The Role of Behavior Science in Infection Control: An Incomplete Science

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Objectives

- Real Life Infection Prevention
- De-implementation
- Behavioral Science and Infection Prevention
- Conclusions

Real Life in Infection Prevention

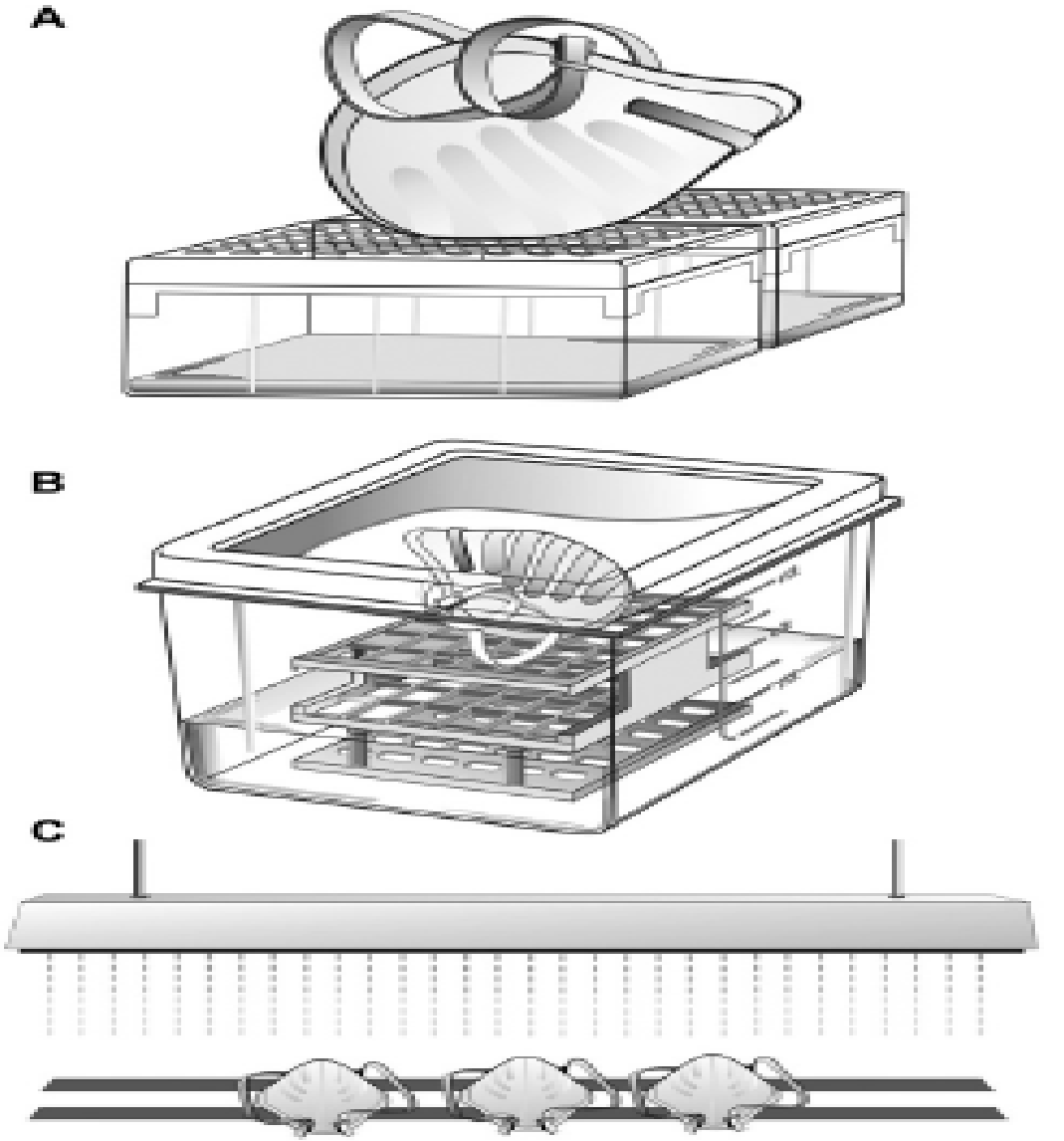
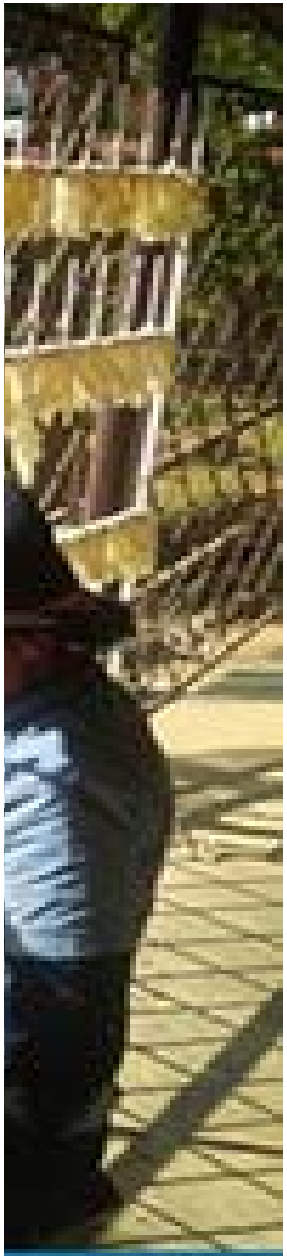
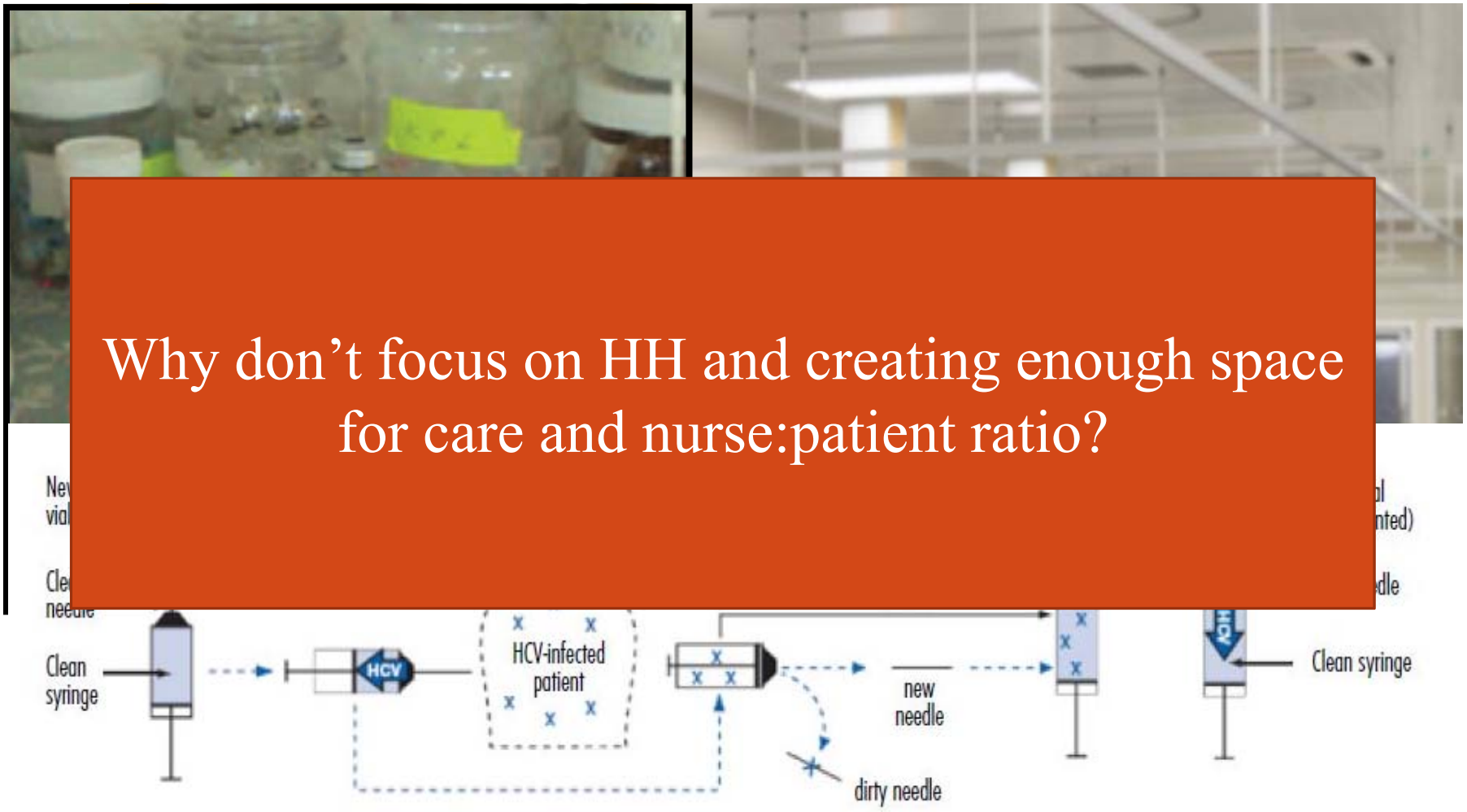


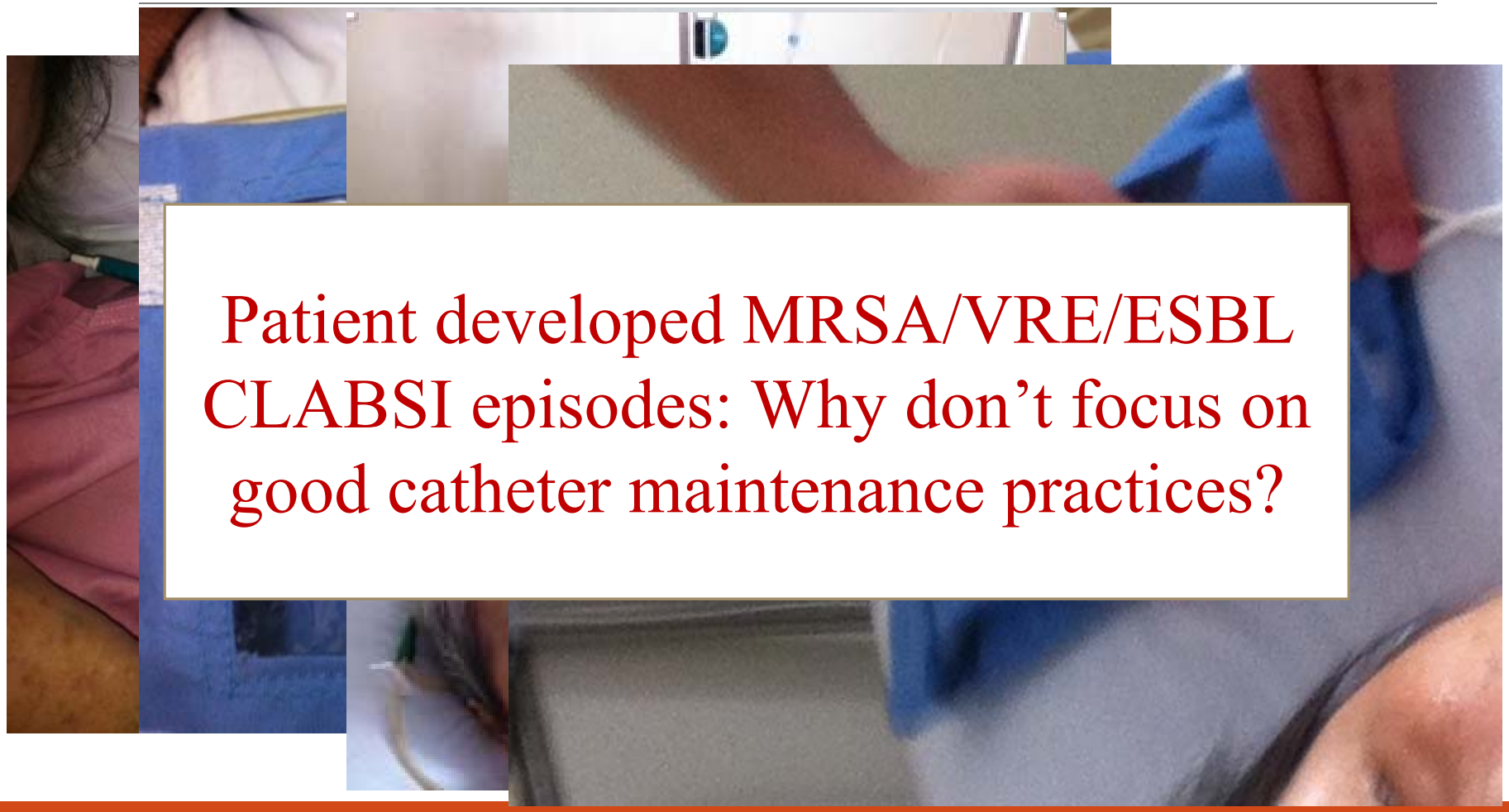
Fig 1. Devices for decontaminating FFRs. (A) MGS device for decontamination of individual FFRs. (B) Chamber for applying WMH to FFRs. (C) Decontamination of FFRs using UVGI.



Some ICUs Require HCWs to Change Shoes Prior to Entering ICUs: But Ignore Basic HH and Over crowded ICUs



My Mother-in-Law Case



Patient developed MRSA/VRE/ESBL CLABSI episodes: Why don't focus on good catheter maintenance practices?

Frequency of Supoptimal and Unnecessary Infection Control Practices in Thailand

Characteristics	
General	**Number (%)**
Reported unnecessary and suboptimal practices	
Not disinfecting connectors/hubs before accessing	99(49)
Use of multi-dose vial	87(43)
Use of central venous cutdown for any CVC insertion	56(28)
Use of 3-way stopcock	50(25)
Routine submission of catheter tip for culture	43(21)
Routine CVC change	31(15)
Femoral CVC insertion in adults	0(0)

Apisarnthanarak A, et al. National survey of suboptimal and unnecessary practices. AJIC 2013

De-implementation

LESSONS LEARNT

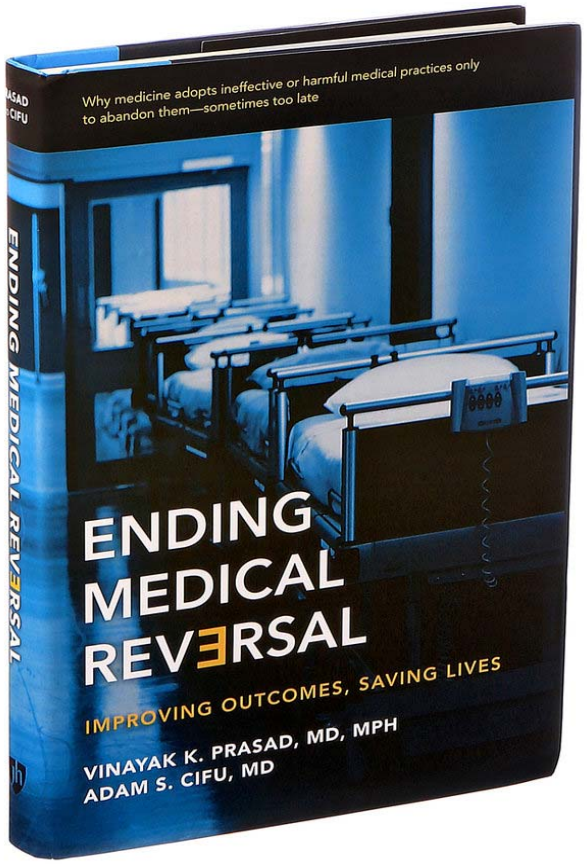
De-implementation

Evidence-based de-implementation for contradicted, unproven, and aspiring healthcare practices

vinay Prasad and John PA loannidis*

- Abandoning ineffective medical practices
- Part of evidence based medicine
- Often takes years to occur
- “example is the routine use of gown and glove precautions”
- “such resistance to evidence inflates healthcare costs and may distract from alternative strategies”

Medical Reversals



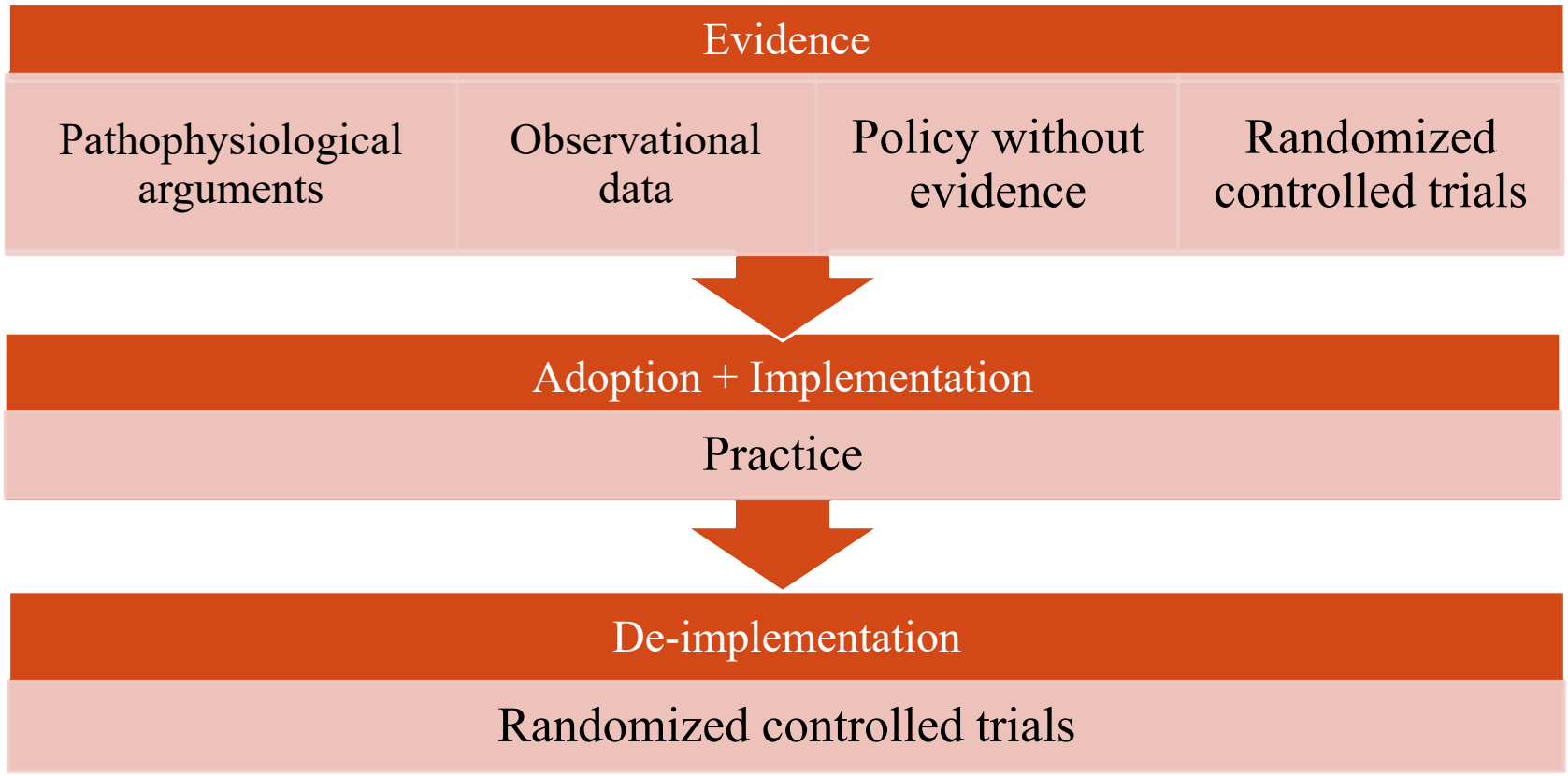

HEALTH

The New York Times

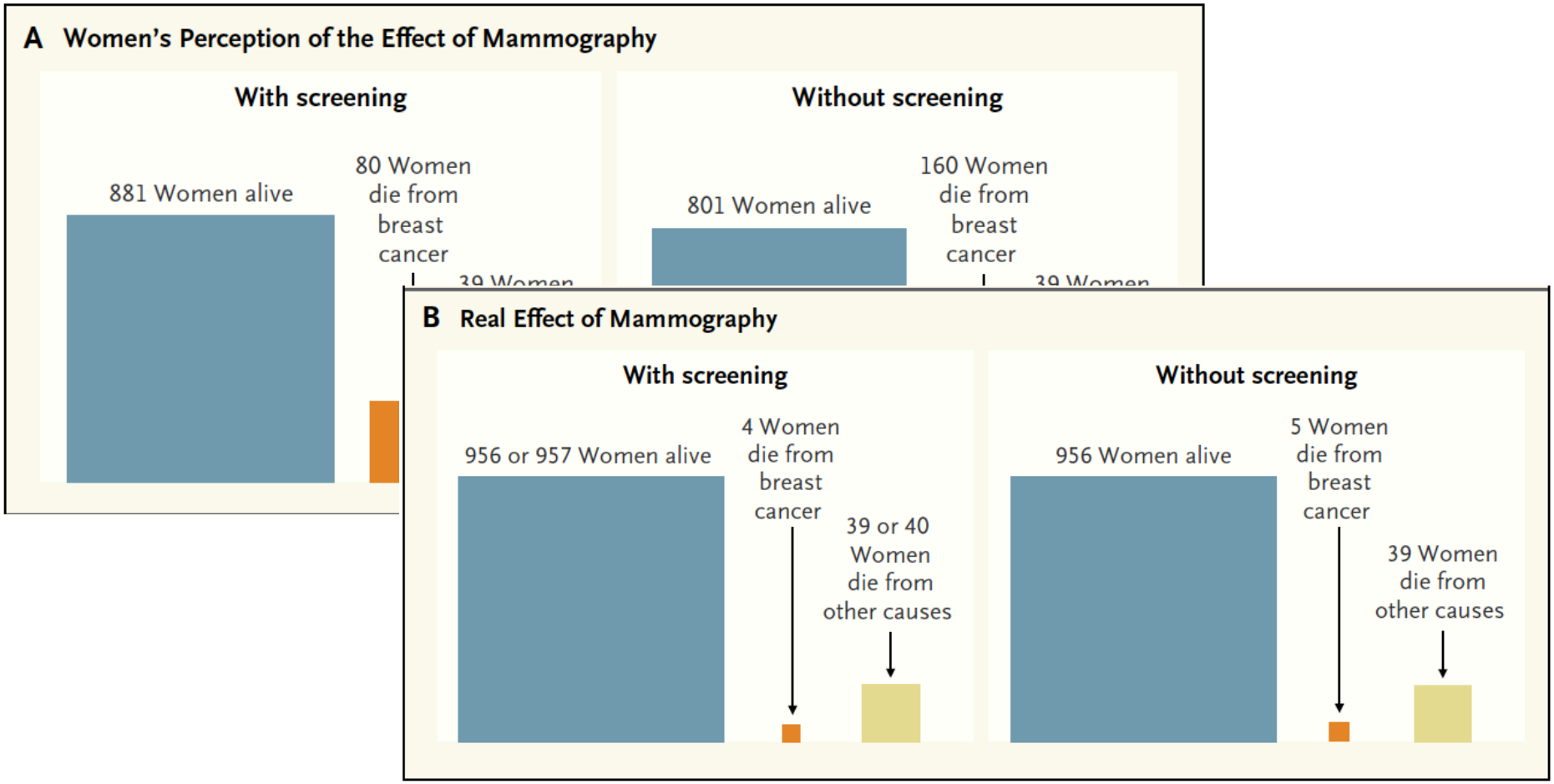
10 Findings That Contradict Medical Wisdom. Doctors, Take Note.

Researchers identified nearly 400 common medical practices and theories that were contradicted by rigorous studies. Here are some of the most notable findings.

De-implementation?

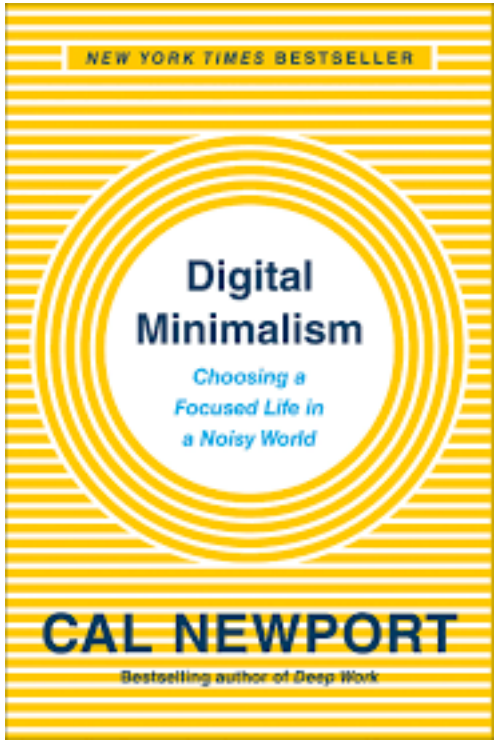


Swiss de-implementation of mammogram program



Biller-Andorno & Juni
NEJM 2014

Medical minimalism



Making it easier to focus on what matters in medicine

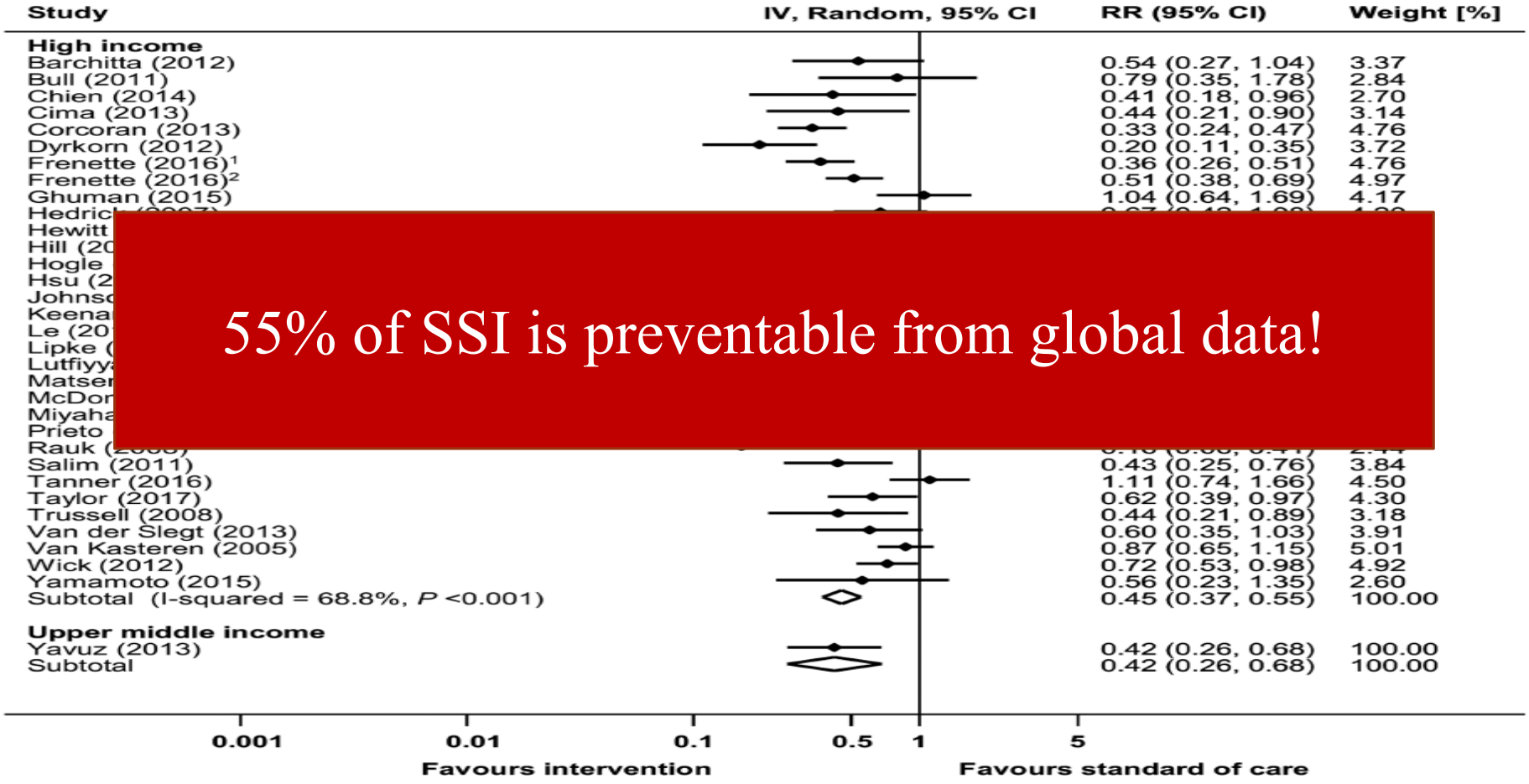
Time with the patient—talk & guide care

Infection Control & Hospital Epidemiology (2018), **39**, 1277–1295
doi:10.1017/ice.2018.183

Original Article

The preventable proportion of healthcare-associated infections 2005–2016: Systematic review and meta-analysis

Peter W. Schreiber MD[1], Hugo Sax MD Prof[1,2], Aline Wolfensberger MD[1], Lauren Clack PhD[1], Stefan P. Kuster MD, MSc[1,2] and Swissnoso[a]



55% of SSI is preventable from global data!

Strong recommendation to not performing these interventions for SSI reduction

Pre-operative period: Do not remove patients' hair. If absolutely necessary, use clipper.

Operative period: Laminar airflow should not be used.

Post-operative period: Do not prolong surgical antibiotic prophylaxis in the post-operative period.

General barrier to stop non evidence-based IPC measure

- The measures have been already used when the surgeon are young ("We have done this before…")
- Skepticism concerning new study results
- A new training is necessary to implement new measures
- Sometimes additional cost

Pre-operative period: Do not remove patients' hair. If absolutely necessary, use clipper.

(WHO: STRONG RECOMMENDATION, MODERATE QUALITY OF EVIDENCE)

ALLAGANZI B, ET AL. LANCET INFECT DIS 2016

Preoperative hair removal and surgical site infections: network meta-analysis of randomized controlled trials

A. Lefebvre [a,*], P. Saliou [b], J.C. Lucet [c], O. Mimoz [d], O. Keita-Perse [e], B. Grandbastien [f], F. Bruyère [g,h], P. Boisrenoult [i], D. Lepelletier [j], L.S. Aho-Glélé [a] on behalf of the French study group for the preoperative prevention of surgical site infections

Journal of Hospital Infection 91 (2015) 100–108

19 RCTs (1971 – 2009)

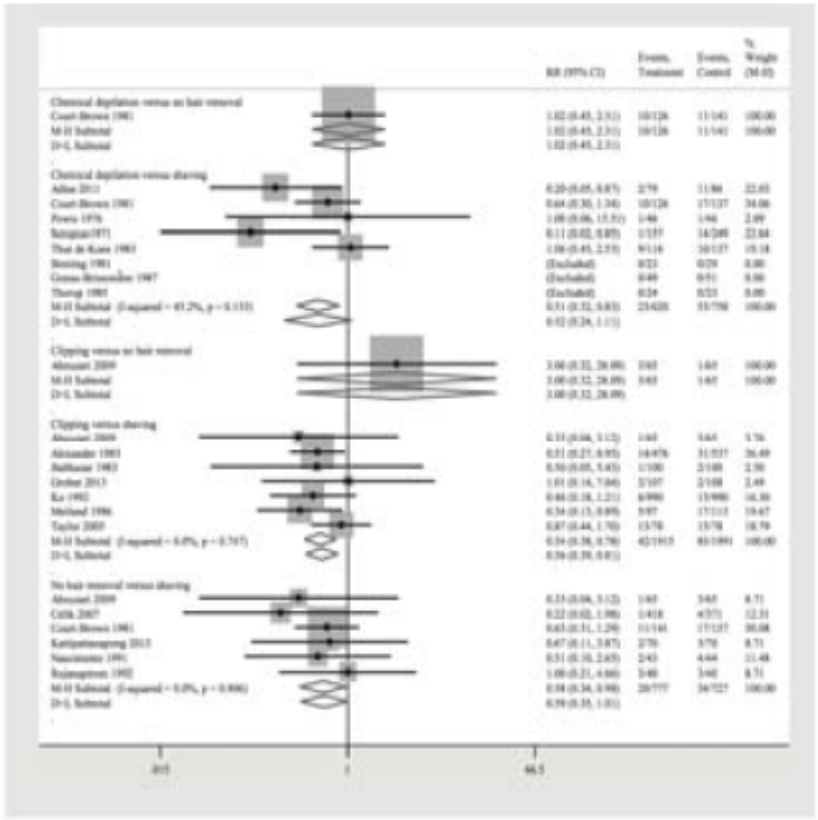
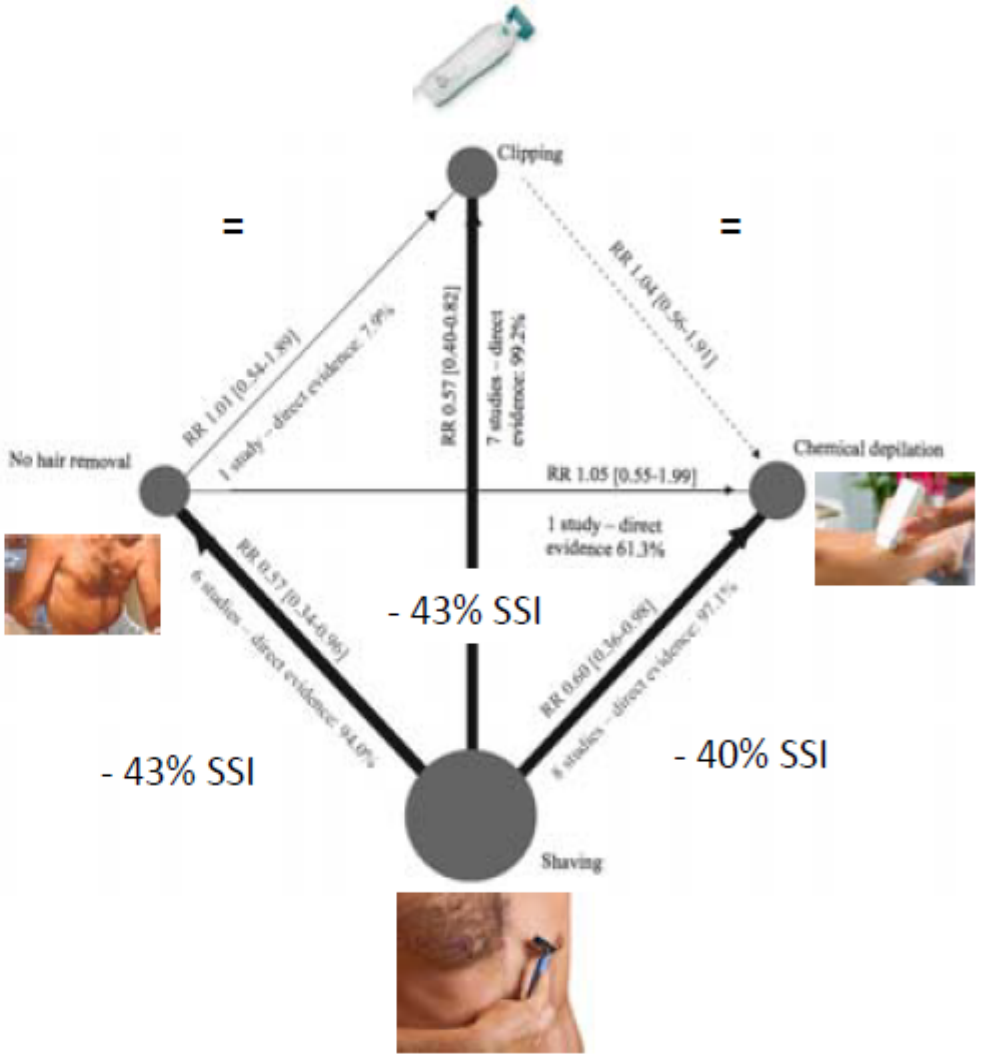


Figure 2. Paired meta-analyses of relative risk of surgical site infections according to the method of hair removal. RR, relative risk; CI, confidence interval; M-H, Mantel–Haenszel pooling method; D+L, DerSimonian and Laird pooling method.




Euromedis
RASOIR
DOUBLE LAMES - POUR USAGE MÉDICAL
Euromedis
RASOIR
DOUBLE LAMES - POUR USAGE MÉDICAL
OUVRIR ICI
Usage unique
Non stérile
Rase les cheveux et les poils de toute longueur
100 PCS

Do not remove patients' hair

(If absolutely necessary, remove with clipper)

(WHO: strong recommendation, moderate quality of evidence)

How to overcome such barrier!

- Consensus in IPC committee
- Information for HCWs and patients
- Organize easy access to clippers, stop of buying razor
- Re-organization of hair removal procedure
- Audit again and again!

Operative period: Laminar airflow should not be used.

THE PANEL SUGGEST THAT LAF SHOULD NOT BE USED TO REDUCE SSIS FOR PATIENTS UNDERGOING TOTAL ARTHROPLASTY SURGERY

(WHO: CONDITIONAL RECOMMENDATION, LOW TO MOD LEVEL QUALITY OF EVIDENCE)

ALLAGANZI B, ET AL. LANCET INFECT DIS 2016

Effect of laminar airflow ventilation on surgical site infections: a systematic review and meta-analysis

Peter Bischoff, N Zeynep Kubilay, Benedetta Allegranzi, Matthias Egger, Petra Gastmeier

- No benefit for laminar airflow compared with conventional turbulent ventilation of the operating room in reducing the risk of SSIs in total hip and knee arthroplasties, and abdominal surgery
- Laminar airflow NOT an evidence-based preventive measure to reduce the risk of SSIs
- Equipment should NOT be installed in new operating rooms

	Laminar airflow		Conventional ventilation		Weight	Odds ratio (95% CI)
	Events	Total	Events	Total		
Kakwani et al (2007)[39]	0	212	9	223	0·9%	0·05 (0·00–0·92)
Brandt et al (2008)[30]	242	17 657	99	10 966	16·1%	1·53 (1·21–1·93)
Dale et al (2009)[31]	324	45 620	260	48 338	17·1%	1·32 (1·12–1·56)
Pedersen et al (2010)[35]	517	72 423	80	8333	16·0%	0·74 (0·59–0·94)
Breier et al (2011)[37]	356	29 530	77	11 682	15·9%	1·84 (1·44–2·36)
Hooper et al (2011)[38]	25	16 990	21	34 495	10·1%	2·42 (1·35–4·32)
Namba et al (2012)[33]	46	8478	109	22 013	14·2%	1·10 (0·78–1·55)
Song et al (2012)[36]	34	2037	16	1149	9·8%	1·20 (0·66–2·19)
Total	1544	192 947	671	137 199	100·0%	1·29 (0·98–1·71)

Events are number of surgical site infections. Test for heterogeneity showed very high inconsistency between the studies (I^2=83%).

Table 3: Meta-analysis comparing the risk of deep surgical site infection after total hip arthroplasty for laminar airflow *vs* conventional ventilation

	Laminar airflow		Conventional ventilation		Weight	Odds ratio (95% CI)
	Events	Total	Events	Total		
Miner et al (2007)[40]	15	3513	13	4775	11·4%	1·57 (0·75–3·31)
Brandt et al (2008)[30]	55	5993	22	3403	16·5%	1·42 (0·87–2·34)
Breier et al (2011)[37]	93	14456	36	6098	19·1%	1·09 (0·74–1·60)
Hooper et al (2011)[38]	27	13994	23	22832	15·1%	1·92 (1·10–3·34)
Song et al (2012)[36]	27	2151	23	937	15·0%	0·51 (0·29–0·89)
Namba et al (2013)[34]	105	16693	299	39523	22·9%	0·83 (0·66–1·04)
Total	322	56800	416	77568	100·0%	1·08 (0·77–1·52)

Events are number of surgical site infections. Test for heterogeneity showed high inconsistency between the studies (I^2=71%).

Table 4: Meta-analysis comparing the risk of deep surgical site infection after total knee arthroplasty for laminar airflow *vs* conventional ventilation

Therefore, it is important to focus on IPC with very good evidence and still are not completely implemented

Barriers for stopping constructing LAF in new operating room

- Not believing the evidence: end point of studies: air contamination vs. SSI rates
- Local health authority still require LAF
- National guideline still require LAF
- Industry is interested to sell LAF ventilation system

How to overcome the barrier to stop installation of LAF

- Consensus in the IPC committee
- Interaction with the local health authorities
- Develop national consensus
- Ongoing search for optimal ventilation system

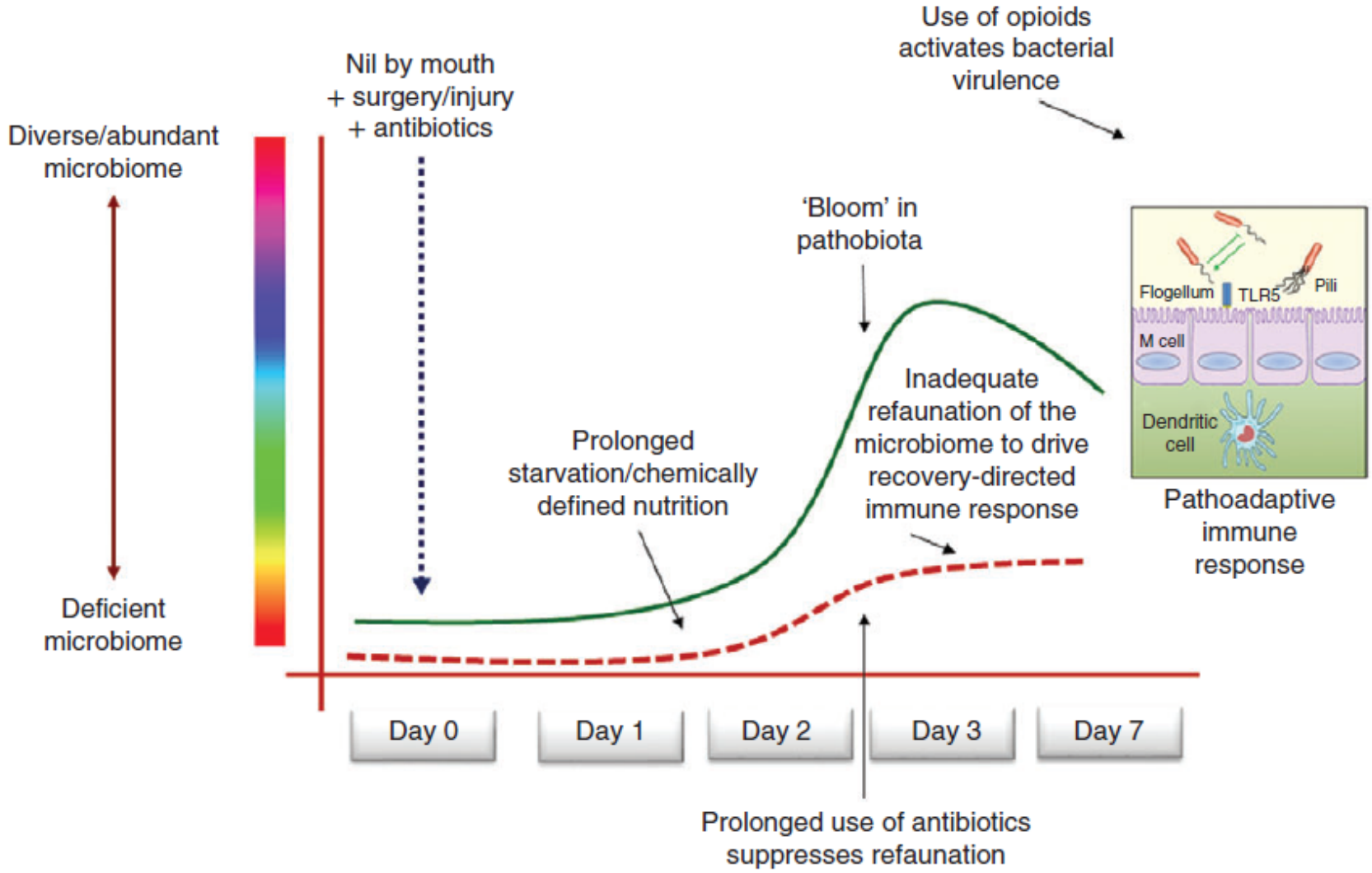
Do not prolong surgical AB prophylaxis in the post-operative period

THE PANEL RECOMMEND AGAINST THE PROLONGATION OF SAP AFTER COMPLETION OF THE OPERATION TO PREVENT SSIS

(WHO: STRONG RECOMMENDATION, MODERATE QUALITY OF EVIDENCE)

The gut microbiome and the mechanism of surgical infection

J. C. Alverdy[1], S. K. Hyoju[1], M. Weigerinck[2] and J. A. Gilbert[1]



b Severe surgical injury

refaunate and provide competitive exclusion to any transient pathobiota. **b** When surgical injury is severe and prolonged, causing a delay in resumption of normal foodstuff, refaunation of the microbiome can become impaired. This may result in a period of vulnerability to colonizing pathobiota, the consequences of which can be a loss of systemic immune function from lack of tonic immune stimulation by the microbiota. PSA, polysaccharide A; DC, dendritic cell, TLR, toll-like receptor

Association of duration and type of surgical prophylaxis with antimicrobial associated adverse events

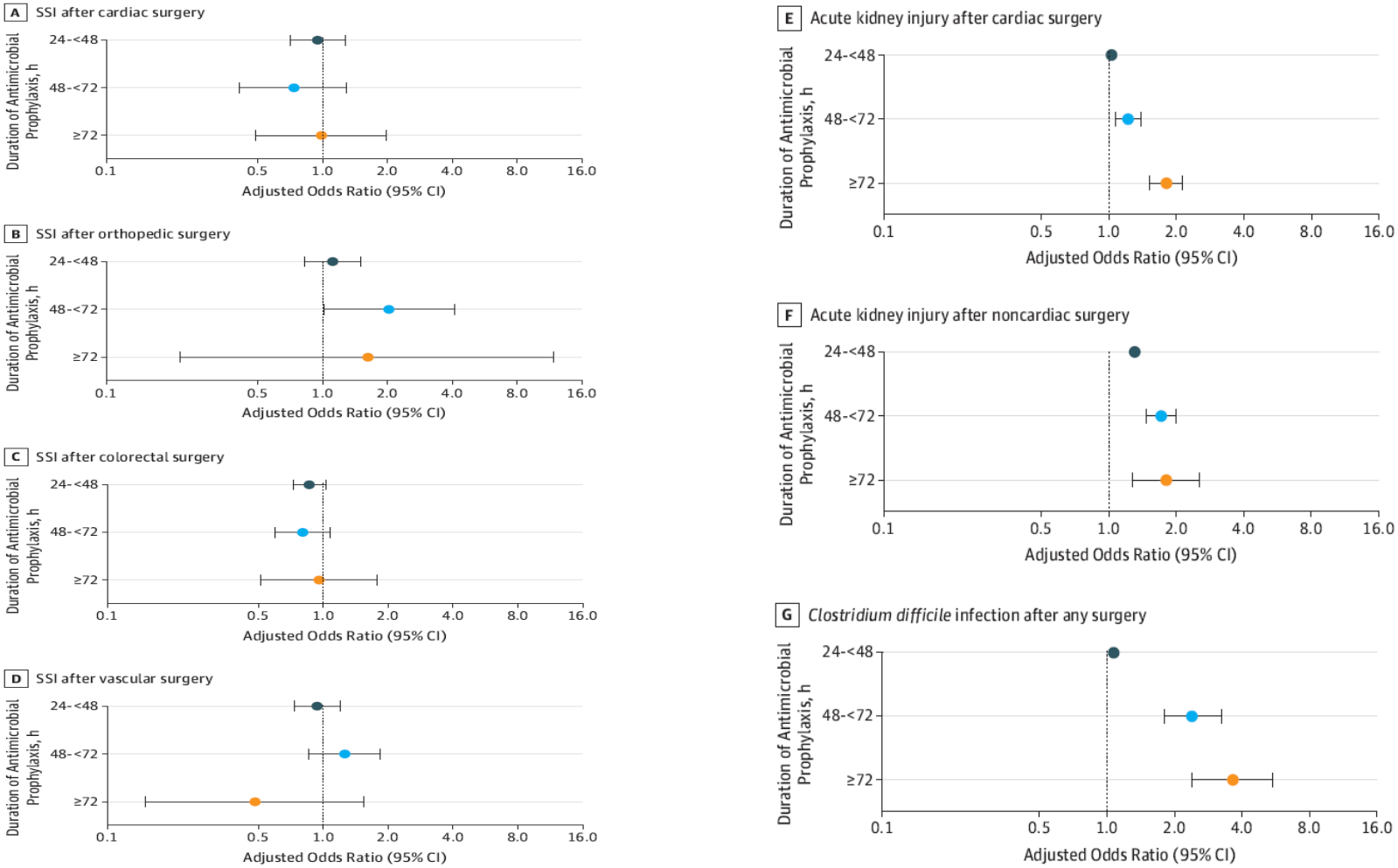
- Multi-center, national, retrospective cohort study
- All patients within national VA healthcare system who underwent cardiac, orthopedic total joint replacement, colorectal and vascular procedures from 2008-2013
- 4 groups of AB prophylaxis: <24 hr, 24-48 hr, 48-72 hr, >72 hr
- Multi-variate analysis for 3 endpoints: SSI, acute kidney injury and CDI

Branch-Ellimann, et al. JAMA Surg 2019

JAMA Surgery | Original Investigation

Association of Duration and Type of Surgical Prophylaxis With Antimicrobial-Associated Adverse Events

Westyn Branch-Elliman, MD, MMSc; William O'Brien, MS; Judith Strymish, MD; Kamal Itani, MD; Christina Wyatt, MD; Kalpana Gupta, MD, MPH



Barriers for stopping prolonged SAP

- Safety of individual patient vs. safety of all patients
- Not believing the evidence
- Not believing that this is causing side effects (in general and in individual patients)

How to overcome barrier of stop prolonged perioperative prophylaxis

- Hospital should establish multi-disciplinary antimicrobial management team
- Regular audits and feedback to surgeons
- Use electronic stop order
- Education about side effects of prolonged antibiotic prophylaxis

Summary

- De-implementation of non evidence-based IPC measures is also very difficult
- Education about the correct IPC measures is usually not enough
- Routine audits of IPC measures with appropriate feedback are useful to stop the use of these measures
- Some behavioral-targeted innovation are needed

ORIGINAL ARTICLE

Hand Hygiene Behavior: Translating Behavioral Research into Infection Control Practice

Thanee Eiamsitrakoon, MD;[1] Anucha Apisarnthanarak, MD;[2] Winitra Nuallaong, MD, MSc;[3]
Thana Khawcharoenporn, MD, MSc;[2] Linda M. Mundy, MD, PhD[4]

BACKGROUND. In 2009, the World Health Organization (WHO) recommended "My Five Moments for Hand Hygiene" (5MHH) to optimize hand hygiene (HH). Uptake of these recommendations by healthcare workers (HCWs) remains uncertain.

METHODS. We prospectively observed HCW compliance to 5MHH. After observations, eligible HCWs who consented to interviews completed surveys on factors associated with HH compliance based on constructs from the transtheoretical model of behavioral change (TTM) and the theory of planned behavior (TPB). Survey results were compared with observed HCW behaviors.

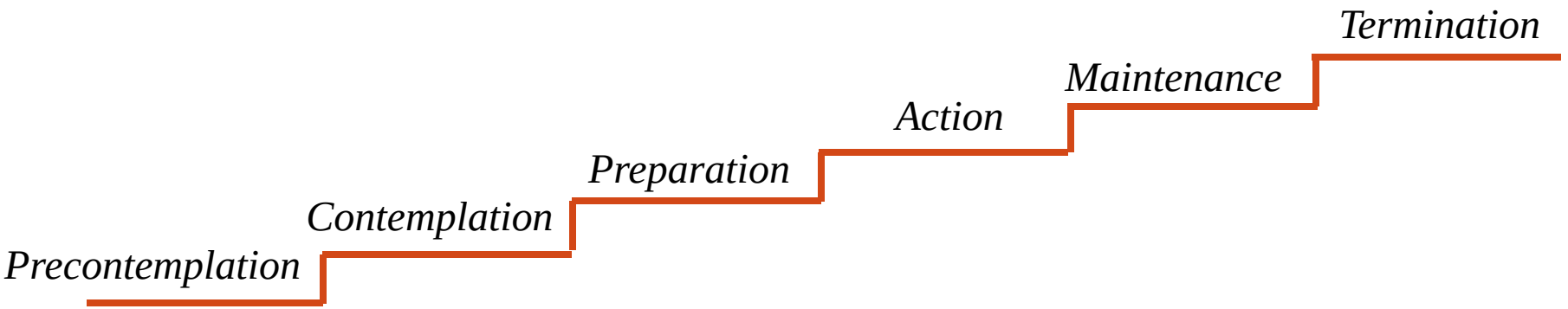
RESULTS. There were 968 observations among 123 HCWs, of whom 110 (89.4%) were female and 63 (51.3%) were nurses. The mean HH compliance for all 5MHH was 23.2% (95% confidence interval [CI], 18.1%–28.3%) by direct observation versus 82.4% (95% CI, 79.9%–84.9%) by self report. The HCW 5MHH compliance was associated with critical care unit encounters ($P < .05$), medicine unit encounters ($P = 0.08$, $P < .001$), immunocompromised patient encounters ($P < .05$), and HCW prioritized patient advocacy ($P < .001$). Self-reported TTM stages of action or maintenance ($P = .08$) and the total TPB behavior score correlated with observed 5MHH ($r = 0.21$, $P = .02$) and with self-reported 5MHH compliance ($r = 0.53$, $P < .001$).

CONCLUSION. Observed HCW compliance to 5MHH was associated with the type of hospital unit, type of provider-patient encounter, and theory-based behavioral measures of 5MHH commitment.

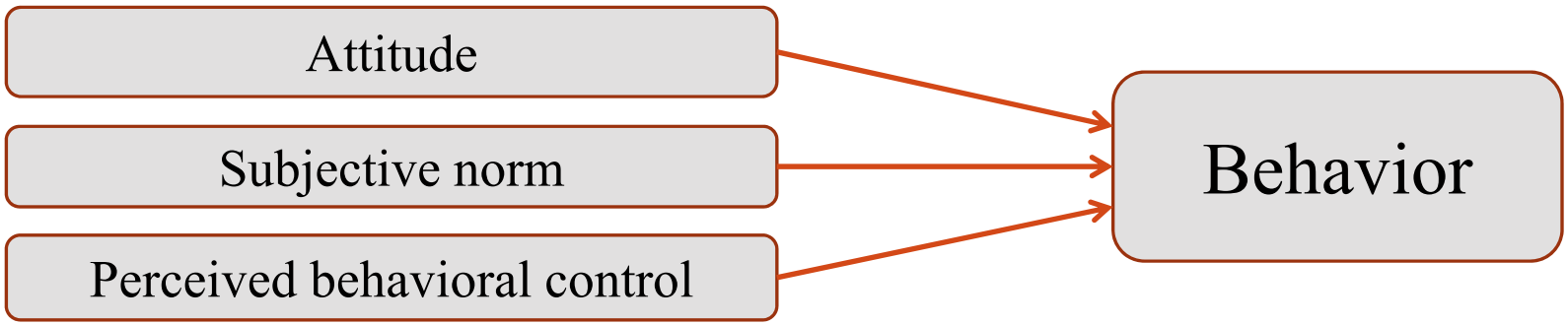
Infect Control Hosp Epidemiol 2013;34(11):000-000

The 2 behavior Theorem

The Transtheoretical Model of Health Behavior Change (TTM)



The Theory of Planned Behavior (TPB)



TTM Stages of Readiness

Pre-contemplation: a HCW not intending to change commitment to HH in the next 6 mos

Contemplation: a HCW who self reported awareness of potential commitment to HH in the next 6 mos

Preparation: a HCW who intended to practice 5MHH within the next month

Action: a HCW who had committed to 5MHH within the past 6 months

Maintenance: a HCW who continued to commit to 5MHH in at least 6 mos.

- Prochaska JO, The transtheoretical model of health behavior change. Am J Health Promot. 1997
- Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991

Methods: TPB

The 2 behavior Theorem

Behavioral domain	Variable	Item No.	Question	Score	Alpha coefficient
Attitude	Behavioral belief	5	Do you think hand hygiene in following situations* contributes to healthcare associated infection reduction?	Unipolar 1 to 7	0.76
	Outcome evaluation	1	How do you think, if healthcare associated infection is reduced?	Bipolar -3 to +3	n/a†
Subjective Norm	Normative belief	5	How do you think boss/ co-workers want you to do hand hygiene in following situations?	Bipolar -3 to +3	0.86
	Motivation to comply	1	Will you comply with hand hygiene practice if boss/co W workers want you to do so?	Unipolar 1 to 7	n/a†
Perceive Behavioral Control	Control belief	5	Do you think hand hygiene in following situations* is difficult or easy?	Bipolar -3 to +3	0.68
	Power of control	1	Do you think you can increase hand hygiene compliance?	Unipolar 1 to 7	n/a†

- Prochaska JO, The transtheoretical model of health behavior change. Am J Health Promot. 1997
- Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991

Study cohort

Characteristics	N = 123
Gender: Female	110 (89.4)
Age (years): mean; (95% CI)	26.9 (26.1-27.7)
Occupation	
Nurse	63 (51.2)
Nurse assistant	29 (23.6)
Physician	16 (13)
Others [a]	15 (12.2)
Duration of work (years): mean ((95% CI)	4.1 (3.3-4.9)
Ever had experienced for hand-hygiene education	67 (54.5)

Note: Data available in number (percentage) unless otherwise indicated.

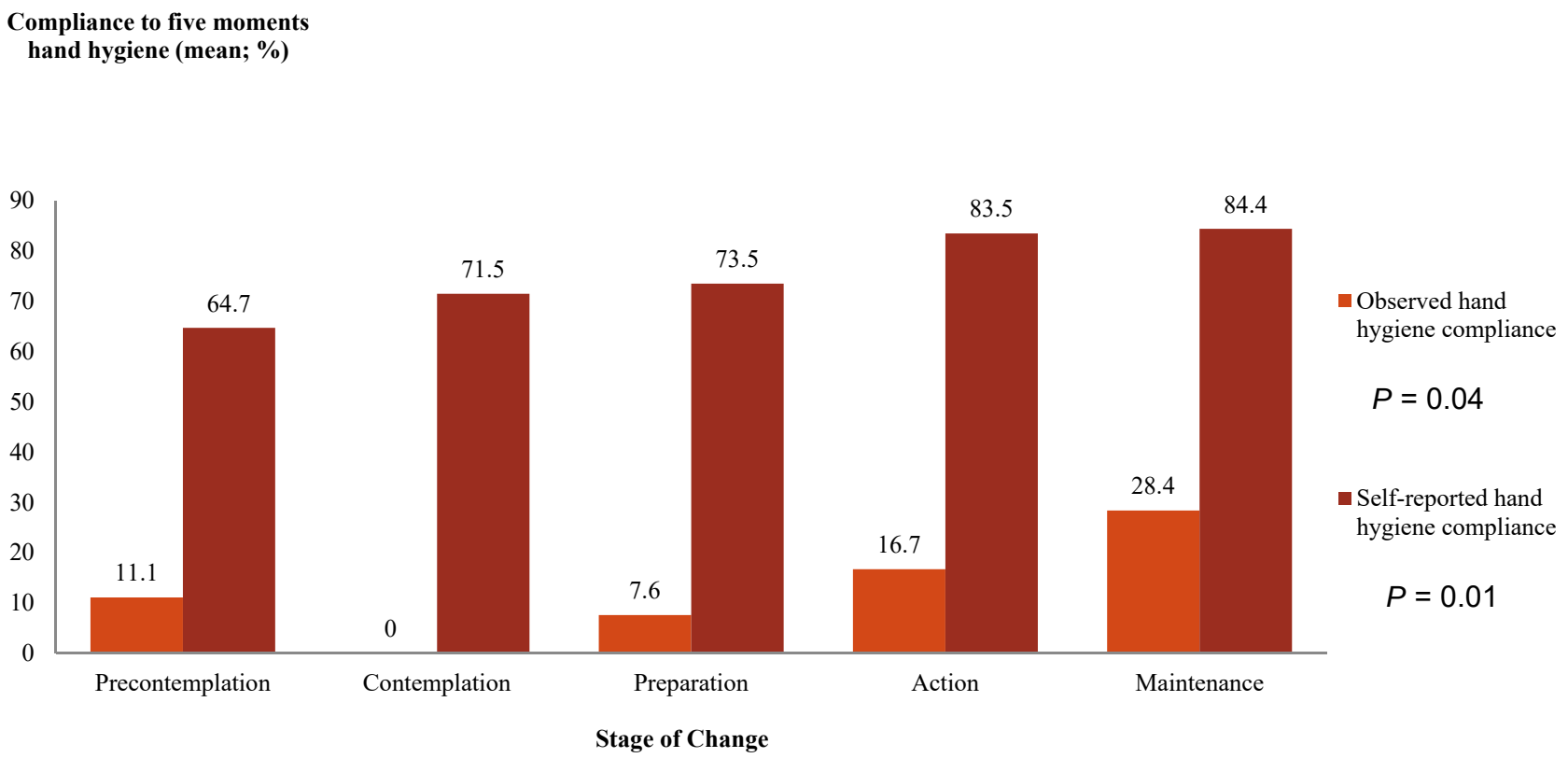
[a] Students and technicians

Factors associated with hand hygiene compliance by TTM

Factor	aOR (95% CI)	*P*
Working in critical care units	1.5 (1.07-2.11)	0.01
Working in Medicine Department	1.87 (1.31-2.67)	0.08
Caring for immunocompromised patients	2.1 (1.35-3.25)	0.001
Considering patient's advantage as first priority*	2.27 (1.62-3.2)	<0.001
Being in stage of action or maintenance	1.77 (0.91-2.45)	0.08

**If your hands are clean, who do you think benefits most, as a first priority? The prioritized ranking order from 1-6 among 6 groups (self, patient, respondent's family, patient's family, coworkers, boss)

Hand hygiene compliance by TTM Stages of Change

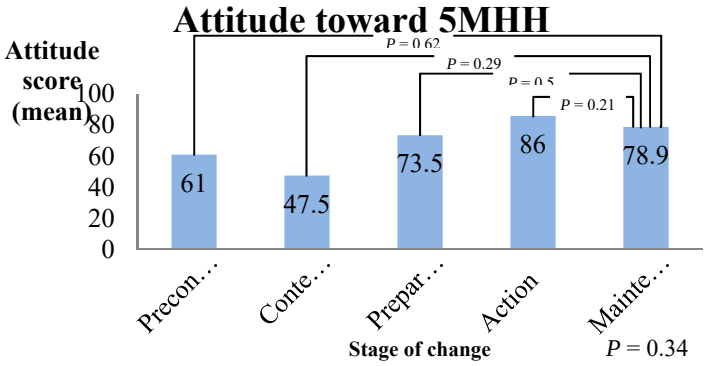


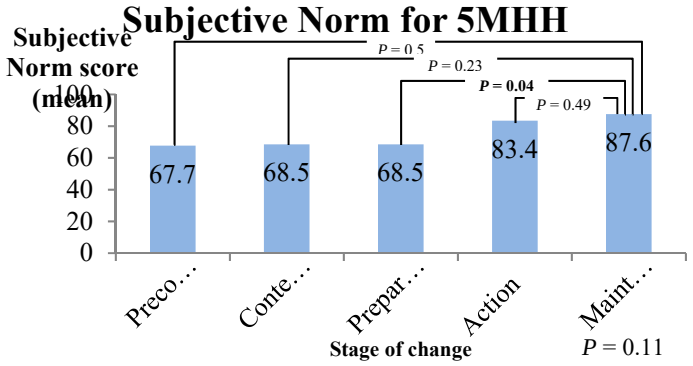
Factors associated with hand hygiene compliance by TPB

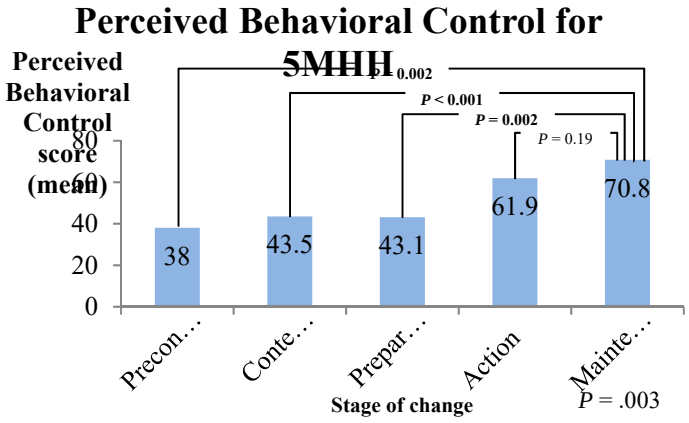
Factors	aOR (95% CI)	P
Working in critical care units	1.47 (1.05-2.07)	0.02
Working in Medicine Department	1.93 (1.35-2.74)	<0.001
Caring for immunocompromised patients	2.17 (1.41-3.34)	<0.001
Considering patient's advantage as first priority	2.12 (1.49-3.04)	<0.001
Extremely positive attitude toward five moments hand hygiene†	1.49 (1.01-2.20)	0.04

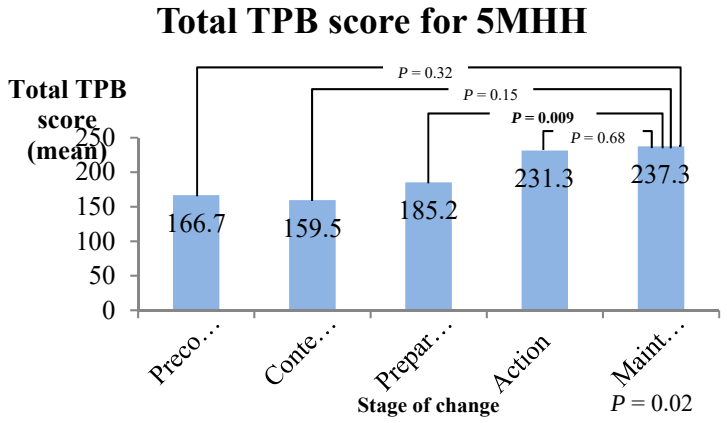
† Attitude score in the 1st interval from maximal end.

Relationship between TPB domains and TTM stages of change









What do we learn?

Behavioral science is complex and require some understanding in different culture.

Healthcare workers' behavior significantly impact on hand hygiene adherence.

HCWs at different stage of readiness are subject to target with different intervention!

Questions remains: Which behavioral theory work best!

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY MAY 2015, VOL. 36, NO. 5

ORIGINAL ARTICLE

Behavior-Based Interventions to Improve Hand Hygiene Adherence Among Intensive Care Unit Healthcare Workers in Thailand

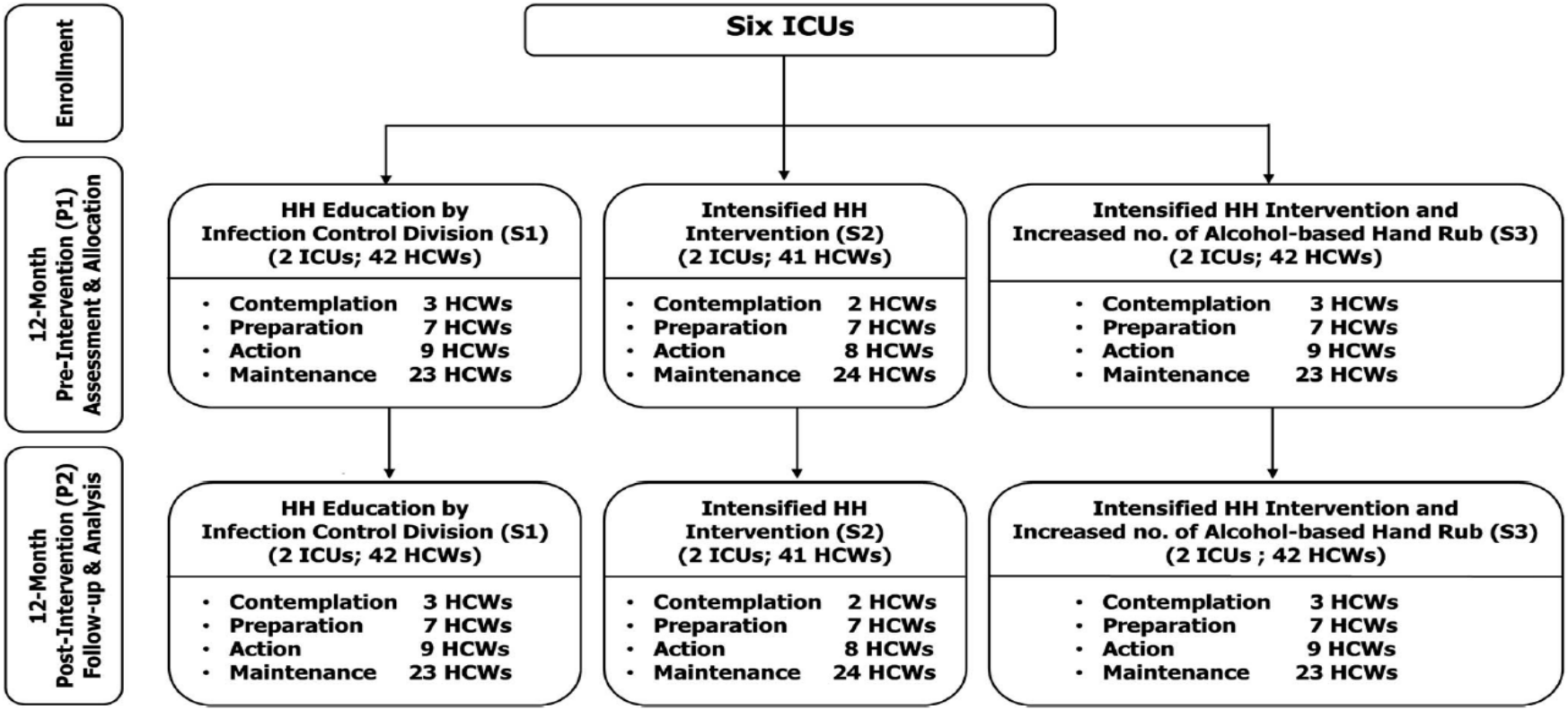


TABLE 2. Comparison of Demographic and Behavioral Characteristics of 3 Groups of Intensive Care Units With Healthcare Workers (HCWs) Assigned to a Group Intervention in Five Moments for Hand Hygiene

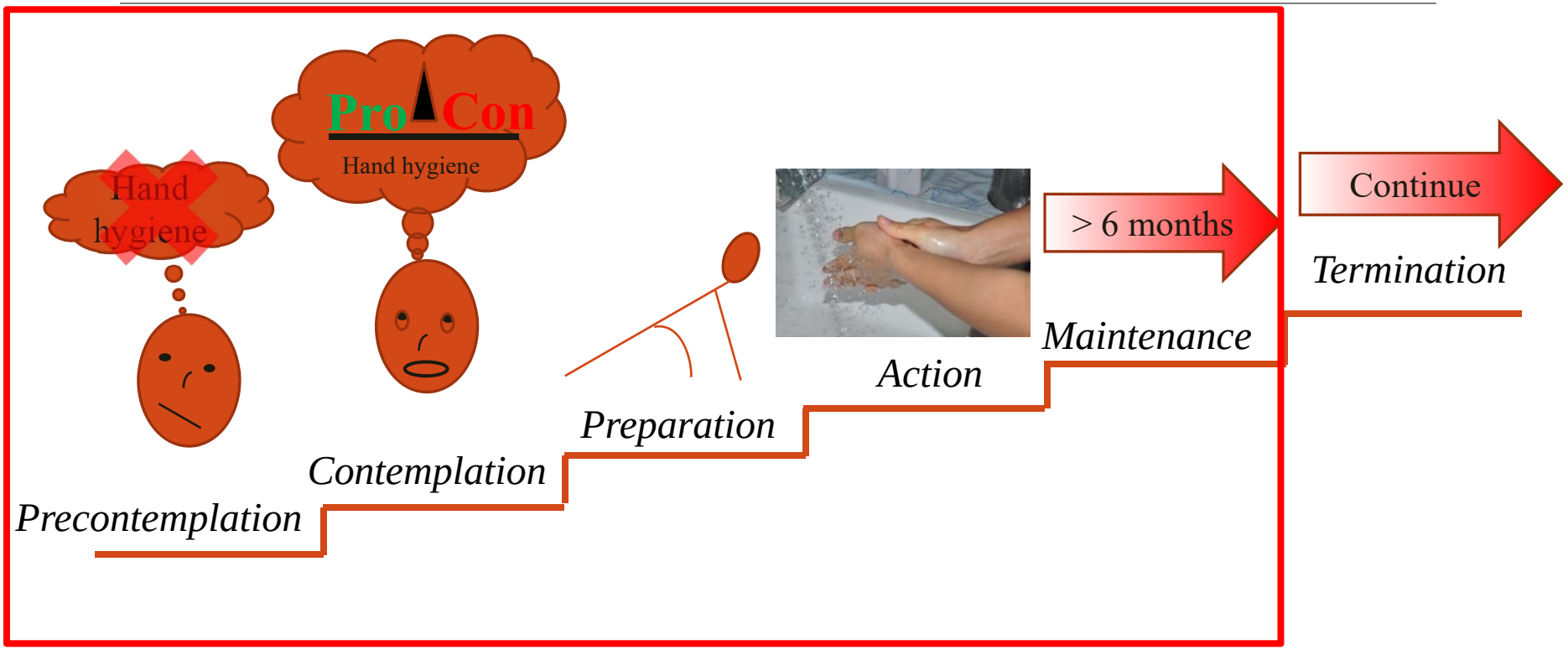
Characteristic	S1 (n = 42)	S2 (n = 41)	S3 (n = 42)
Female sex	38 (90)	36 (87)	37 (88)
Age, mean, y	26.5	28.7	27.4
Occupation			
Nurse	25 (60)	24 (58.5)	24 (57.1)
Nurse assistant	8 (20)	9 (22)	9 (21.4)
Physician	5 (12)	4 (9.7)	5 (12)
Other[a]	4 (8)	4 (9.7)	4 (8)
Duration of work, mean (range), y	5.3 (2.1–6.9)	5.4 (2.3–6.7)	5.4 (2.1–6.8)
Observed HH opportunity/HCW, mean (range)	15.1 (12.4–16.9)	15.4 (12–16.8)	15.2 (12.1–16.7)
Observed HH moments/HCW, mean (range)	4 (3–5)	4.2 (3.2–5)	4.3 (3.1–5)
Self-report of TTM stage of commitment to HH			
Contemplation	3 (7)	2 (5)	3 (7)
Preparation	7 (17)	7 (15)	7 (14)
Action	9 (21)	8 (21)	9 (21)
Maintenance	23 (55)	24 (59)	23 (55)

TABLE 3. Observed Adherence to Five Moments for Hand Hygiene (5MHH) Among Intensive Care Unit Healthcare Workers

Observed HH Adherence	Preintervention (n = 968 opportunities)	Postintervention (n = 968 opportunities)	*P* Value
Assigned HH adherence group, %			
S1	68.0	71.0	.84
S2	65.0	85.0	.02
S3	66.0	95.0	.005
Observed 5MHH adherence, %			.04
Before touching the patient (moment 1)	53.1	71.0	
Before a clean or aseptic procedure (moment 2)	39.9	63.0	
After body fluid exposure risk (moment 3)	34.6	79.4	
After touching the patient (moment 4)	86.4	96.9	
After touching the patient's surroundings (moment 5)	80.2	90.1	
Self-reported TTM stage of commitment to HH			.02
Contemplation (n = 8)	21.0	54.5	
Preparation (n = 21)	25	75.1	
Action (n = 26)	79.9	91.9	
Maintenance (n = 70)	86.5	96.9	

Do the same theory work to enhance doctor to comply with ASP?

Introduction



Stage of Change

The Transtheoretical Model of Behavioral Change

Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. Am J Health Promot. 1997;12(1):38-48.

Methods and Data collections

Commitment to hand hygiene stage of change

- **Precontemplation**

  Prescriber who did not want to follow, or did find applicable, the antibiotic regimen recommended per international/local guidelines for treatment and/or surgical prophylaxis

- **Contemplation**

  Prescribers who may follow international/local guidelines for treatment of organ-specific infection and/or surgical prophylaxis in the next 90 days

- **Preparation**

  Prescribers who may follow international/local guidelines for treatment of organ-specific infection and/or surgical prophylaxis in the next 30 days

- **Action**

  Prescribers who already follow international/local guidelines for treatment of organ-specific infection and/or surgical prophylaxis for <6 months

- **Maintenance**

  Prescribers who already follow international/local guidelines for treatment of organ-specific infection and/or surgical prophylaxis for ≥6 months

Antibiotic prescribing behavioral assessment of physicians involved in surgical care

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Infection Control & Hospital Epidemiology (2019), **40**, 1077–1086
doi:10.1017/ice.2019.185

Table 2. Multivariate analysis of appropriate antibiotic prescribing behavior by providers of 92 patients in peri-operative care.

Multivariate analysis	aOR	95%CI	*P* value
Overall appropriate antibiotic prescriptions			
Action plus Maintenance stages in TTM	7.95	2.09 - 30.31	.002
Considering patients as first priority	4.03	1.06 - 15.33	.04
Neurosurgical procedure	.14	.02 - .90	.04
Surgical prophylaxis	.15	.004 - .53	.003
Appropriate antibiotic prescriptions for treatment			
Action plus Maintenance stages in TTM	9.8	1.86 - 51.73	.007
Appropriate antibiotic prescriptions for surgical prophylaxis			
Action plus Maintenance stages in TTM	7.0	1.14 - 42.97	.04

Table 1. Baseline Characteristics Among 92 Prescriptions in Perioperative Care Who Were Prescribed Antibiotics for Treatment or Prophylaxis

Variable	Overall (n = 92)			Treatment (n = 62)			Surgical Prophylaxis (n = 30)		
	Appropriate (n = 70)	Inappropriate (n = 22)	*P* Value	Appropriate (n = 54)	Inappropriate (n = 8)	*P* Value	Appropriate (n = 16)	Inappropriate (n = 14)	*P* Value
Age (mean ± SD)	27.10 ± 2.16	30.23 ± 8.76	.007	27.50 ± 2.27	31.63 ± 10.21	.01	25.75 ± .86	29.43 ± 8.12	.08
Sex (male)	42 (60)	14 (63.6)	.81	32 (59.3)	4 (50)	.71	6 (37.5)	4 (28.6)	.71
Level of training			.04			.07			.26
Extern and Intern	27 (38.6)	10 (45.5)		17 (31.5)	4 (50)		10 (62.5)	6 (42.9)	
Residency	41 (58.6)	8 (36.4)		35 (64.8)	2 (25)		6 (37.5)	6 (42.9)	
Fellow and staff	2 (2.9)	4 (18.2)		2 (3.7)	2 (25)		0 (0)	2 (14.3)	
Antibiotic for treatment	54 (77.1)	8 (36.4)	.001	. . .	. . .	. . .	. . .	. . .	. . .
Urinary tract infection	10 (18.5)	2 (25)	.65	10 (18.5)	2 (25)	.65	. . .	. . .	. . .
Intraabdominal infection	9 (16.7)	2 (25)	.62	9 (16.7)	2 (25)	.62	. . .	. . .	. . .
Pneumonia	16 (29.2)	2 (25)	1.00	16 (29.2)	2 (25)	1.000	. . .	. . .	. . .
Other[a]	15 (27.8)	2 (25)	1.00	15 (27.8)	2 (25)	1.000	. . .	. . .	. . .
Antibiotic for surgical prophylaxis	16 (22.9)	14 (63.6)	.001	N/A	N/A	N/A	16 (22.9)	14 (63.6)	.001
Patterns of antibiotic use									
First-generation cephalosporins	13 (18.6)	7 (31.8)	.24	. . .	. . .	. . .	13 (81.3)	7 (50)	.12
Third-generation cephalosporins	16 (22.9)	4 (18.2)	.77	14 (25.9)	2 (25)	1.0	2 (12.5)	2 (12.5)	1.00
BLBIs	20 (28.6)	1 (4.5)	.02	20 (37)	1 (12.5)	.25	. . .	. . .	. . .
Carbapenems	6 (8.6)	4 (18.2)	.23	6 (11.1)	3 (37.5)	.08	0 (0)	1 (7.1)	.47
Vancomycin	2 (2.9)	0 (0)	1.00	1 (1.9)	0 (0)	1.00	1 (6.3)	0 (0)	1.00
Combination antibiotics[b]	8 (11.4)	3 (13.6)	.72	8 (14.8)	0 (0)	.58	0 (0)	3 (21.4)	.09
Other[c]	5 (7.1)	3 (13.6)	.39	5 (9.3)	2 (25)	.22	0 (0)	1 (7.1)	.47
Antibiotic de-escalation	46 (85.2)	4 (50)	.04	46 (85.2)	4 (50)	.039	. . .	. . .	. . .
Total TPB score (mean ± SD)	41.34 + 5.84	42 + 3.30	.62	40.83 + 6.02	42.25 + 2.87	.52	43.06 + 5.01	41.86 + 3.61	.46
Attitude	13.57 ± 1.55	12.71 ± 1.54	.37	13.65 ± 1.64	12.50 ± 1.51	.07	13.31 ± 1.20	13.64 ± 1.45	.50
Subjective norm	21.17 ± 4.02	21.14 ± 2.64	.97	20.93 ± 4.15	21.88 ± 3.09	.54	22 ± 3.56	20.71 ± 2.37	.26
Perceived behavioral control	6.60 ± 2.43	7.64 ± 1.39	.06	6.26 ± 2.52	7.88 ± 1.36	.08	7.75 ± 1.69	7.50 ±1.35	.66
TTM stage of change			.001			.002			.17
Precontemplation	4 (5.7)	8 (36.4)	.001	2 (3.7)	4 (50)	.002	2 (12.5)	4 (28.6)	.38
Contemplation	2 (2.9)	2 (9.1)	.24	2 (3.7)	0 (0)	1.00	0 (0)	2 (14.3)	.21
Preparation	1 (1.4)	1 (4.5)	.42	1 (1.9)	0 (0)	1.00	0 (0)	1 (7.1)	.47
Action	5 (7.1)	0 (0)	.33	4 (7.4)	0 (0)	1.00	1 (6.3)	0 (0)	1.00
Maintenance	58 (82.9)	11 (50)	.004	45 (83.3)	4 (50)	.05	13 (81.3)	7 (50)	.12
Consider patients as first priority	593 (75.7)	12 (54.5)	.006	39 (72.2)	4 (50)	.24	14 (87.5)	8 (57.1)	.10
Lack of rationale[d]	4 (5.7)	5 (22.7)	.03	3 (5.6)	2 (25)	.12	1 (6.3)	3 (21.4)	.32
Recovery	69 (98.6)	20 (90.9)	.14	53 (98.1)	6 (75)	.04	16 (100)	14 (100)	. . .

Comments from 2 reviewers

Reviewer #1: *The role of behaviour in prescribing antimicrobials is controlled by a complex interplay of various factors, including one's medical background, age; friends in the medical world; place of training; institution where one studied medicine or completed specialization; friends or contacts in the pharmaceutical industry; the panel of antimicrobials listed in the hospital formulary; and one's own biases. Thus, changing behaviour in the prescribing world is basically different from, say, policies devised to enhance better hand hygiene. More than that, modification of prescribing practices among surgical care providers is often blind empiricism rather than prescribing principles recommended by Western-based guidelines. This is particularly true for Thailand, Vietnam, and countries in southern Africa and south America.*

Reviewer #2: *Why didn't the authors examine a more common practice (say orders for and discontinuation of prophylactic antibiotics)? It would seem that such an approach would provide many more opportunities to assess the impact of behavior characteristics, consistency, level of training, type of procedure, etc. on antibiotic prescribing.*

Conclusions

- Several practices need implementation science, while many others require de-implementation science.
- The myth behind the success is perhaps based on the interventions to improve HCWs behaviors.
- While behavioral sciences is complex and do work in improve certain aspects of infections prevention (e.g., HH), it remains to be seen whether which theory and implementation strategy work best among HCWs.
- Innovative idea to adapt behavioral science into real practices will required input of colleagues from different specialties (e.g., psychiatrist, behavior science specialist).

Thank you very much for your attention!

Introduction

Study objective was to evaluate factors associated with five moments hand hygiene compliance and the role of behavior in commitment to hand hygiene

The Transtheoretical Model of Health Behavior Change (TTM)*

- 6 stages in Stages of Change construct
- Used in assessment of several health behaviors *but* not hand hygiene

The Theory of Planned Behavior (TPB)**

- Has been used in hand hygiene
- Correlated with hand hygiene compliance

* Prochaska JO, The transtheoretical model of health behavior change. AJHP 1997
** Ajzen I. The theory of planned behavior. OBHDP 1991

Methods

Setting: Thammasat University Hospital, a 650-bed tertiary care hospital in central Thailand

Study design and data collection

- From January 1st to December 31st, 2012

Data	Contents	
Random observation	• HH performance based on 5MHH • Patient characteristics	Adapt from WHO HH observation form *
Interview	• Participants' demographics • Self-reported HH compliance • Opinion about HH	Created and adapted from previous study **

* World Health Organization. Evaluation and feedback tool: Observation form.
** Pittet D. et al. Nurses and physicians' perceptions of the importance and impact of healthcare-associated infections and hand hygiene, 2009

Results: Comparisons by 5MHH

Compliance to 5MHH = 18.8% (182/968 opportunities)

Hand hygiene moment		Direct observations		HCW self-report
		No.	Compliance mean % (95% CI)	Compliance mean % (95% CI)
1	Before touching the patient	373	17.9 (11.9-23.8)	69.3 (65.5-73.1)
2	Before a clean or aseptic procedure	91	16.3 (6.4-26.3)	82.5 (78.7-86.3)
3	After body fluid exposure risk	156	19.2 (11.2-27.2)	97 (95.2-98.7)
4	After touching the patient	257	38.8 (30.9-46.7)	87.5 (84.7-90.4)
5	After touching the patient's surroundings	91	21.9 (12.1-31.8)	75.9 (72.1-79.6)
Total		968	23.2 (18.1-28.3)	82.4 (79.9-84.9)