



Prevention of Infection Guidelines

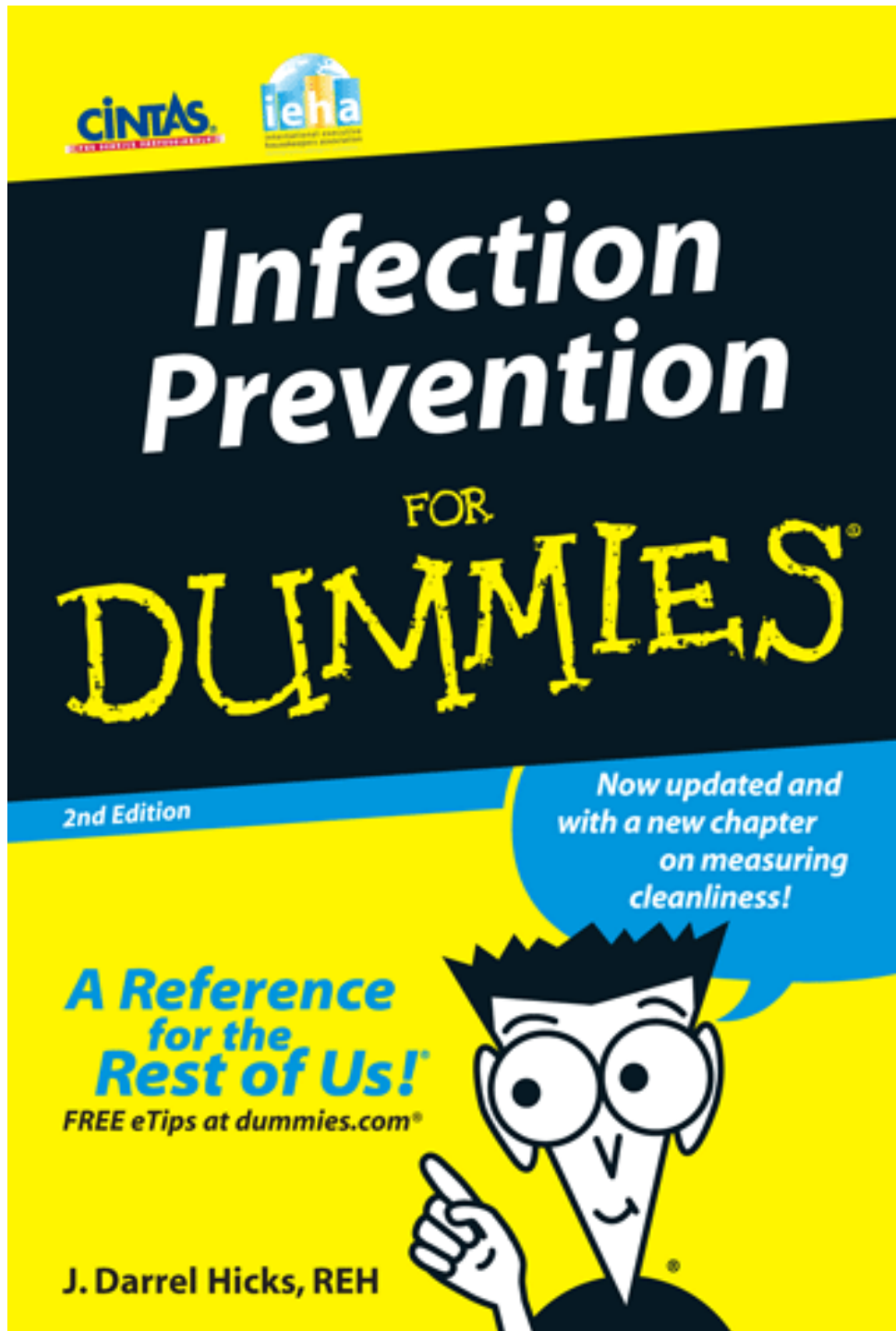
J. Barth, A. Boutsiadis, N. Tardy, J. Rossi,
JC. Panisset and JL. Prudhon



6th Advanced Course on Knee surgery
January 31st – February 5th, 2016 Val d'Isère - France



CENTRE
OSTÉO-ARTICULAIRE
DES CÈDRES



1. Literature



2. Our Protocol

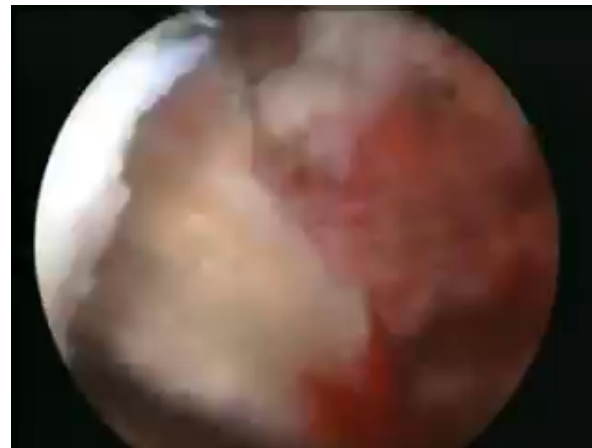


Orthopaedic Infections

Arthroplasties (0.5-1.8%)



ACLs (0.14-1.7%)





Who is the culprit?



Surgical site infection in orthopaedic and bone trauma surgery
(selected series)^a

Type of orthopaedic surgery	Risk of surgical site infection
Primary hip and knee arthroplasties	0.8% Norwegian Register (73,000 arthroplasties) 0.9% Finnish Register (4628 arthroplasties) 0.9% Geneva Register (6101 arthroplasties)
Elbow arthroplasties	3.6% (2458 arthroplasties)
Femoral osteosynthesis	3.9% (541 operations)
Pin track care	7.0% (170 procedures)
Foot and ankle surgery	1.6% (555 operations)
Hallux valgus (Lapidus procedure)	1.3% (61 operations)
Arthroscopies	0.1–0.4% (552, 258 procedures)
Open fractures Gustilo grade I	0.9%
Open fractures Gustilo grade II	1.9%
Open fractures Gustilo grade III	12–53%
Amputation stump	5–22%

Risk of Infection
<1%

R-TKR secondary to deep SSI in the U.S. has been projected to be 70,000 annually by 2020, at a cost of \$1.62 billion annually



Infection prevention and control strategies are important for patient safety and reducing the economic and clinical burden of infection TKR

Kurtz et al. J Arthroplasty. 2012

Review

Risk factors for periprosthetic joint infection after total joint arthroplasty: a systematic review and meta-analysis

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CrossMark

SUMMARY

Many of the mooted risk factors associated with periprosthetic joint infection (PJI) after total joint arthroplasty (TJA) remain controversial and are not well characterized. Online and manual searches were performed using Medline, Embase, Chinese National Knowledge Infrastructure and the Cochrane Central Database from January 1980 to March 2014). For inclusion, studies had to meet the quality assessment criteria of the CONSORT statement, and be concerned with evaluation of risk factors for PJI after TJA. Two reviewers extracted the relevant data independently and any disagreements were resolved by consensus. Fourteen studies were included in this meta-analysis. The following significant risk factors for PJI were identified: body mass index (both continuous and dichotomous variables); diabetes mellitus; corticosteroid therapy; hypoalbuminaemia; history of rheumatoid arthritis; blood transfusion; presence of a wound drain; wound dehiscence; superficial surgical site infection; coagulopathy; malignancy, immunodepression; National Nosocomial Infections Surveillance Score ≥ 2 ; other nosocomial infection; prolonged operative time; and previous surgery. Factors that were not significantly associated with PJI were: cirrhosis; hypothyroidism; urinary tract infection; illicit drug abuse; alcohol abuse; hypercholesterolaemia; hypertension, ischaemic heart disease; peptic ulcer disease; hemiplegia or paraplegia; dementia; and operation performed by a staff surgeon (vs a trainee). Strategies to prevent PJI after TJA should focus, in particular, on those patients at greatest risk of infection according to their individual risk factors.

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Detailed data on 31 potential risk factors for periprosthetic joint infection and the outcomes of meta-analysis

Potential risk	No of studies	Pooled OR or SMD	LL 95% CI	UL 95% CI	P-value	Q-test (P)	I ² (%) ^c
BMI (continuous)	3	1.08	1.02	1.15	0.009 ^b	0.087	59.1
BMI (>40 kg/m ²)	2	3.74	2.01	6.96	<0.001 ^a	0.376	0
Diabetes mellitus	8	1.26	1.15	1.38	<0.001 ^a	0.376	7.0
Cirrhosis	3	1.07	0.87	1.32	0.524 ^a	0.792	0
Steroid therapy	5	2.19	1.52	3.15	<0.001 ^a	0.413	0
Hypothyroidism	2	0.98	0.89	1.08	0.732 ^a	0.925	0
Urinary tract infection	3	1.08	0.99	1.19	0.886 ^a	0.339	7.6
Renal disease	4	1.02	0.93	1.08	0.378 ^b	0.028	67.1
Albumin level < 34 g/l	2	2.94	1.57	5.53	<0.001 ^a	0.462	0
Hypercholesterolaemia	2	0.93	0.85	1.01	0.097	0.659	0
Rheumatoid arthritis	7	1.41	1.26	1.57	<0.001 ^b	0.019	60.4
Blood transfusion	5	1.60	1.22	2.11	0.002 ^a	0.146	48.1
Wound drainage	6	2.00	1.15	3.47	0.017 ^a	0.103	48.1
Wound dehiscence	3	8.08	3.96	17.3	<0.001 ^a	0.593	0
Surgical site infection	3	9.13	4.14	20.5	<0.001 ^a	0.716	0
Drug abuse	2	1.07	0.56	1.94	0.252	0.714	0
Alcohol abuse	2	1.39	0.93	2.06	0.086 ^a	0.200	39.2
Coagulopathy	3	1.31	1.13	1.52	<0.001 ^a	0.146	48.1
Hypertension	2	1.05	0.97	1.14	0.241 ^a	0.173	46.1
IHD	2	1.07	0.98	1.17	0.115 ^a	0.230	30.1
Peptic ulcer disease	2	1.19	0.89	1.59	0.252	0.714	0
Hemiplegia or paraplegia	2	1.10	0.69	1.74	0.693	0.200	39.2
Malignancy	5	1.17	1.02	1.22	0.017 ^a	0.103	48.1
Immunodepression	2	1.32	1.15	1.50	<0.001 ^a	0.593	0
Dementia	2	1.03	0.75	1.41	0.878 ^a	0.976	0
Nosocomial infection	2	2.48	1.07	5.73	0.034 ^a	0.643	0
NNIS score ≥ 2	2	4.93	2.88	8.43	<0.001 ^a	0.716	0
Superficial infection	2	4.52	1.53	13.35	0.006 ^a	0.708	0
Operation performed by trainee (vs staff surgeon)	2	1.24	0.50	3.10	0.641	0.138	54.5
Operative time	2	2.18	1.39	3.42	0.001 ^a	0.710	0
Previous surgery	2	3.15	1.49	6.63	0.003 ^a	0.324	0

High Risk
OR>2

Zhu *et al.* Journal of Hospital Infection 2015

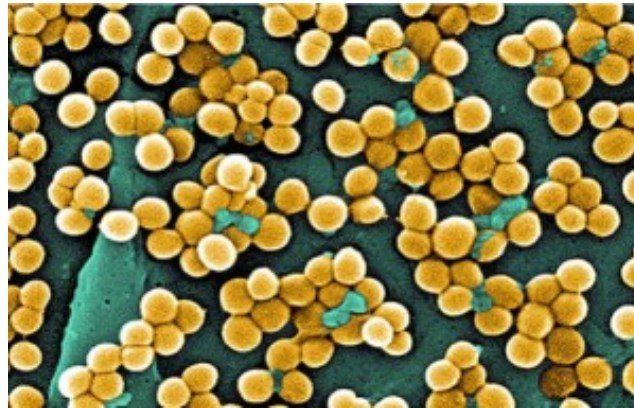
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Moderate Risk
 1<OR<2

Zhu *et al.* Journal of Hospital Infection 2015

Main responsible organism: *Staphylococcus*



Sources of *S. aureus* in SSI

Endogenous to the patient (nasal colonization)

Exogenous (hospital environment)

Hematogenous

Weiser et al. JBJS 2015

How to reduce SSI?

Main measures to prevent orthopaedic surgical site infection^a

Measure	Relative surgical site infection reduction	Evidence grading
High impact		
Active post-discharge surveillance	33%, France	IA
Multimodal intervention	87%, The Netherlands 65%, Houston, TX, USA 10%, Madrid, Spain	IA
Adequate antibiotic prophylaxis	73%, among orthopaedic patients in the USA 81%, review of the literature	IA
Promising impact, needs further studies		
Nasal mupirocin, <i>S. aureus</i> decolonization	43%, Pittsburgh, PA, USA	IB

^a Adapted from Uçkay *et al.*⁴ and Mangram *et al.*⁷

Multifactorial

Uçkay *et al.* Journal of Hospital Infection 2013



CURRENT CONCEPTS REVIEW

The Current State of Screening and Decolonization for the Prevention of *Staphylococcus aureus* Surgical Site Infection After Total Hip and Knee Arthroplasty

Mitchell C. Weiser, MD, MEng, and Calin S. Moucha, MD

Investigation performed at the Department of Orthopaedics, Icahn School of Medicine at Mount Sinai, New York, NY

- The most common pathogens in surgical site infections after total hip and knee arthroplasty are methicillin-sensitive *Staphylococcus aureus* (MSSA), methicillin-resistant *S. aureus* (MRSA), and coagulase-negative staphylococci.
- Patients colonized with MSSA or MRSA have an increased risk for a staphylococcal infection at the site of a total hip or knee arthroplasty.
- Most colonized individuals who develop a staphylococcal infection at the site of a total hip or total knee arthroplasty have molecularly identical *S. aureus* isolates in their nares and wounds.
- Screening and nasal decolonization of *S. aureus* can potentially reduce the rates of staphylococcal surgical site infection after total hip and total knee arthroplasty.

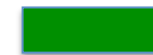
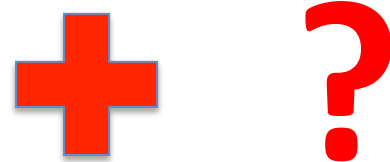
Effectiveness of Bundled Intervention

20 US hospitals - 42 534 operations



mupirocin intranasally twice daily + bathe daily with chlorhexidine-gluconate (CHG) for up to 5 days before operation

bathe with CHG the night before and morning of their operations



vancomycin and cefazolin or cefuroxime for perioperative prophylaxis

cefazolin or cefuroxime alone

Schweizer *et al.* JAMA 2015

Effectiveness of Bundled Intervention

20 US hospitals - 42 534 operations
median 39 months

Table 2. Poisson Regression Analysis of Monthly Rates of Complex *Staphylococcus aureus* Surgical Site Infections per 10 000 Operations

	Preintervention Period		Intervention Period		Rate Ratio for Bundled Intervention (95% CI)	P Value
	No. of Operations	Mean Rate (95% CI)	No. of Operations	Mean Rate (95% CI)		
All operations	28 218	36 (25-51)	14 316	21 (13-32)	0.58 (0.37-0.92) ^a	.02
Urgent/emergent			1189	37 (15-88)	1.03 (0.41-2.57) ^a	.95
Scheduled			13 127	20 (13-30)	0.55 (0.35-0.86) ^a	.009
Cardiac operations	7576	46 (26-82)	3257	40 (23-70)	0.86 (0.47-1.57) ^b	.63
Urgent/emergent			571	67 (32-137)	1.44 (0.53-3.91) ^b	.48
Scheduled			2686	33 (18-62)	0.72 (0.45-1.15) ^b	.17
Hip or knee arthroplasties	20 642	32 (21-48)	11 059	15 (10-24)	0.48 (0.29-0.80) ^c	.005
Urgent/emergent			618	14 (3-75)	0.44 (0.07-2.72) ^c	.38
Scheduled			10 441	16 (10-26)	0.51 (0.30-0.85) ^c	.009

Schweizer *et al.* JAMA 2015

Behavioral aspects

- Dedicated hospital hygiene team
- Elaboration of guidelines
- Staff education
- Avoidance of urinary catheter
- Active post-discharge surveillance
- Limitation of traffic flow in the operating theatre

Our Protocole



Clinique des Cèdres

Prophylaxis before dental interventions

Haematogenous seeding ?

NOT PROVED!!!

Consensus statement
maintenance of good oral
hygiene

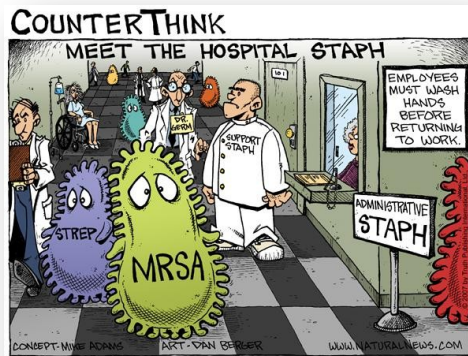


Uçkay *et al.* Journal of Hospital Infection 2013

Pre-hospital

20-30% of the population carriers for MSSA

1–5% MRSA



CLINIQUE DES CEDRES - ECHIROLLES

PROTOCOLE

Titre : **Dépistage systématique et conduite à tenir en cas de :**

- ▶ Staph Aureus Meticilline Sensible
- ▶ Staph Aureus Meticilline Résistant
- ▶ Bactéries Hautement Résistantes émergentes

Référence	Révision	Date application	page
OPPMT038	R10	Juin 2015	1/5

Rédaction : Equipe opérationnelle d'hygiène	Vérification AQ : E. C. DE CARVALHO 03/06/15	Approbation EOH H VIART 03/06/15	Dr G RICHALET 03/06/15
Destinataires : CME – Direction – Président du CLIN – EOH - Laboratoire – Directrice des soins infirmiers - Responsables services d'hospitalisation. Bloc opératoire. Urgence. Pharmaciens. Responsable ELIOR			

Bundled Intervention (JAMA)

Original Investigation

Association of a Bundled Intervention With Surgical Site Infections Among Patients Undergoing Cardiac, Hip, or Knee Surgery

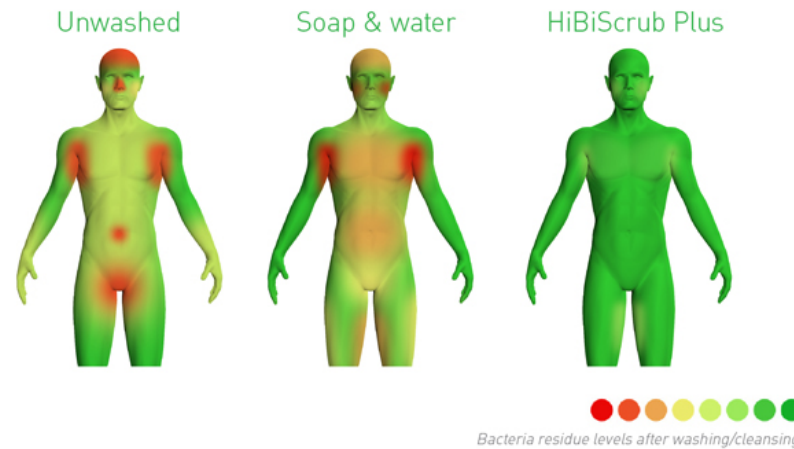
Marin L. Schweizer, PhD; Hsiu-Yin Chiang, MS, PhD; Edward Septimus, MD; Julia Moody, MS; Barbara Braun, PhD; Joanne Hafner, RN, MS; Melissa A. Ward, MS; Jason Hickok, MBA, RN; Eli N. Perencevich, MD, MS; Daniel J. Diekema, MD; Cheryl L. Richards, MJ, LPN, LMT; Joseph E. Cavanaugh, PhD; Jonathan B. Perlin, MD, PhD; Loreen A. Herwaldt, MD

Schweizer *et al.* JAMA 2015

Skin Preparation

Superiority of Chlorhexidine (Vs Povidone)

Darouiche et al. N Engl J Med 2010



Chlorhexidine body wash daily after Operation

Patient's Preparation in the room



CLINIQUE DES CEDRES - ECHIROLLES

PROTOCOLE

Titre : PREPARATION CUTANEE DE L'OPERE AU BLOC OPERATOIRE			
Référence	Révision	Date application	Page
OPHYG093	1	Décembre 2014	1/3

Rédaction : C. Dyck M. Azran	Vérification AQ :	Approbation Clinique G. Richalet
Destinataires : Responsable bloc opératoire, Pharmacienne.		
n° de révision	Date	Nature des modifications

Antibiotics



When Give Antibiotics ?

- 1h – 30 min before operation

Matar et al. JBJS 2010

For How Long??

- One dose is OK

Uçkay et al. Journal of Hospital Infection 2013

Hair removal

Clippers

NOT razors



Immediately before surgery

Uçkay *et al.* Expert Rev Anti Ther 2010

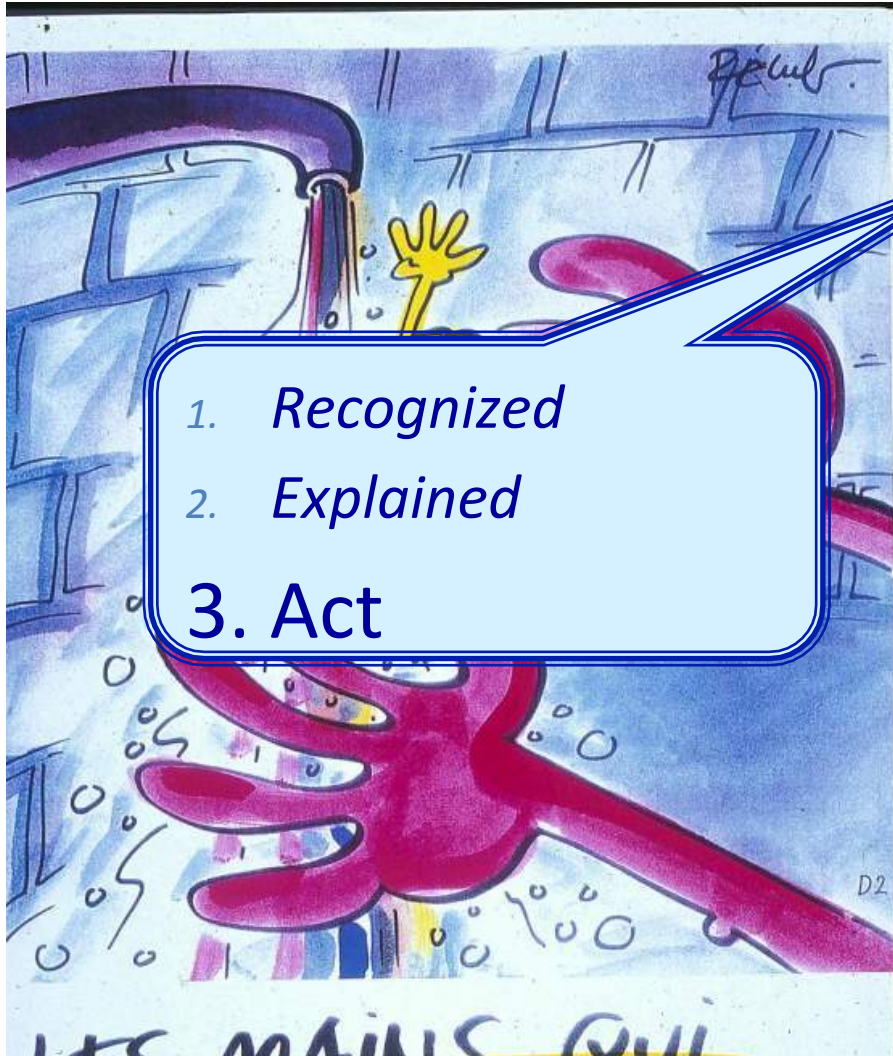
Surgeon's Preparation

In 1825- French pharmacist moistening hands
liquid chloride

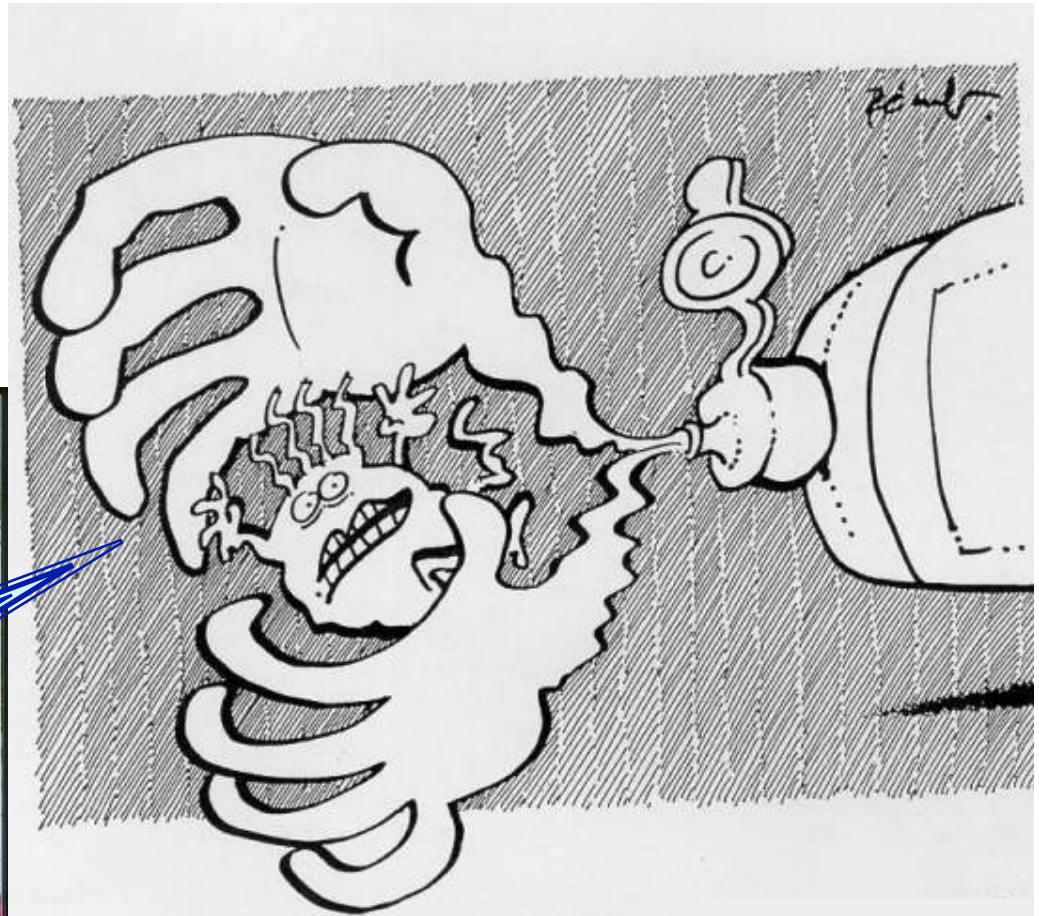


2-3 min

*Handwashing ...
an action of the past
(except when hands are visibly soiled)*

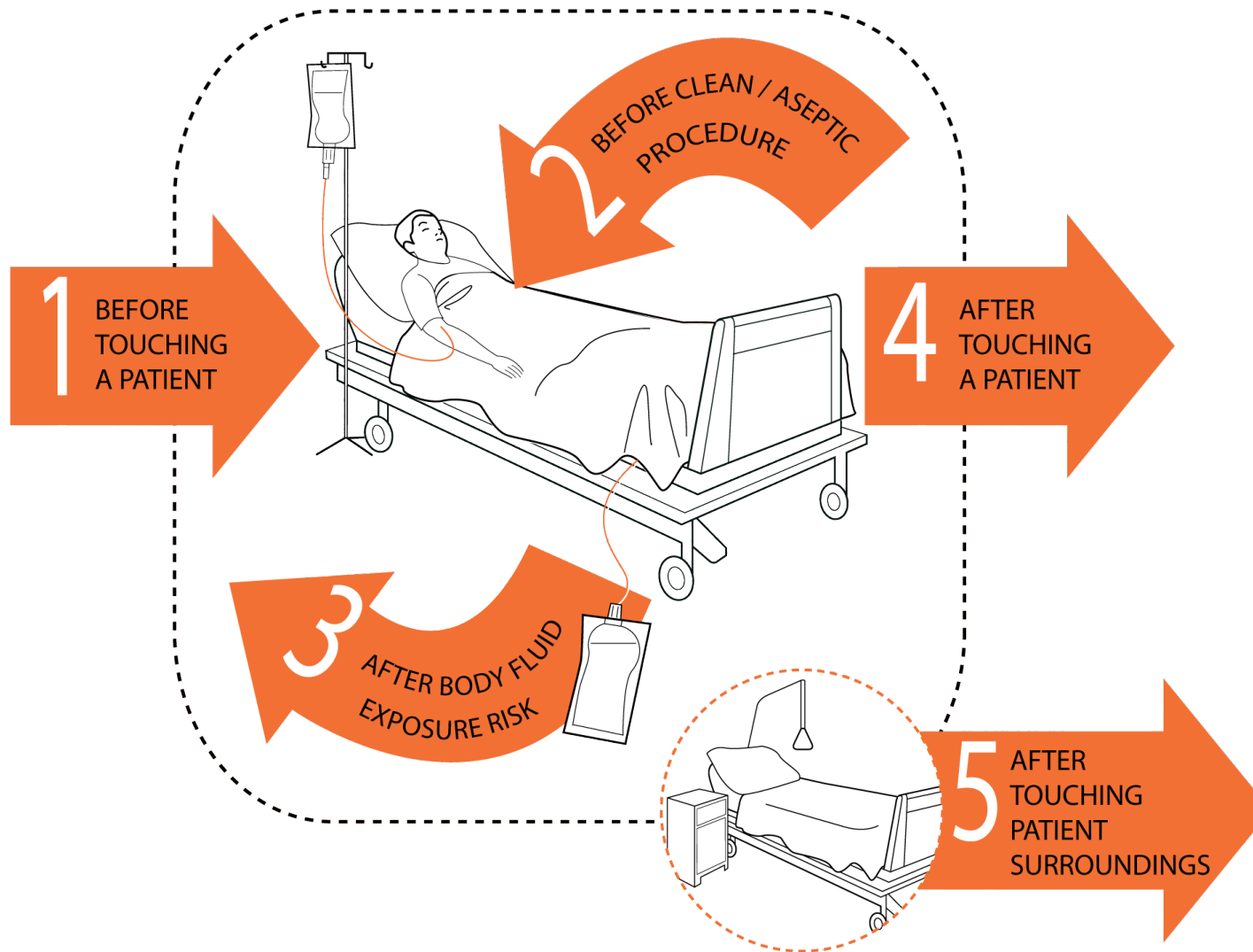


1. *Recognized*
2. *Explained*
3. *Act*



**Alcohol-based
hand rub
is standard of care**

“My 5 Moments for Hand Hygiene”



Sax et al. J Hosp Infect 2007

Gloves, gowns, drapes

Cohrane review in 26 articles=inconclusive

Routine changing of the outer gloves

ONLY EXPERT OPINION



Personal Protection System

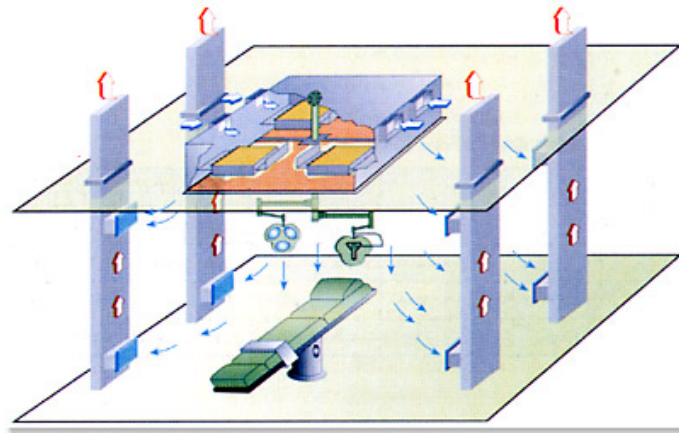
- Its Usage under Controversy
- Positive Pressure

The Gown-glove Interface
maybe a Source of
Contamination

Fraser *et al.* CORR 2015



Laminar Air Flow



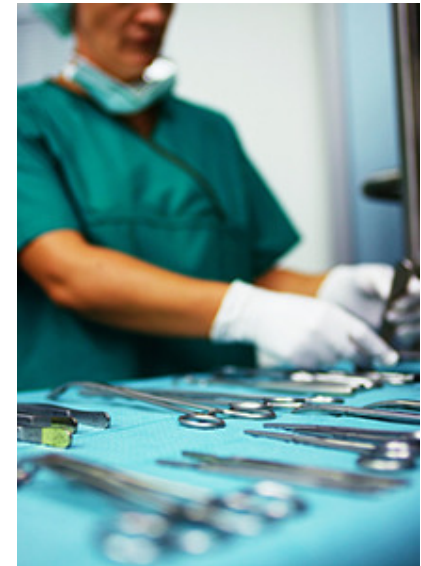
60-90.000\$ Cost Installation

Retrospective analyses absence of SSI reduction

Brandt *et al.* Ann Surg 2008.



AVOID



Post-surgical wound care

- Various dressings
- Topical agents
- No superiority protocol
- Avoidance of blistering



Uçkay et al. / Journal of Hospital Infection 84 (2013)

Take Home Message

- NO REAL GUIDELINES EXIST
- Make Protocols in the CLINIC
- FOLLOW YOU AND THE REST OF THE TEAM THE SAME PROTOCOL
- ALWAYS A CHECKLIST BEFORE CUTTING THE PATIENT



"See? The idiots put my danged knee replacement in backward!"

Aknowlgement for my Fellow



Achilleas Boutsiadis, M.D.

STAY TUNNED ALWAYS !



Thank You!

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2016

NOVEMBER 30th
> DECEMBER 3rd

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CONGRESS PRESIDENTS: Philippe BEAUFILS
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OF NORTH AMERICA



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French/ English

SYMPOSIA

SHOULDER POSTERIOR
INSTABILITY

A. Godenèche and P. Mansat

ANTERO LATERAL
TENODESIS OF THE KNEE

P. Imbert and D. Saragaglia

REGISTRATION: MCO CONGRÈS
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