [22]	Study 2 Vázquez- Vázquez et al. 2011 [23]	Study 3 Castro-Sánchez et al. 2014 [24]	Study 4 Venier et al. 2015 [25]
Type of paper	Conference (presentation)	Conference	Journal article	Conference (presentation)
Origin of the paper	Switzerland (/Canada)	Spain	England	France
Lead (type of organisation)	University hospital	Regional Patient Safety Observatory (Spain)	University	Coordination centre (fighting nosocomial infections)
Paper focus ^a	i), ii) and iii) – Inception, scoping; design, development; pretesting, refinement; and successful launching described. No evaluation of implementation done besides pretesting.	i) and ii) - Inception, scoping; design, development, implementation (launching), but no pretesting/pilot, evaluation done.	i) and ii) – Inception, scoping; design, development. No pretesting. Future evaluation provided.	i), ii) and iv) – brief description about inception, scoping, development, and more focusing on description about implementation of a large scale survey, and its evaluation. No pretesting/pilot studies.
Name of game	Story-based serious game	Serious for hand hygiene training.	'On call: antibiotics'	Flu0
Description of game intervention	Game users can decide where to use hand hygiene and disposable gloves using story-based serious game in which 2 doctors are interacting with different patients during ward rounds. Emotional engagement, role identity development through medical specific distracting plot, and mental simulation. Immediate feedback messages and tracking mechanism of results are also incorporated.	Promotion of hand hygiene using WHO's 'Five Moments for Hand Hygiene' with a ludic approach. A non-risk environment was created without any adverse effects from actions of game users, who have to decide when and how hand hygiene should be performed in a 3D setting with different hotspots. Every decision is followed by feedback to strengthen success or to explain why game users performed incorrectly. Low cognitive erosion to keep the playability.	Serious game for antimicrobial prescribing decisions in virtual hospital patients. Prescribers receive clinical information and have to make diagnostic and therapeutic decisions. They get immediate feedback on performance and wider impacts of prescribing decisions. Personalisation/scores/leader boards and difficulty enhancement mechanisms incorporated in the game to sustain engagement.	Serious game for nurses and doctors to educate 8 key points to know and to do when dealing with one or more patients with flu.

^ai) inception, scoping, ideation; ii) design, development, configuration; iii) small-scale implementation (pretesting/piloting), refinement; iv) large-scale, wide implementation, sustainability

For Infection Control

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^ai) inception, scoping, ideation; ii) design, development, configuration; iii) small-scale implementation (pretesting/piloting), refinement; iv) large-scale, wide implementation, sustainability

Does it work?

“For serious games to continue its growth in training health care professionals, work must be done to build and empirically verify organizational frameworks for their development, evaluation, and distribution”

Obrigada



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