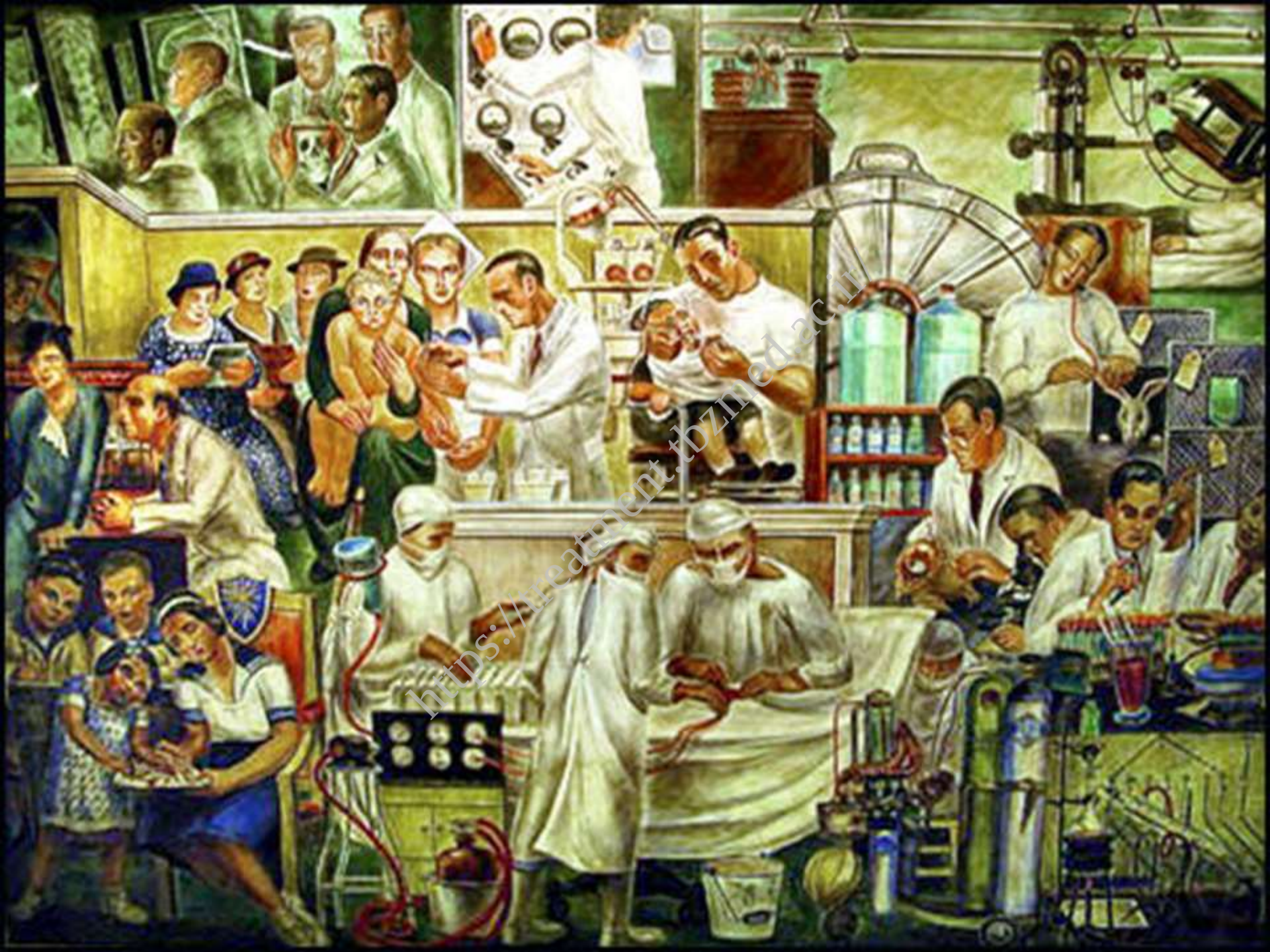
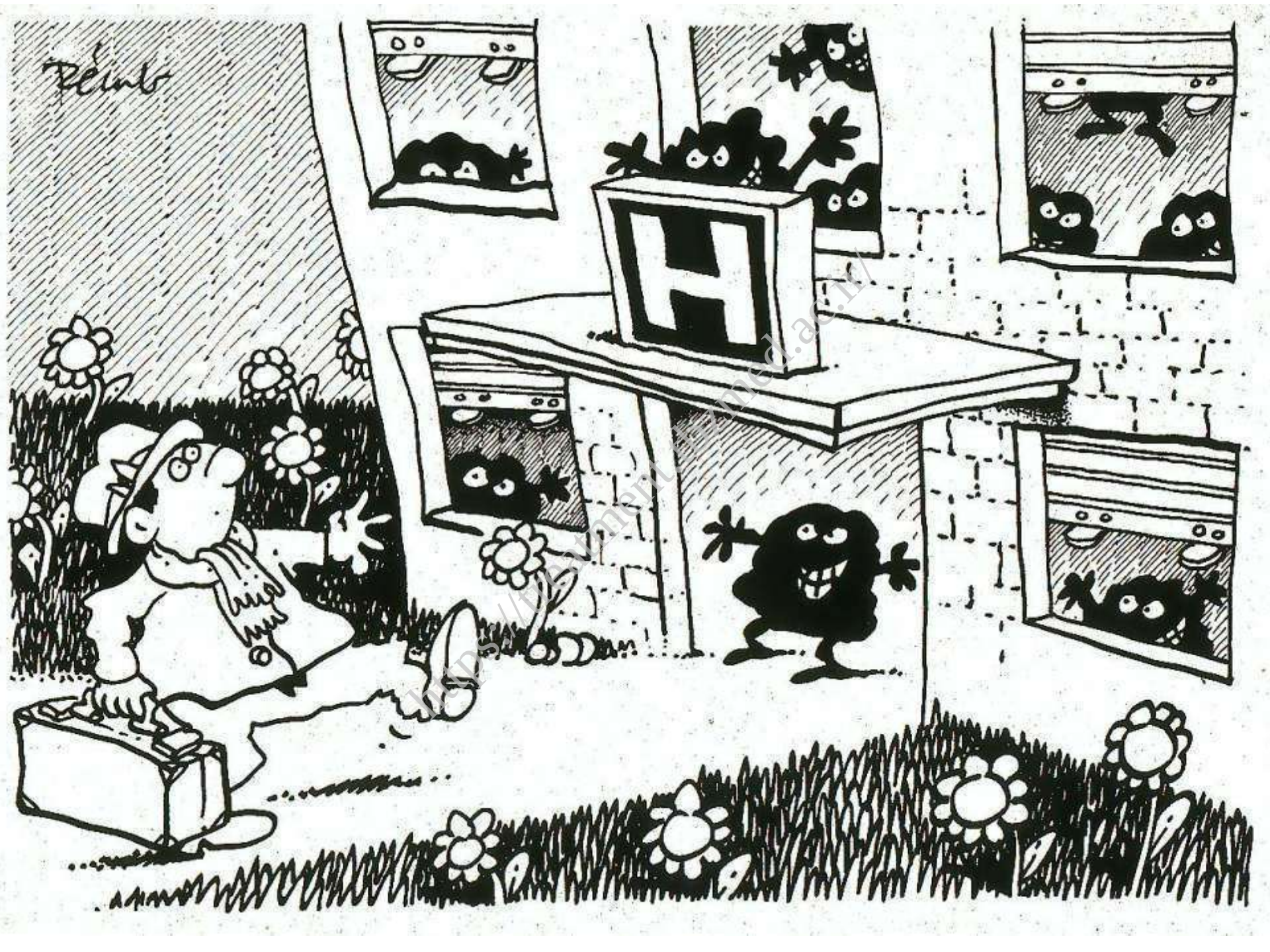
The Modern Approach to Infection Control

B. Naghili M.D, MPH

Infection Control Program

Tabriz University Of Medical Sciences




Pelmo
H

What is Infection Control?

Things that we can all do to stop/reduce the spread of infection to patients, visitors and staff

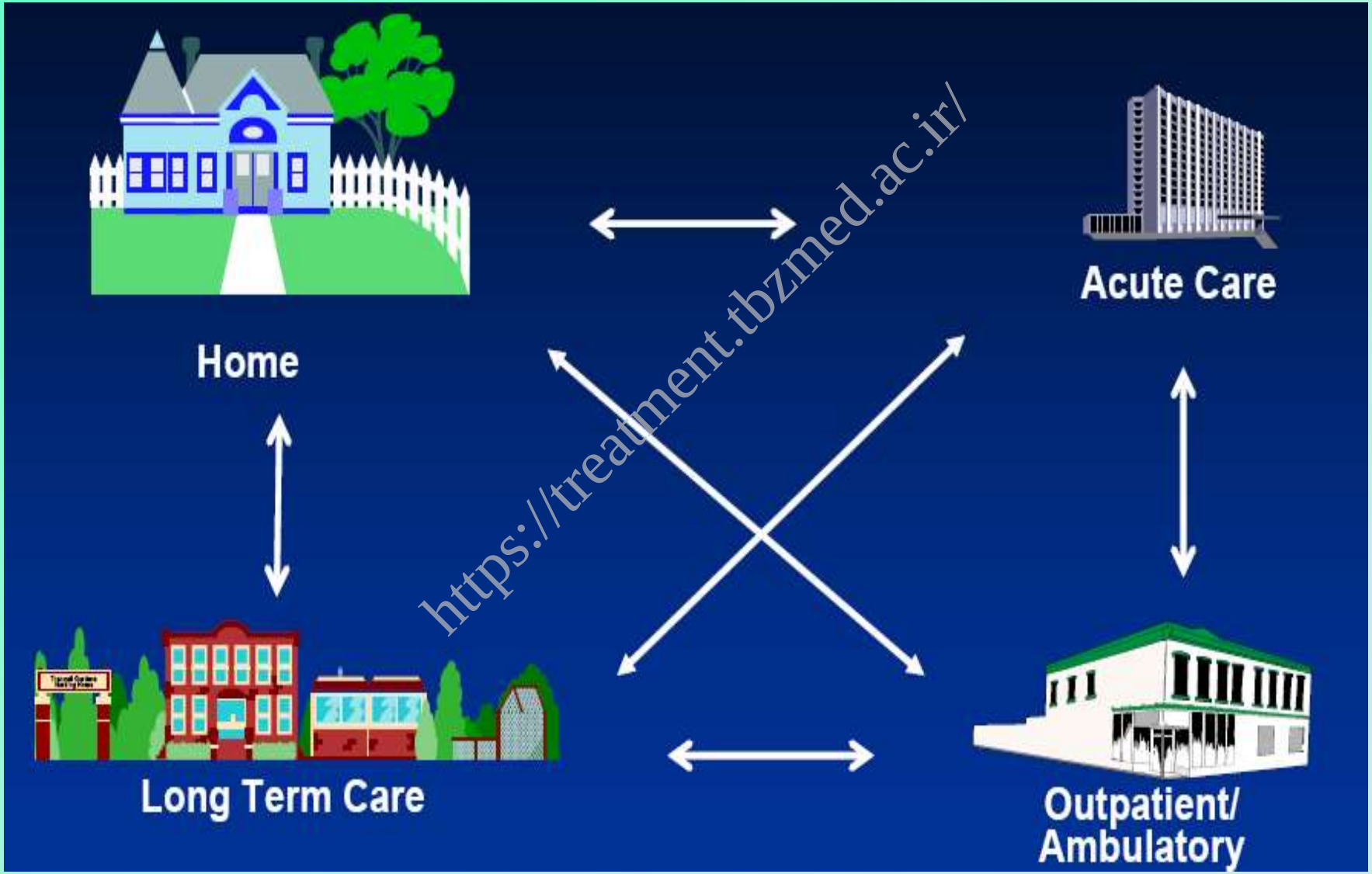
"Infection Control is everybody's business"

(Department of Health)

عفونت های ناشی از مراقبت های بهداشتی درمانی هر ساله صدها میلیون نفر از بیماران را مبتلا می کنند

- رنج تحمل بیماری
- تجویز داروهای بیشتر
- تحمیل عوارض دارویی بیشتر
- مدت بستری طولانی تر
- تحمیل هزینه بیشتر
- ایجاد مرگ و میر بیشتر
- انتشار میکروارگانیسم های مقاوم به جامعه

انتشار عفونت های ناشی از خدمات بهداشتی درمانی



- بررسی شیوع در ۵۵ بیمارستان در ۱۴ کشور عضو چهار منطقه سازمان جهانی بهداشت(آسیای جنوب شرقی، اروپا، مدیترانه شرقی واقیانوسیه غربی) که تحت نظارت سازمان جهانی بهداشت انجام شد، نشان داد که ۲۲-۵ درصد بیماران بیمارستان از عفونت های بیمارستانی رنج می برند.

- در سراسر دنیا،حداقل یک چهارم بیماران در مراقبت های ویژه یک عفونت را در طی اقامت خود در بیمارستان کسب می کنند و در کشورهای در حال توسعه این تخمین دو برابر می تواند باشد.

- هر روز ۲۴۷ نفر در امریکا در اثر یک عفونت ناشی از مراقتبهای بهداشتی درمانی می میرند.

- در ایالات متحده امریکا یک بیمار از ۱۳۶ بیمار بستری دربیمارستان براثر یک عفونت بیمارستانی به شدت مریض می شوند که معادل ۲۰۰۰۰۰۰ بیمار در سال و در حدود ۸۰۰۰۰ مرگ در سال است.

- در انگلستان عفونت های ناشی از مراقبت های بهداشتی درمانی سالانه موجب ابتلای ۳۲۰۰۰۰ نفر و مرگ ۵۰۰۰ نفر می شوند.

- در میان بیماران بخش های ویژه، حتی در بخش های غنی و ثروتمند، حداقل ۲۵٪ بیماران به یک عفونت ناشی از مراقبت های بهداشتی درمانی مبتلا می شوند.

- در بعضی کشورها این نسبت ممکن است بسیار بیشتر باشد برای مثال در ترینداد و توباگو دو سوم بیماران بستری شده در بخش های مراقبت ویژه حداقل از یک عفونت ناشی از مراقبت بهداشتی درمانی رنج می برند .

- در کشورهای در حال توسعه روزانه ۴۳۸۴ کودک به علت این عفونتها می میرند.

- میزان عفونت های همراه با وسایل و ابزار عروقی در میان نوزادان کشورهای در حال توسعه ۲۰-۳ بار بیشتر از کشورهای توسعه یافته است.

- در برزیل و اندونزی بیش از نصف نوزادان بستری شده در بخش نوزادان یک عفونت ناشی از مراقبت های بهداشتی درمانی را کسب می کنند که میزان مرگ و میری بین ۱۲٪ تا ۵۲٪ دارند.

- در کشورهای توسعه یافته میزان عفونت های بیمارستانی در میان نوزادان ۱۲ برابر کمتر است.

- در آمریکا در طی دهه های اخیر،خطر ابتلا به این عفونتها به طور یکنواخت افزایش یافته و هزینه اضافی معادل ۵/۴ تا ۷/۵ میلیارد دلار در سال را تحمیل می نماید. در انگلیس، برآورد می شود که عفونتهای ناشی از مراقبتهای بهداشتی درمانی سالانه یک میلیارد پوند هزینه به نظام سلامت ملی(NHS) تحمیل می کنند.

- درترینیداد و توباگو ۵٪ بودجه سالانه بیمارستانهای کشور و در تایلند برخی بیمارستانها تا ۱۰٪ بودجه سالانه شان را برای مراقبت این عفونتها هزینه می کنند. در مکزیکو، این هزینه ها حدود ۷۰٪ کل بودجه وزارت بهداشت را تشکیل می دهند .

- در کشور ما برآورد می شود سالیانه حدود ۶ میلیون بیمار در ۸۰۰ بیمارستان کشور بستری و خدمات دریافت می نمایند.
- ساختار فیزیکی برخی بیمارستان ها اجازه همراه شدن با پیشرفت دانش پزشکی کشور را نمی دهد.
- به دلایل مختلف امکان تشخیص آزمایشگاهی بسیاری از عفونت ها میسر نمی گردد.
- شروع درمان با آنتی بیوتیک های وسیع الطیف و یا تغییر آنها صرفاً بر مبنای یافته های بالینی انجام و ادامه می یابد.
- تجویز آنتی بیوتیک پروفیلاکسی نیاز به استانداردسازی دارد.
- کمبود منابع مالی مشکلات زیادی را برای بیمارستان ها ایجاد نموده است.

HOSPITAL GENERAL STATISTICAL FORM.

This Sheet will serve for the Classification of Cases in Hospitals under the following headings:—"Remaining, 1st January"—"Admitted"—"Cured (or Relieved)"—"Dead"—"Discharged incurable, for Irregularities, or at their own Request"—"Remaining, 31st December"—"Duration of Cases in Days."

Write the Name of Hospital, the Sex, the required Heading, and Date, with the Pen.

Ages	Months. 0	3	6	1	2	3	4	5	10	15	20	25	30
CLASS I.—Order I. (Zymotic Diseases.)													
1. Small Pox													
Measles													
Whooping Cough													
Croup													
Scarlatina													
Quinsy													
Diphtheria													
Coryza, Catarrh, Influenza													
Ophthalmia (purulent)													
Erysipelas													
Metria (puerperal Fever)													
Pyæmia													
Hospital gangrene													
Carbuncle, Boil													
Dysentery													
Diarrhœa													
Cholera													
Typhoid Fever (typhia)													
Typhus													
Relapsing Fever (typhinia)													
Ague													
Remittent Fever													
Rheumatism													
OTHERS													

The very first requirement in a hospital is that it should do the sick no harm

Order II.

Scrofula
Tuberculosis Mesenterica

the diseases in
marginal list
frequent occur-
tals; and all
ceptions, are
Others" in
orders in the
ns. They will
d in abstract-
by writing
persons ad-
or dead, &c.,
rticular dis-
argin below.
ons aged 16
dmitted for
indicated in
als sheet by
"Others" of
I.; and his
be written
ps" in the
so of other
diseases not
in the mar-
written in
partments.
the facts is
uld be given
to the gene-

I.
I.

ith abscess
placed to

ER II.
ay (Greek elephas-

glanders
hydrophobia
malignant pustule
pecuia*
* *Infection by punc-
ture in dissection
or by handling the
parts of dead ani-
mals*

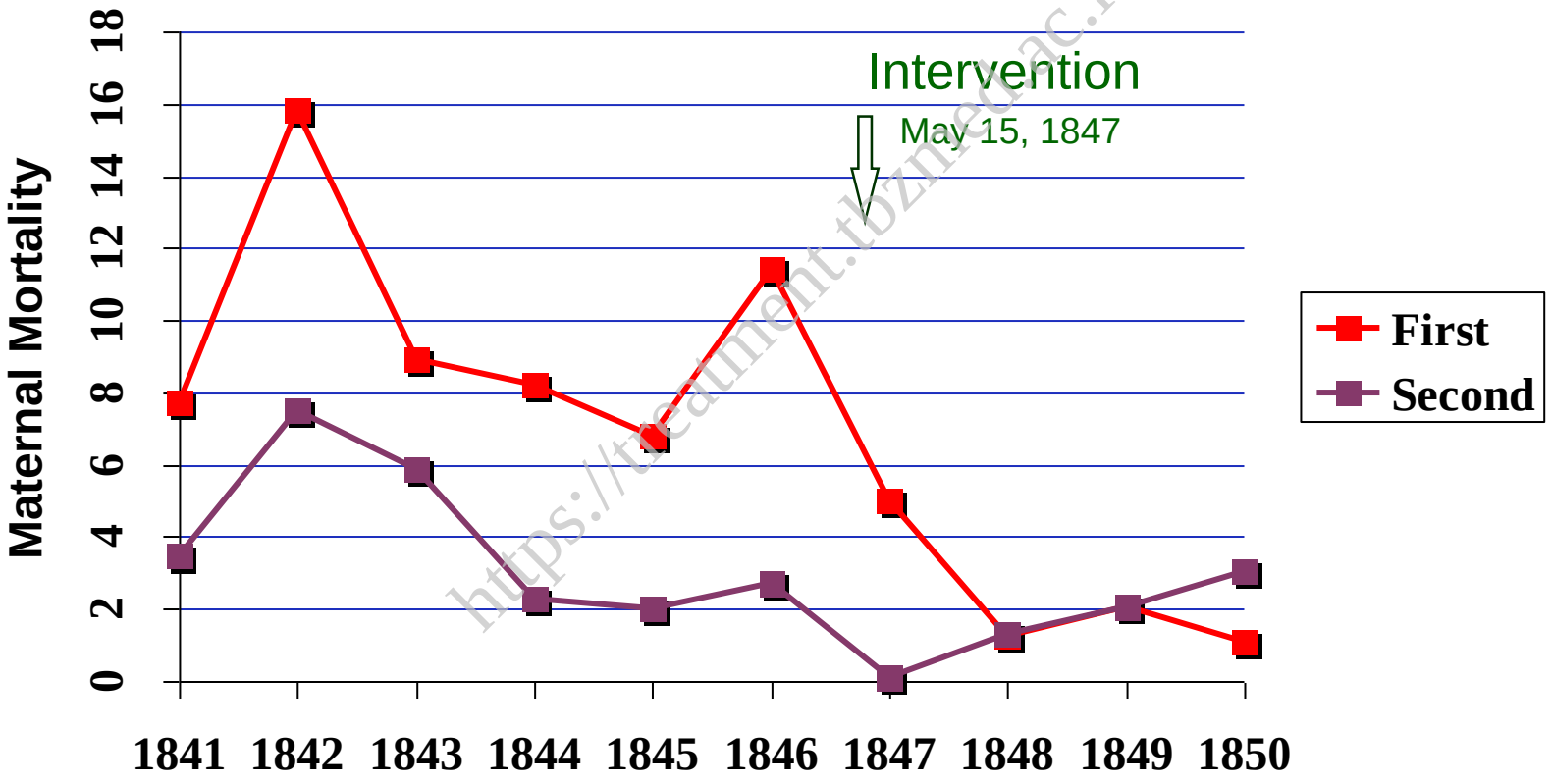
Order III.

rickets
bronchocele
cretinism
ergotism

Order IV.

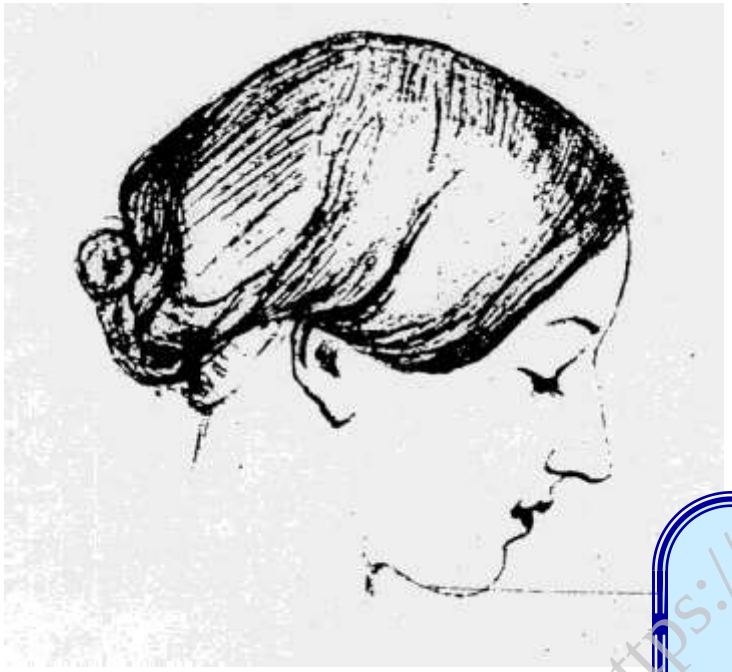
Ignaz Philipp Semmelweis

Maternal mortality rates, First and Second Obstetric Clinics, GENERAL HOSPITAL OF VIENNA, 1841-1850



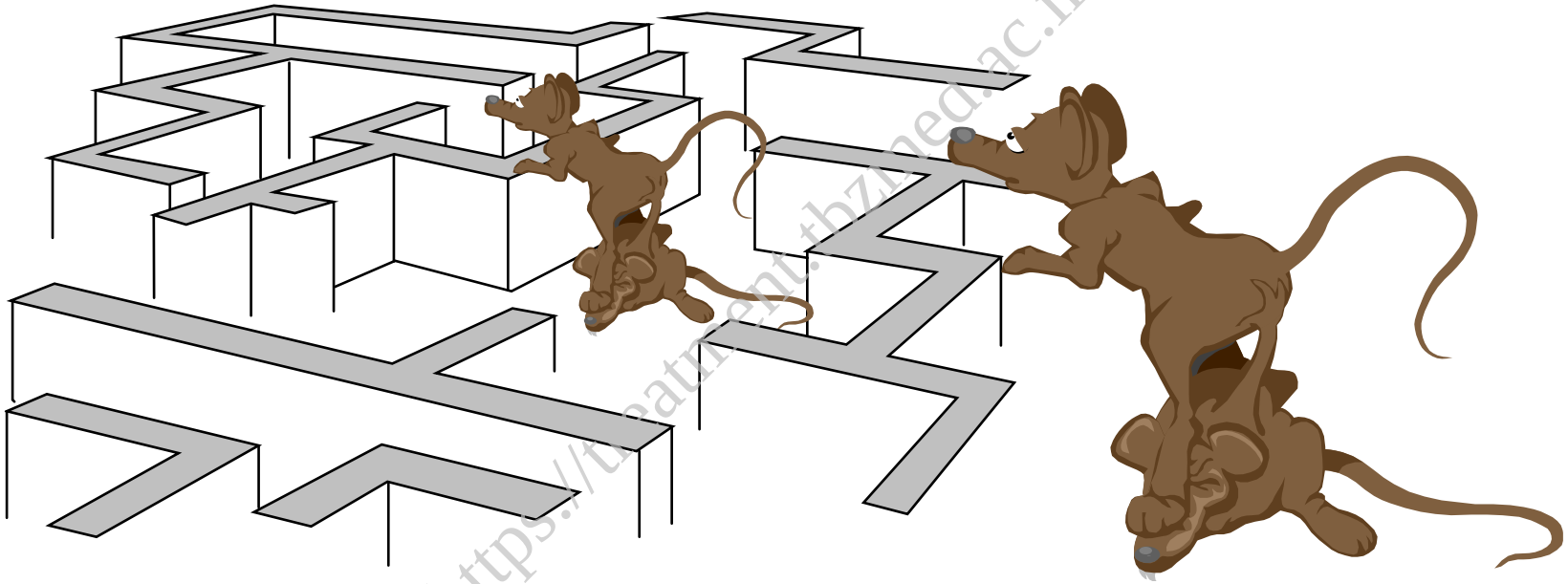
Infection Control and Quality Healthcare in the New Millenium

Are there lessons to be learned ?



Recognize
Explain
Act

Does infection control



control infections ?

SENIC

Study on the Efficacy of Nosocomial Infection Control

per 110 beds

- 1 infection control nurse per 200 to 250 beds
- 1 hospital epidemiologist per hospital (1000 beds)
- Organized surveillance for nosocomial infections
- Feedback of nosocomial infection rates

1st principle of infection prevention

at least 35-50% of all healthcare-associated infections are associated with only 5 patient care practices:

- Use and care of urinary catheters
- Use and care of vascular access lines
- Therapy and support of pulmonary functions
- Surveillance of surgical procedures
- Hand hygiene and standard precautions

1st principle of infection prevention

at least 35-50% of all healthcare-associated infections are associated with only 5 patient care practices:

- Use and care of urinary catheters
- Use and care of vascular access lines
- Therapy and support of pulmonary functions
- Surveillance of surgical procedures
- Hand hygiene and standard precautions

Healthcare-Associated Urinary Tract Infection

- Urinary tract infection (UTI) causes
  ~ 40% of hospital-acquired infections
- Most infections due to urinary catheters
- 25% of inpatients are catheterized
- Leads to increased morbidity and costs

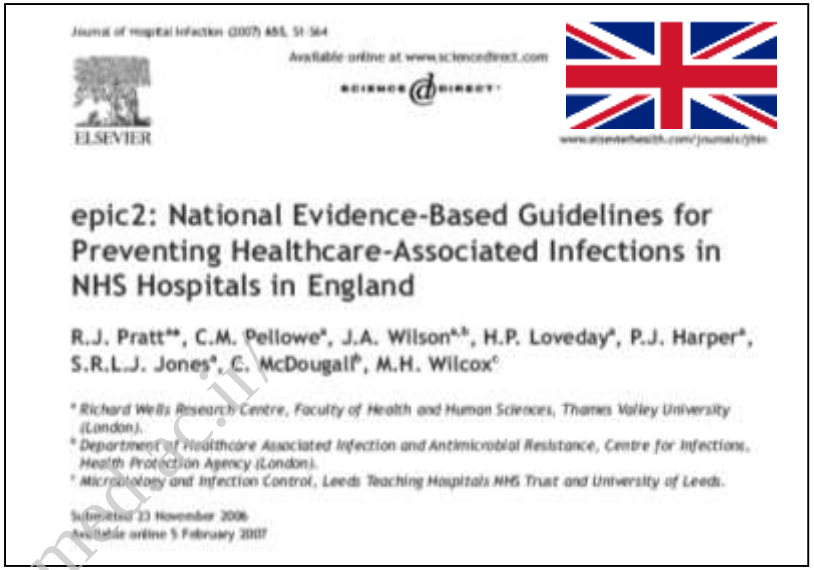
S42 · INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY · OCTOBER 2008, VOL. 29, SUPPLEMENT 1

SUPPLEMENT ARTICLE: SHEA/IDSA PRACTICE RECOMMENDATION

Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals

Evelyn Lo, MD; Lindsay Nicolle, MD; David Classen, MD, MS; Kathleen M. Arias, MS, CIC; Kelly Podgorny, RN, MS, CPHQ; Deverick J. Anderson, MD, MPH; Helen Burstin, MD; David P. Calfee, MD, MS; Susan E. Coffin, MD, MPH; Erik R. Dubberke, MD; Victoria Fraser, MD; Dale N. Gerding, MD; Frances A. Griffin, RRT, MPA; Peter Gross, MD; Keith S. Kaye, MD; Michael Klompas, MD; Jonas Marschall, MD; Leonard A. Mermel, DO, ScM; David A. Pegues, MD; Trish M. Perl, MD; Sanjay Saint, MD; Cassandra D. Salgado, MD, MS; Robert A. Weinstein, MD; Robert Wise, MD; Deborah S. Yokoe, MD, MPH

Infect Control Hosp Epidemiol . 2008 Suppl 1:S41-50.



Journal of Hospital Infection (2007) 65S, S1-S64

Available online at www.sciencedirect.com

SCIENCE DIRECT®

ELSEVIER

www.elsevierhealth.com/journals/jhin

epic2: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England

R.J. Pratt**, C.M. Pellowe*, J.A. Wilson*,†, H.P. Loveday*, P.J. Harper*, S.R.L.J. Jones*, C. McDougall‡, M.H. Wilcox§

* Richard Wells Research Centre, Faculty of Health and Human Sciences, Thames Valley University (London).
† Department of Healthcare Associated Infection and Antimicrobial Resistance, Centre for Infections, Health Protection Agency (London).
‡ Microbiology and Infection Control, Leeds Teaching Hospitals NHS Trust and University of Leeds.

Submitted 13 November 2006
Available online 5 February 2007

J Hosp Infect. 2007 65 Suppl 1:S1-64

ELSEVIER

International Journal of Antimicrobial Agents 31S (2008) S68–S78

INTERNATIONAL JOURNAL OF
Antimicrobial Agents

www.ischemo.org

European and Asian guidelines on management and prevention of catheter-associated urinary tract infections☆

Peter Tenke[a,*], Bela Kovacs[a], Truls E. Bjerklund Johansen[b], Tetsuro Matsumoto[c], Paul A. Tambyah[d], Kurt G. Naber[e]

[a] *Department of Urology, South-Pest Hospital, 1 Köves str., H-1204 Budapest, Hungary*
[b] *Department of Urology, Århus University Hospital, Brendstrupgårdvej 100, DK-8200 Århus N, Denmark*
[c] *Department of Urology, University of Occupational and Enviromental Health, 1-1, Iseigaoka, Yahatanishi-ku, Kitakyushu, 807-8555 Japan*
[d] *Department of Medicine, National University Singapore, 5 Lower Kent Ridge Road, Singapore 119074, Singapore*
[e] *Technical University of Munich, Munich, Germany, mailing address: Bickleder 44c, D-94315 Straubing, Germany*

Int J Antimicrob Agents
2008 Suppl 1:S68-78.

Prevention of Catheter-Associated Urinary Tract Infection (CA-UTI)

Two main principles

Avoid unnecessary catheterization

Limit the duration of catheterization

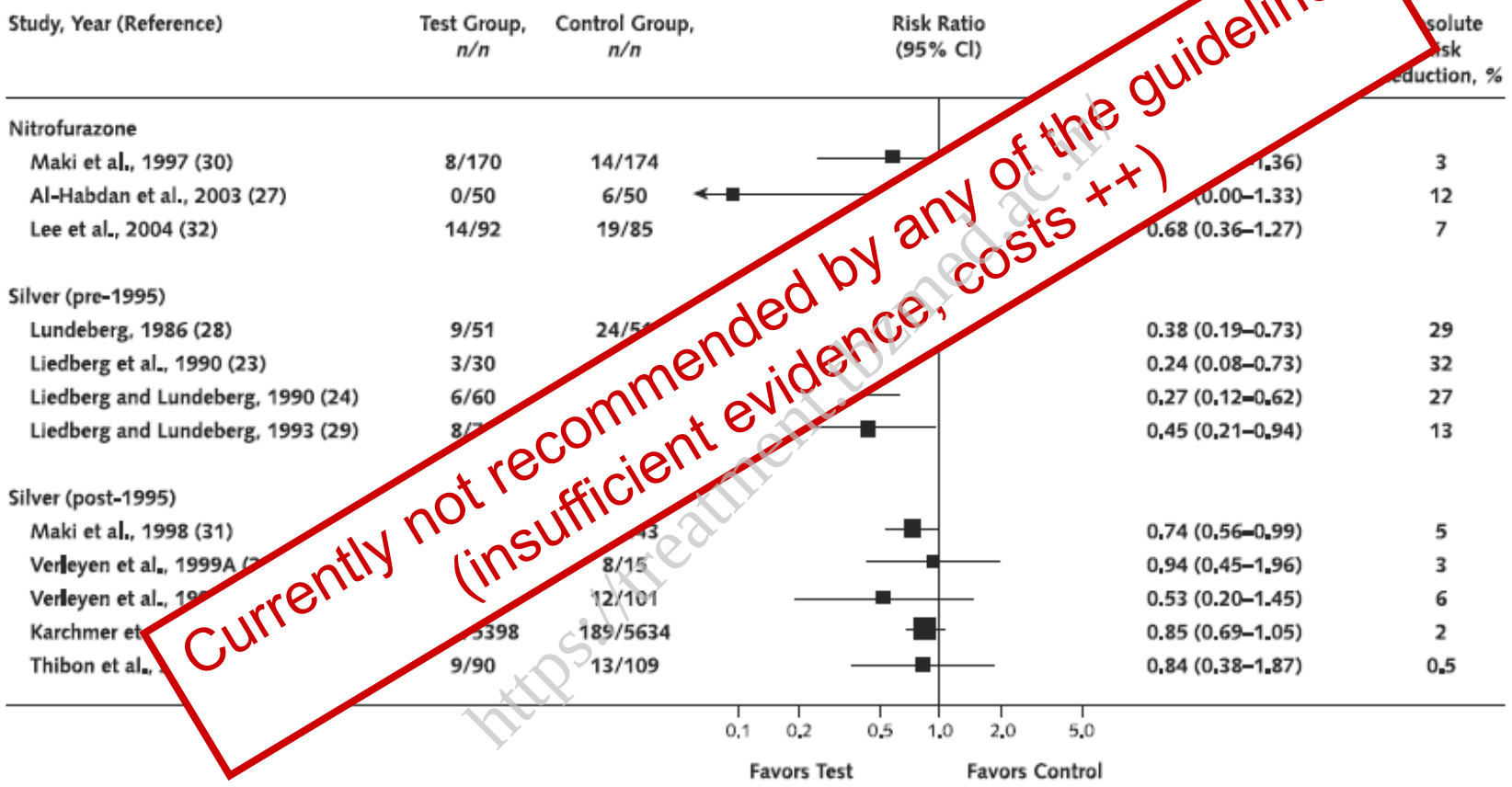
Indications for the use of indwelling urethral catheters

- **Indications**
  - Perioperative use for selected surgical procedures
  - Urine output monitoring in critically ill patients
  - Management of acute urinary retention and urinary obstruction
  - Assistance in pressure ulcer healing for incontinent residents
  - **As an exception**, at patient request to improve comfort

- Urinary incontinence is **not** an accepted indication for urinary catheterization
  - 21 to 50 percent of urinary catheters not indicated

Antimicrobial-coated urinary catheters

Proportion of participants (or catheters) developing catheter-associ**acteriuria**



Currently not recommended by any of the guidelines (insufficient evidence, costs ++)

Some effect, but studies mostly of poor quality
Useful in high-risk groups?

Catheter insertion and maintenance

- Practice hand hygiene (A-III)
  - before insertion of the catheter
  - before and after any manipulation of the catheter site

Catheter insertion and maintenance

- Insert catheters by use of aseptic technique and sterile equipment (A-III)
- Cleanse the meatal area with antiseptic solutions is unnecessary (A-I)
  - routine hygiene is appropriate
- Properly secure indwelling catheters after insertion to prevent movement and urethral traction (A-III)
- Maintain a sterile, continuously closed drainage system (A-I)
- Do not disconnect the catheter and drainage tube unless the catheter must be irrigated (A-I)

Catheter insertion and maintenance

- Maintain unobstructed urine flow (A-II)
- Empty the collecting bag regularly, using a separate collecting container for each patient, and avoid allowing the draining spigot to touch the collecting container (A-II)
- Keep the collecting bag below the level of the bladder at all times (A-III)
- Do not routinely use silver-coated or other antibacterial catheters (A-I)
- Do not screen for asymptomatic bacteruria in catheterized patients (A-II)
- Do not treat asymptomatic bacteruria in catheterized patients except before invasive urologic procedures (A-I)

What you should not do to prevent CAUTI

- Do not use (avoid) catheter irrigation (A-I)
- Do not use systemic antimicrobials routinely as prophylaxis (A-II)
- Do not change catheters routinely (A-III)

1st principle of infection prevention

at least 35-50% of all healthcare-associated infections are associated with only 5 patient care practices:

- Use and care of urinary catheters
- Use and care of vascular access lines
- Therapy and support of pulmonary functions
- Experience with surgical procedures
- Hand hygiene and standard precautions

Sources of the catheter-associated bloodstream infection

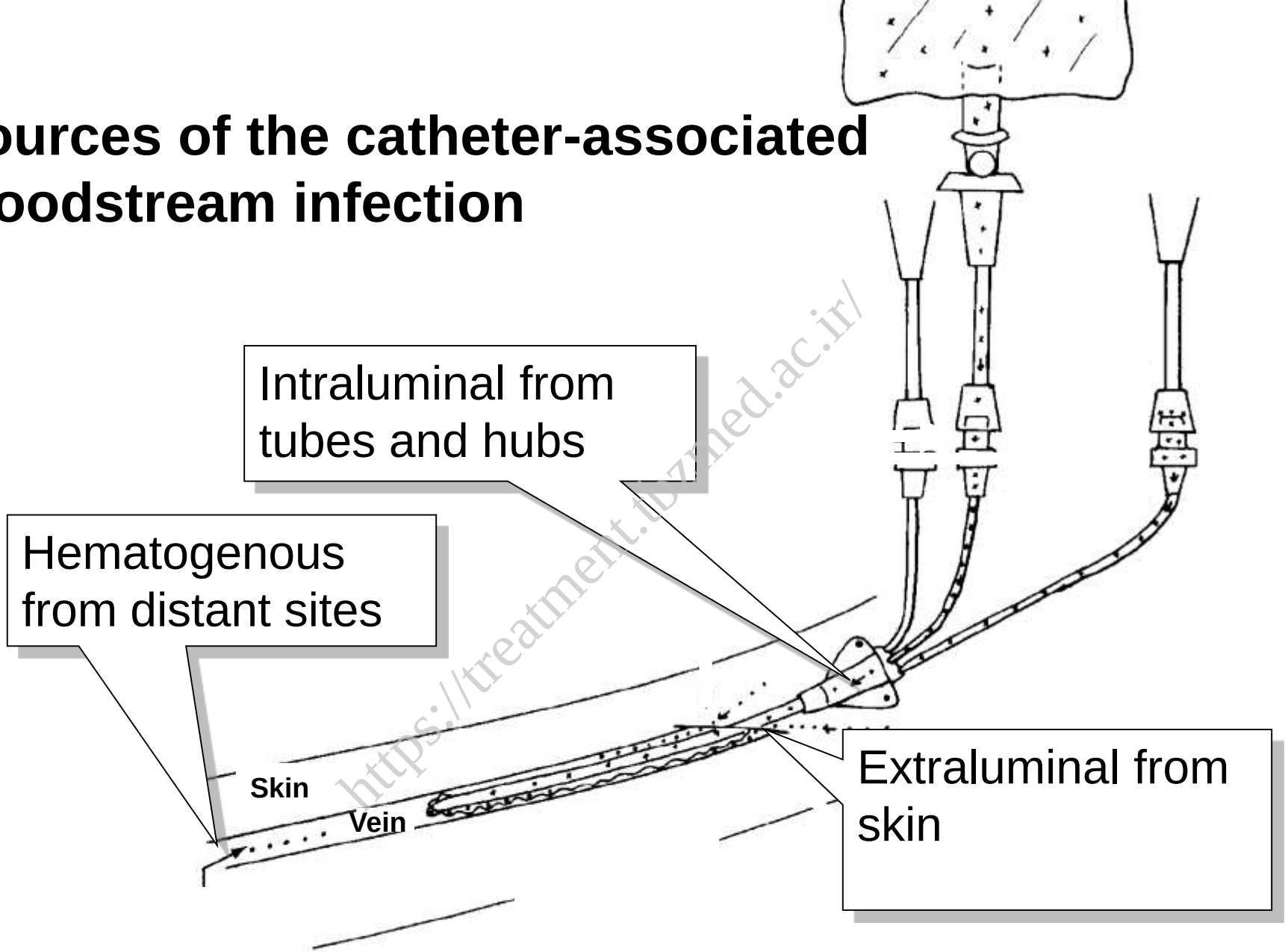
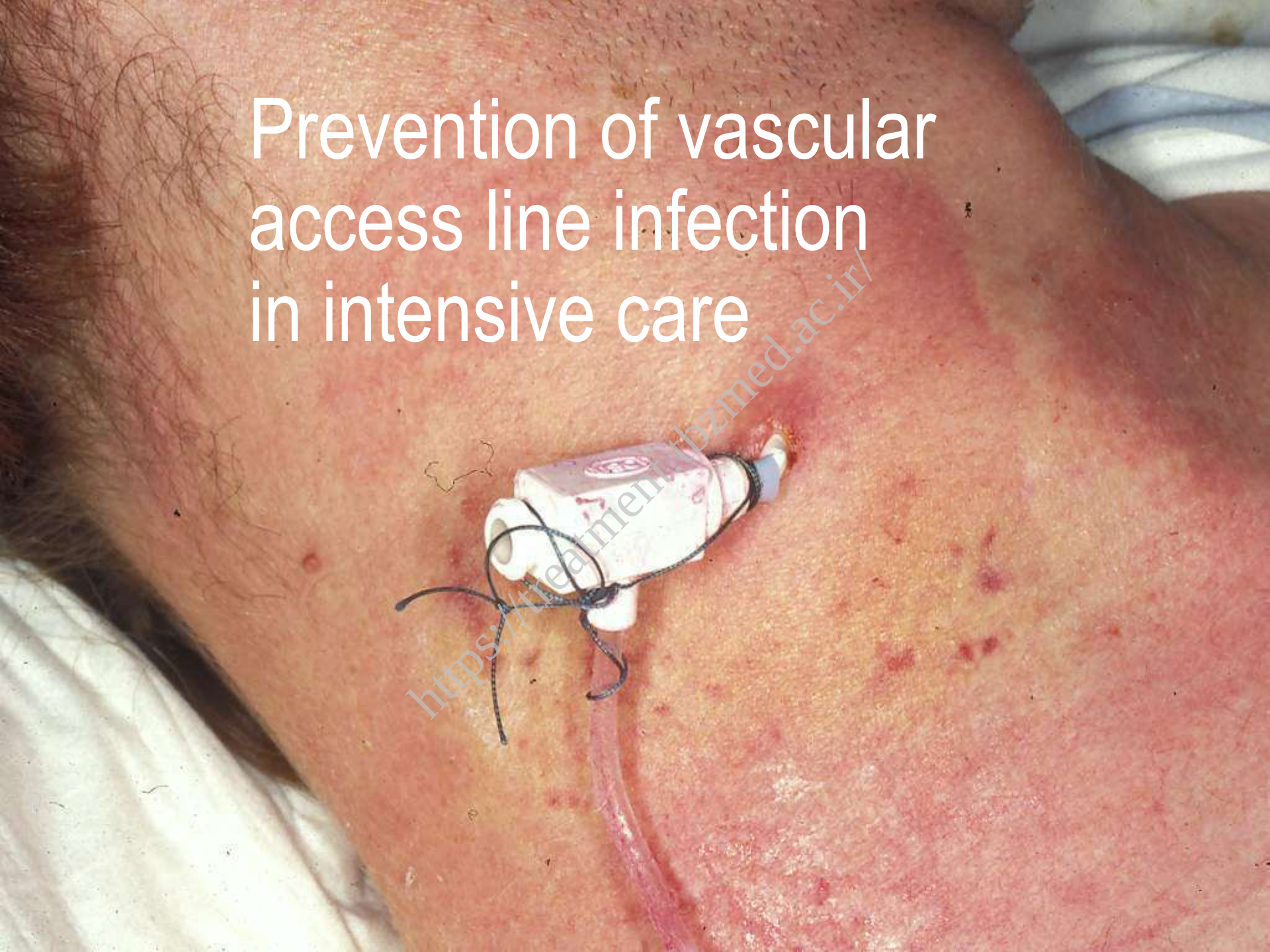


Figure. Source of intravascular catheter–related infections.

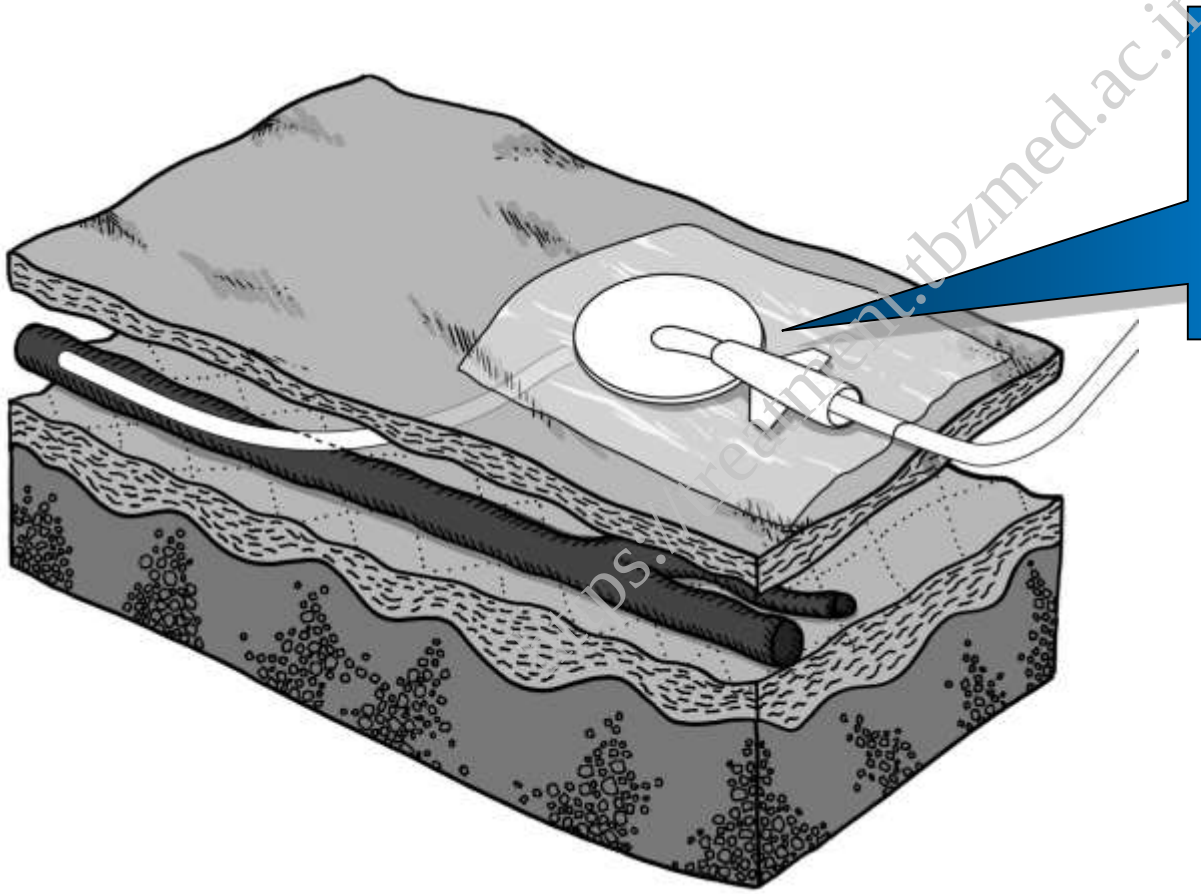
Prevention of vascular access line infection in intensive care



Multimodal intervention strategies to reduce catheter-associated bloodstream infections:

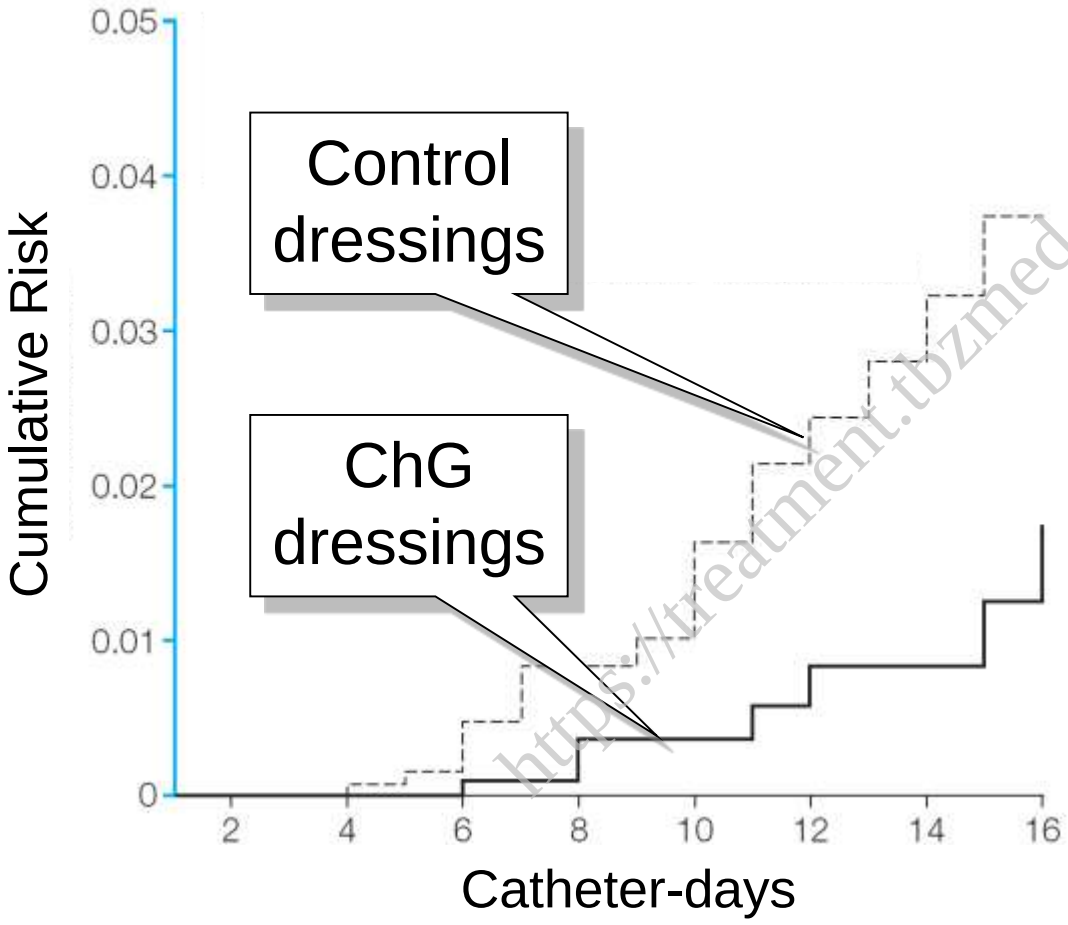
- Hand hygiene
- Maximal sterile barrier precaution at insertion
- Skin antisepsis with alcohol-based chlorhexidine-containing products
- Subclavian access as the preferred insertion site
- Daily review of line necessity
- Standardized catheter care using a non-touch technique
- Respecting the recommendations for dressing change

Could we do better ?



Chlorhexidine gluconate-impregnated sponge

Chlorhexidine-gluconate impregnated dressings decreased major catheter-related infections:



1.40 per 1000 catheter-days

HR = 0.39;
p=0.03

0.60 per 1000 catheter-days

1st principle of infection prevention

at least 35-50% of all healthcare-associated infections are associated with only 5 patient care practices:

- Use and care of urinary catheters
- Use and care of vascular access lines
- Therapy and support of pulmonary functions
- Experience with surgical procedures
- Hand hygiene and standard precautions

Risk factors for Ventilator-Associated Pneumonia (VAP)

Patient

- Age
- Burns
- Coma
- Lung disease
- Immunosuppression
- Malnutrition
- Blunt trauma

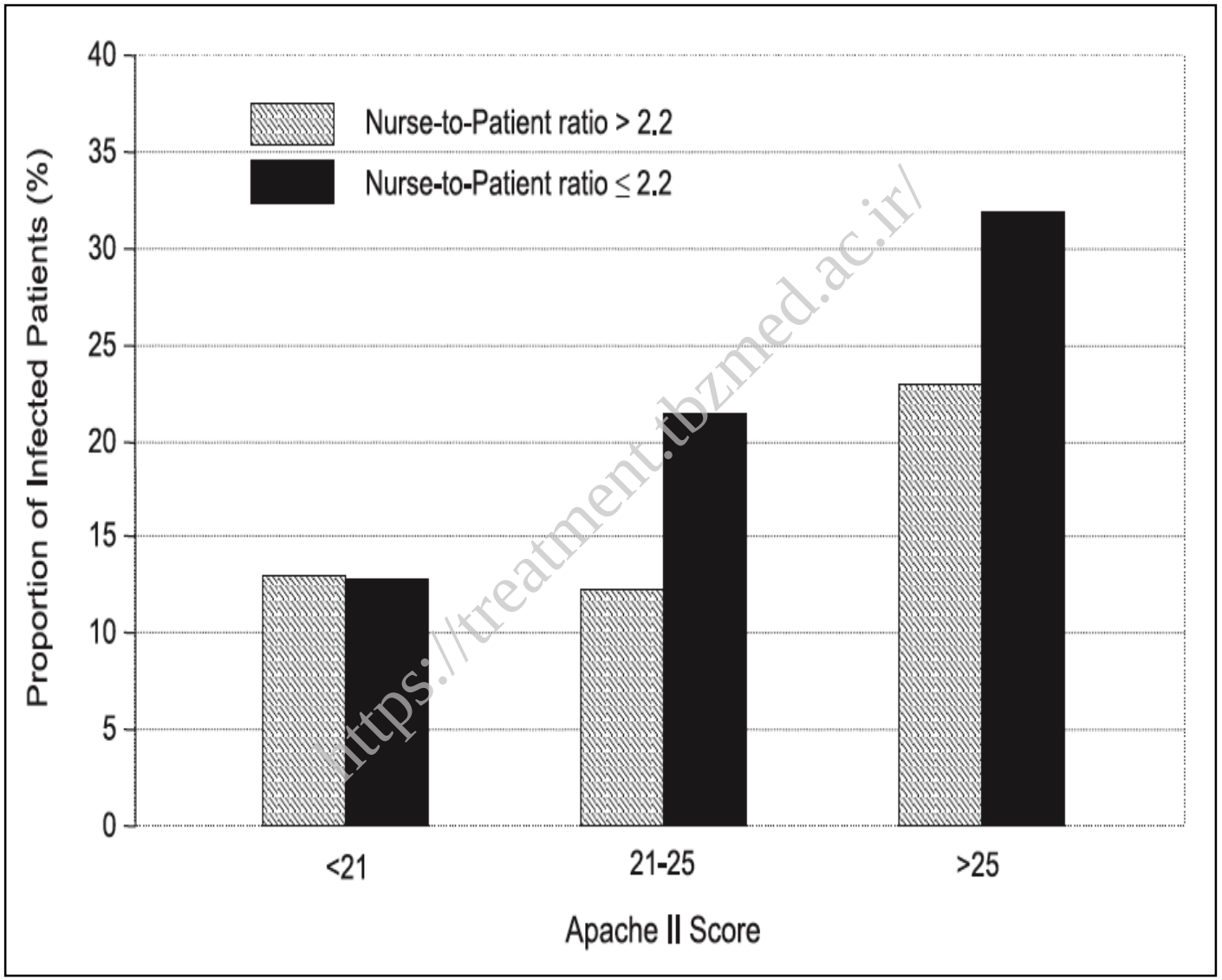
Devices

- Invasive ventilation
- Duration of invasive ventilation
- Reintubation
- Medication
- Prior antiobiotic treatment
- Sedation

General precautions

- Staff education, hand hygiene, isolation precautions (I)
- Surveillance of infection and resistance with timely feedback (II)
- Adequate staffing levels (II)

Effect of staffing level in late onset VAP



Intubation and ventilation

- Avoid intubation and reintubation - I
- Prefer non-invasive ventilation - I
- Prefer orotracheal intubation & orogastric tubes - II
- Continous subglottic aspiration - I
- Cuff pressure > 20 cm H2O - II
- Avoid entering of contaminate consendate into tube/nebulizer - II
- Use sedation and weaning protocols to reduce duration – II
- Use daily interruption of sedation and avoid paralytic agents - II

Is there a role for oral antiseptics ?

Is there a role for oral antiseptics ?

- Oral chlorhexidine application reduces VAP in one study but not for general use – I

Stress bleeding, transfusion, hyperglycemia

- Trend towards less VAP with sucralfate (vs H2 blockers) but increased gastric bleeding > individual choice - I
- Prudent transfusion, leukocyte-depleted red blood cell transfusion - I
- Intensive insulin therapy to keep glucose 80 - 110 mg/dl - I

Aspiration, body position

- Semirecumbent position (30 - 45°) especially when receiving enteral feeding - I
- Enteral nutrition is preferred over parenteral because of translocation risk - I

A multifaceted program to prevent ventilator-associated pneumonia: Impact on compliance with preventive measures*

Lila Bouadma, MD; Bruno Mourvillier, MD; Véronique Deiler, RN; Bertrand Le Corre, RN; Isabelle Lolom, BS; Bernard Régnier, MD; Michel Wolff, MD; Jean-Christophe Lucet, MD, PhD

Crit Care Med 2010: volume 38 in Press

2 year intervention study:

Compliance with preventive measures increased

VAP prevalence rate decreased by 51%

6. Gastric overdistention avoidance
7. Good oral hygiene
8. Elimination of non-essential tracheal suction

VAP Prevention

1. Hand hygiene before and after patient contact, preferably using alcohol-based handrubbing
2. Avoid endotracheal intubation if possible
3. Use of oral, rather than nasal, endotracheal tubes
4. Minimize the duration of mechanical ventilation
5. Promote tracheostomy when ventilation is needed for a longer term
6. Glove and gown use for endotracheal tube manip

1st principle of infection prevention

at least 35-50% of all healthcare-associated infections are associated with only 5 patient care practices:

- Use and care of urinary catheters
- Use and care of vascular access lines
- Therapy and support of pulmonary functions
- Experience with surgical procedures
- Hand hygiene and standard precautions

Strategies to prevent SSI

- Objectives
  - Reduce the inoculum of bacteria at the surgical site
    - Surgical Site Preparation
    - Antibiotic Prophylaxis Strategies
  - Optimize the microenvironment of the surgical site
  - Enhance the physiology of the host (host defenses)

- In relation to risk factors, classified as
  - Patient-related (intrinsic)
  - Pre-operative
  - Operative

Patient-related factors

- **Diabetes** - Recommendation (IDSA/SHEA)
  - Preoperative
    - Control serum blood glucose; reduce HbA1C levels to <7% before surgery if possible (A-II)
  - Post-operative (cardiac surgery patients only)
    - Maintain the postoperative blood glucose level at less than 200 mg/dL (A-I)
- **Smoking**

  - Rationale
    - Nicotine delays wound healing
    - Cigarette smoking = independent RF for SSI after cardiac surgery

  - Studies: None

  - Recommendation
    - Encourage smoking cessation within 30 days before procedure

Procedure-related risk factors

- Hair removal technique
- Preoperative infections
- Surgical scrub
- Skin preparation
- Antimicrobial prophylaxis
- Surgeon skill/technique
- Asepsis
- Operative time
- Operating room characteristics

Antimicrobial prophylaxis

- Recommendations (A-I)
  - Administer within 1 hour of incision to maximize tissue concentration
    - Once the incision is made, delivery to the wound is impaired

Antimicrobial prophylaxis

- Duration of prophylaxis (A-I)
  - Stop prophylaxis
    - within 24 hours after the procedure
    - within 48 hours after cardiac surgery
  - To:
    - Decrease selection of antibiotic resistance
    - Contain costs
    - Limit adverse events

Surgeon Skill and Technique

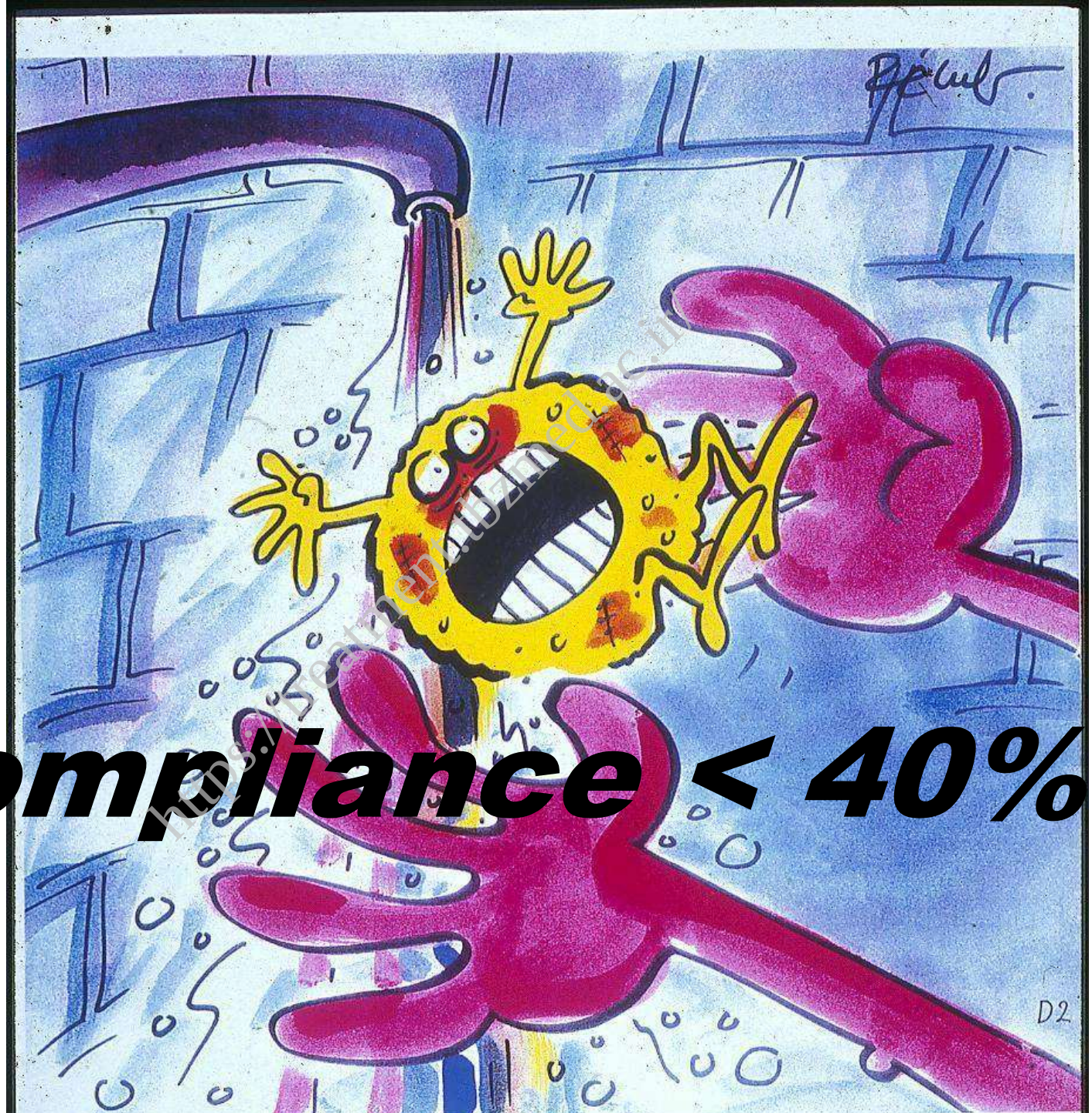
- Excellent surgical technique reduces the risk of SSI (A-III)

- Includes
  - Gentle traction and handling of tissues
  - Effective hemostasis
  - Removal of devitalized tissues
  - Obliteration of dead spaces
  - Irrigation of tissues with saline during long procedures
  - Use of fine, non-absorbed monofilament suture material
  - Wound closure without tension
  - Adherence to principles of asepsis

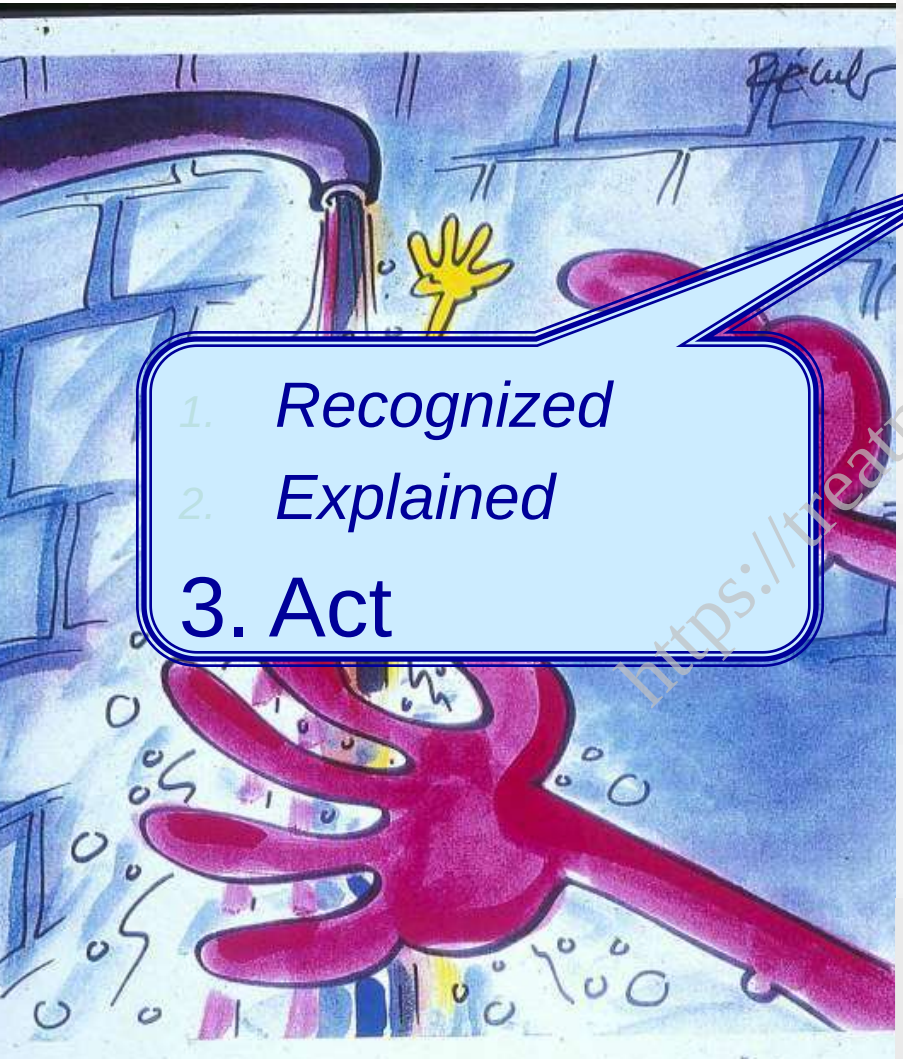
1st principle of infection prevention

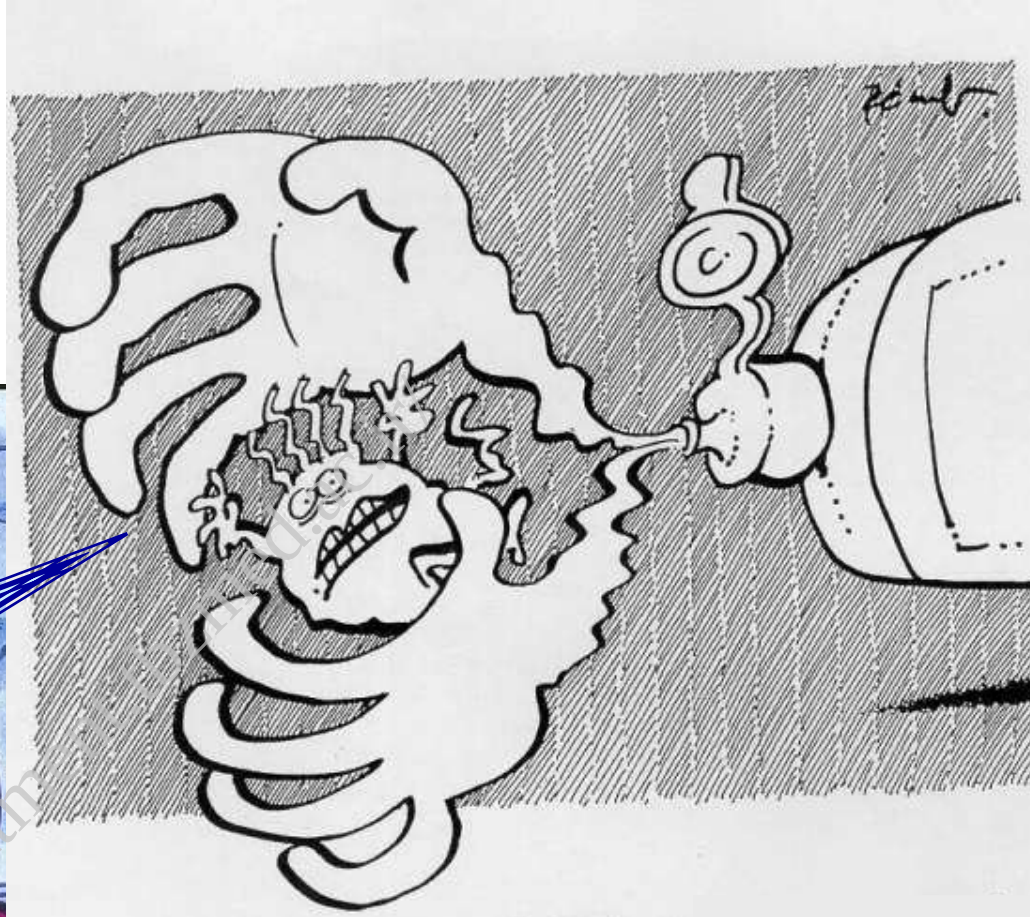
at least 35-50% of
associated with p

- Use and care c
- Use and care c
- Therapy and s
- Experience wit
- Hand hygiene


Compliance < 40%

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





Alcohol-based hand rub is standard of care

The University of Geneva Hospitals (HUG), 1995

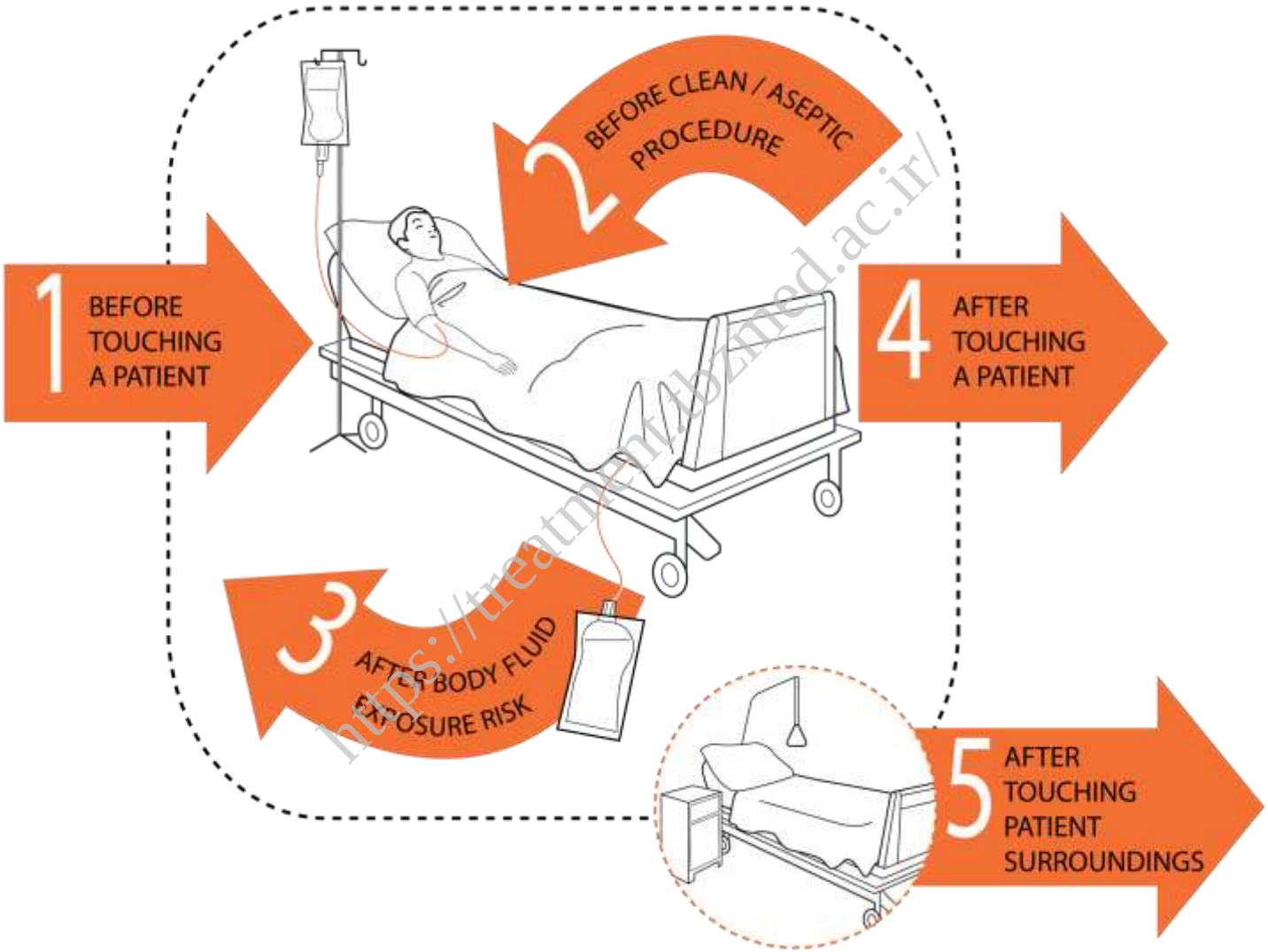
The University of Geneva Hospitals (HUG), 1995 - 1998

« Talking walls »

- The 5 core components of the WHO Multimodal Hand Hygiene Improvement Strategy

Implementation toolkit

“My 5 Moments for Hand Hygiene”



Evolving to new challenges in infection control and patient safety

- Team and multidisciplinary team work
- Successful interventions
- Adaptability of actions
- Scaling up
- Sustainability of actions / interventions
- Leadership commitment / Governance

WHO ***Patient Safety***

WHO
Collaborating Centres

Country
campaigns & activities

Facility
campaigns & activities *including evaluation and feedback*

Patient Safety

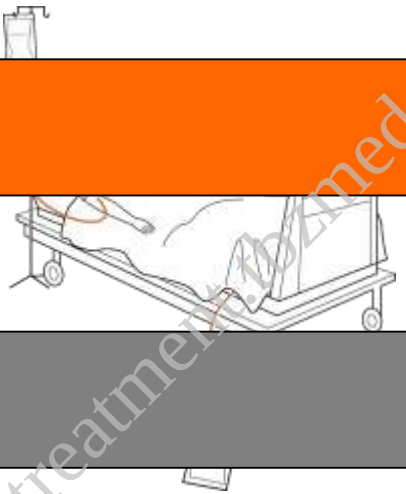
point of care -

- s

5 moments

OHM -

Infection Control



SAVE LIVES