

# STERILIZATION PRACTICES AND HOSPITAL INFECTIONS

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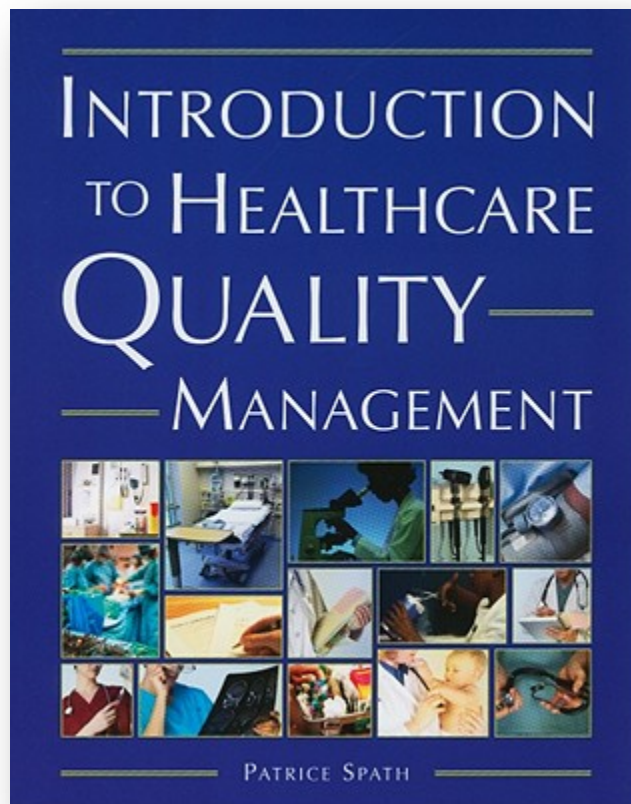
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# Learning Objectives

- The audience will be able to
  - Define the relation between bad sterilization practices and hospital infections
  - Identify and criticise the bad practices and propose solutions
  - Integrate norms, SOPs and guidelines to their daily routine to achieve good practises
  - Review the literature reporting the importance of good and bad sterilization practices

**THERE IS NO RELATIONSHIP  
BETWEEN  
HOSPITAL INFECTIONS  
AND  
GOOD STERILIZATION  
PRACTICES!**

# Quality in health care



# Evolution of quality in healthcare: From “To err is human” to public awareness

- Before 1995, no one was talking about patient safety
  - “To err is human” mentality
- In 2000, a small number in a few pioneering places had developed a strong commitment but,
  - Its impact was limited
  - Most of health care was unaffected
- Since 2005, the majority of health care institutions are involved to some extent and public awareness has soared

**Leape L. 2005**

# Medical Device Directive



Avis juridique important

ES CS DA DE ET EL EN FR IT LV LT HU MT NL PL PT SK SL FI SV

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31993L0042

## Council Directive 93/42/EEC of 14 June 1993 concerning medical devices

*Official Journal L 169 , 12/07/1993 P. 0001 - 0043*

*Finnish special edition: Chapter 13 Volume 24 P. 0085*

*Swedish special edition: Chapter 13 Volume 24 P. 0085*

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COUNCIL DIRECTIVE 93/42/EEC of 14 June 1993 concerning medical devices

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100a thereof,

Having regard to the proposal from the Commission (1),

In cooperation with the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas measures should be adopted in the context of the internal market; whereas the internal market is an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured;

Whereas the content and scope of the laws, regulations and administrative provisions in force in the Member States with regard to the safety, health protection and performance characteristics of medical devices are different; whereas the certification and inspection procedures for such devices differ from one Member State to another: whereas such disparities constitute barriers to trade within the Community:

# Safe Medical Devices!





02:12 / 29:03



**Surgery's Dirty Secrets | BBC Medical Documentary**

# Manufacturing surgical instruments!!!



# Quality assurance in surgical instruments!





WFHSS




&  
8th National Sterilization Disinfection Congress of Turkey

**6-9 November 2013**

Susesi Convention Center, Antalya, Turkey

[www.das.org.tr/2013](http://www.das.org.tr/2013)  
[www.wfhssturkey2013.com](http://www.wfhssturkey2013.com)

Barts Health   
NHS Trust

Tom Brophy - Lead Technologist

**QA of new surgical instruments**  
**Don't accept our rejects!**

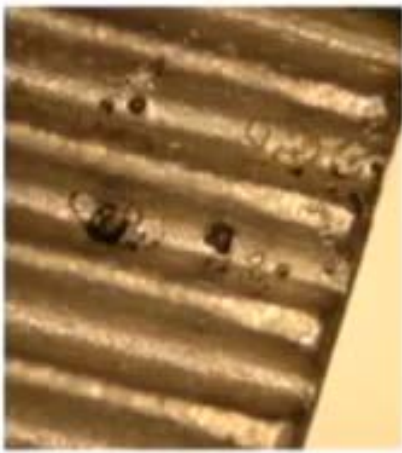
Paul Srodon - Surgeon

Phil Daly - Scientist

Malcolm Birch - Clinical Physics Director

**Slide 86**





# Concerns about prion disease



Thirteen New England patients possibly exposed to fatal brain disease

HEALTH NEWS | Thu Sep 5, 2013 | 9:04pm EDT

## Thirteen New England patients possibly exposed to fatal brain disease

The Massachusetts Department of Public Health said on Thursday that five patients treated at Cape Cod Hospital between June and August are at low risk of infection for the disease, called Creutzfeldt-Jakob disease (CJD). On Wednesday, New Hampshire announced eight patients treated at a hospital in New Hampshire may also have been exposed.

Surgical instruments used on the patients may have become infected with the microscopic protein that causes CJD after they were initially used on someone now suspected of having carried the disease.

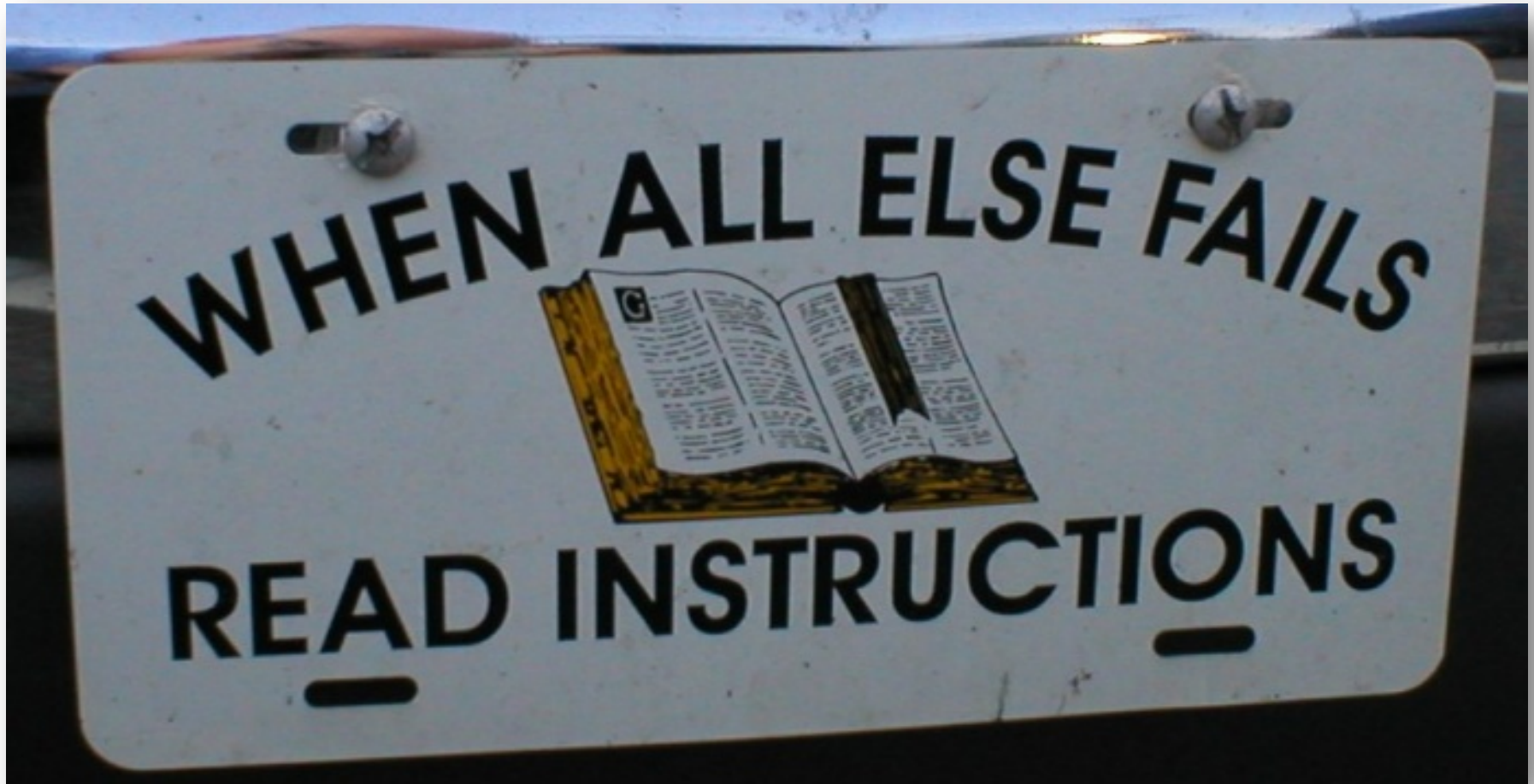
# Protein linked to Alzheimer's could be spread during surgery, say researchers

Concern that tiny pieces of harmful proteins could be spread via surgical instruments leads scientists to call for more research into possible transmission



Photograph: David Levene/the Guardian

# SOPs in CSSD





# Hygienic Requirements for Processing of Medical Devices<sup>1</sup>

Recommendation by the Commission for Hospital Hygiene and Infection Prevention at the Robert Koch Institute (RKI) and the Federal German Institute for Medical Drugs and Medical Products (BfArM) concerning the “Hygienic requirements for processing of medical devices”



## Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008

William A. Rutala, Ph.D., M.P.H.<sup>1,2</sup>, David J. Weber, M.D., M.P.H.<sup>1,2</sup>, and the Healthcare

Infection Control Practices Advisory Committee (HICPAC)<sup>3</sup>



World Federation for  
Hospital Sterilisation Sciences

# Dirty instruments waiting for decontamination



# The Relationship Between Holding Time and the Bacterial Load on Surgical Instruments

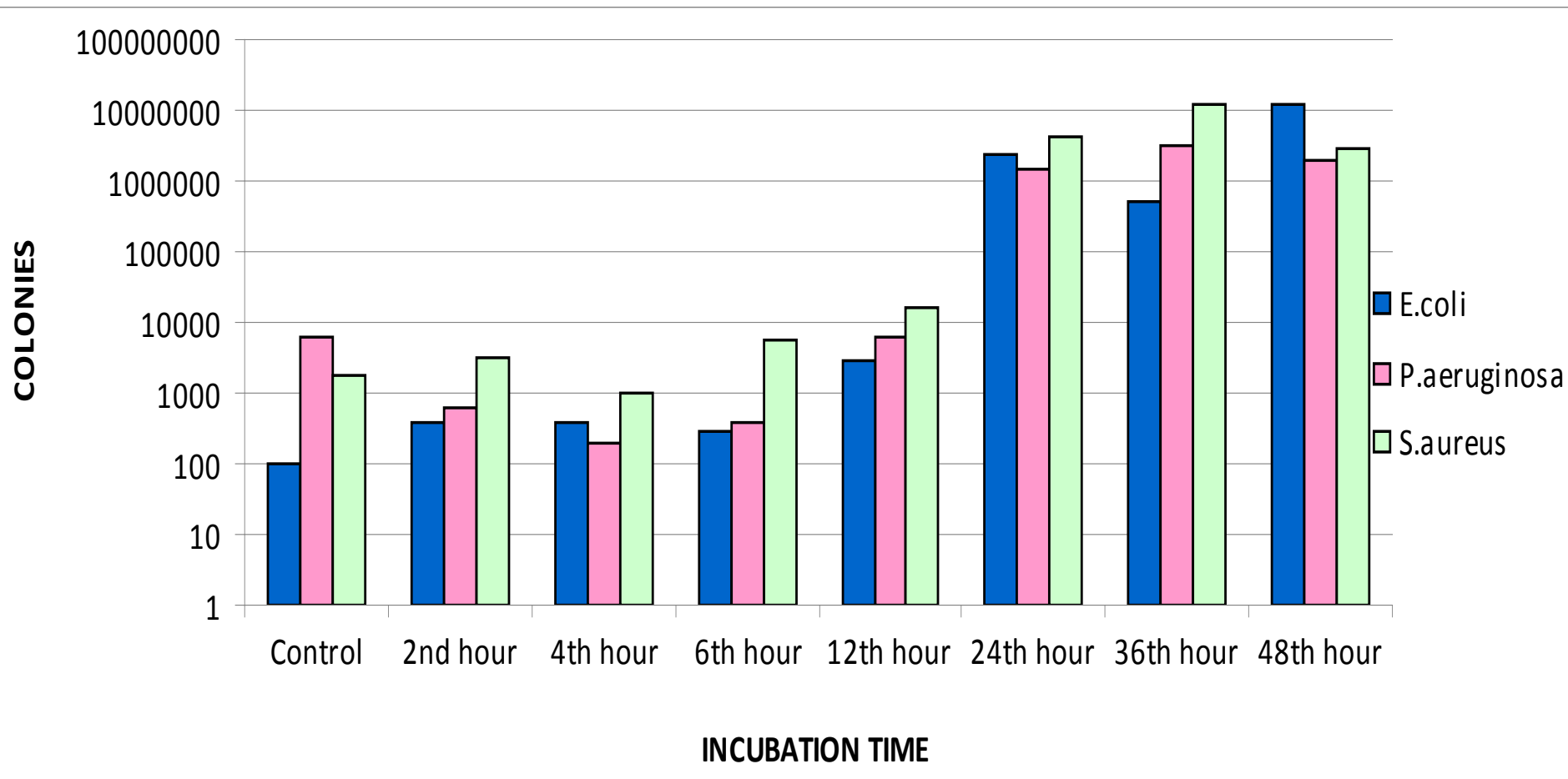
Duygu Percin • Hafize Sav • Hatice Tuna Hormet-Oz •  
Murat Karauz

Received: 6 January 2011 / Accepted: 3 September 2012  
© Association of Surgeons of India 2012

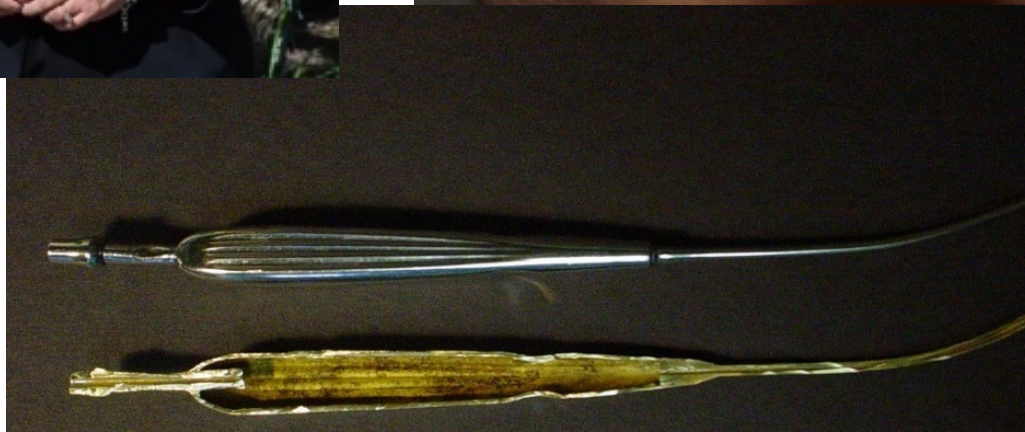
**Abstract** The aim of this investigation was to determine the bacterial load on used instruments and to evaluate the relationship between the bacterial load and the hold-

care workers and maintaining the medical instruments. The number of bacteria contaminating medical devices will determine how long it will take for a cleaning

# Colony counting results on dirty instruments at different hours



# Filthy surgical instruments: The hidden threat in America's operating rooms!



<http://www.iwatchnews.org/2012/02/22/8207/filthy-surgical-instruments-hidden-threat-americas-operating-rooms#!9>



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## Rusty instruments and reused needles discovered inside the Oklahoma dental office that has 'exposed as many as 7,000 patients to HIV and hepatitis'

By DAILY MAIL REPORTER and ASSOCIATED PRESS REPORTER

PUBLISHED: 20:53 GMT, 28 March 2013 | UPDATED: 15:36 GMT, 29 March 2013

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Health inspectors found expired morphine and dirty, rusty instruments that were used on patients with infectious diseases inside an Oklahoma dental clinic, putting thousands of people at risk for hepatitis and the virus that causes AIDS.

State and local health officials planned to mail notices Friday urging 7,000 patients of Dr. W. Scott Harrington to seek medical screenings for hepatitis B, hepatitis C and HIV.

Health officials opened their investigation after a patient with no known risk factors tested positive for both hepatitis C and HIV, the virus that causes AIDS. After determining the 'index patient' had a dental procedure about the likely time of exposure, investigators visited Harrington's office and found a number of unsafe practices, state epidemiologist Kristy Bradley said.

KLINIKBEHANDLUNG

## Stuttgart: Ermittler prüfen OP-Hygiene

dpa, 28.11.2012 13:05 Uhr



Verschmutztes OP-Besteck: Am Stuttgarter Katharinenhospital prüft die Staatsanwaltschaft einen Verdacht auf Körperverletzung.

Foto: TK

*Berlin* - Verschmutztes OP-Besteck im Stuttgarter Katharinenhospital hat die Staatsanwaltschaft auf den Plan gerufen. Man ermittle seit einigen Wochen wegen des Verdachts der versuchten Körperverletzung, so eine Sprecherin mit. Die Klinik hatte Mitte September Anzeige gegen Unbekannt erstattet. Sie bestätigte „vereinzelte Unregelmäßigkeiten“ und sprach vom Verdacht der „Manipulation“.

Der Klinische Direktor Professor Dr. Claude Krier schloss „nach menschlichem Ermessen“ aus, dass Patienten mit den verschmutzten Geräten behandelt

wurden. Er habe keine Häufung von Infektionen nach Operationen festgestellt.

# Hygiene-Skandal im Klinikum Bogenhausen

München - Weil die Sterilisationsabteilung mangelhaft arbeitet, hat das Klinikum Bogenhausen am Mittwochnachmittag seine Operationssäle geschlossen. Auch ein weiteres Krankenhaus ist betroffen.

Google-Anzeige

## Hygienerichtlinien 2013

Infos zu den Hygienerichtlinien Gratis herunterladen - nur hier!

[www.arbeitsschutz-konkret.com](http://www.arbeitsschutz-konkret.com)

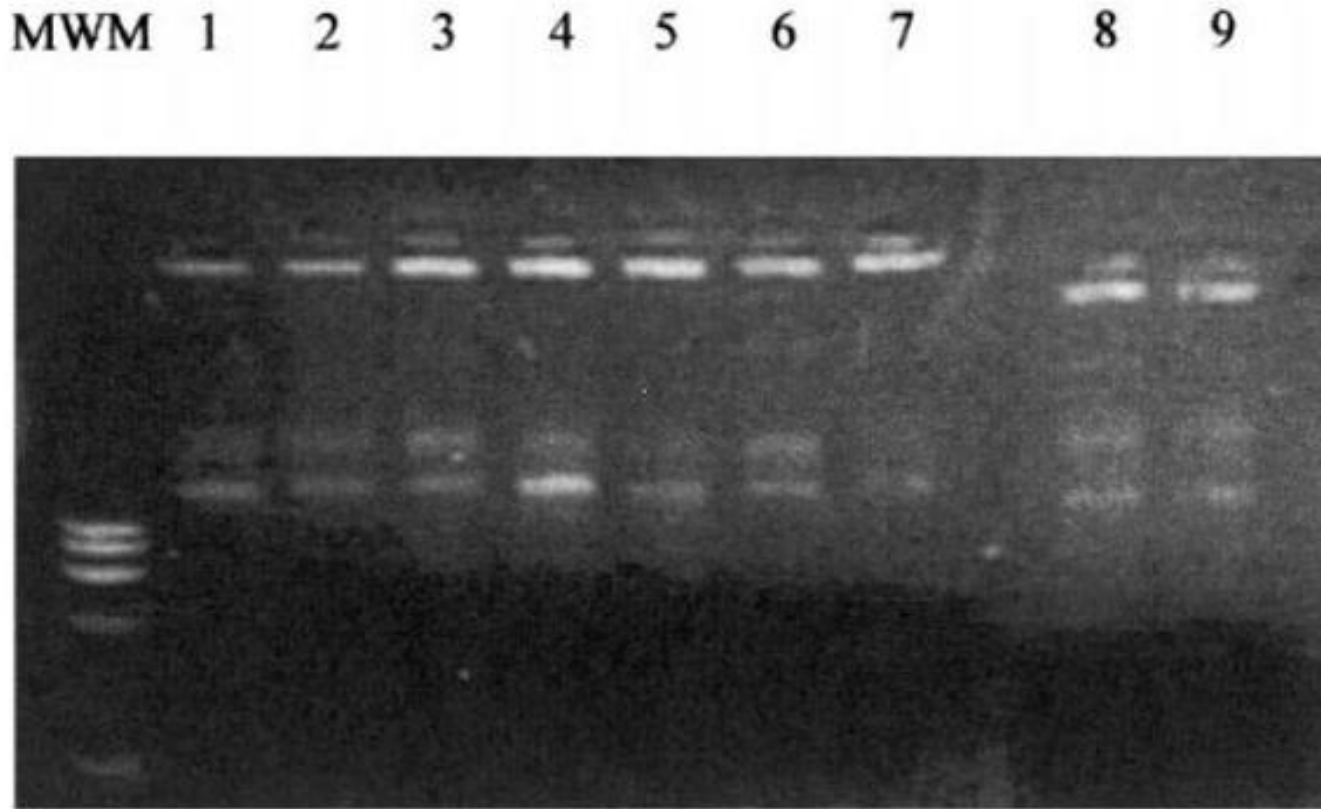


# Polymicrobial ventriculitis and evaluation of an outbreak in a surgical intensive care unit due to inadequate sterilization

- A case of polymicrobial ventriculitis
- An outbreak of *Serratia marcescens* mediastinitis in the intensive care unit of cardiovascular surgery
- 5 of 17 patients died



# Molecular analysis of the strains



**Figure 1** Plasmid profiles of nine *S. marcescens* isolates. MWM, molecular weight marker. 1–8, isolates from eight different patients (patient nos: 1, 2, 3, 4, 5, 7, 11, 13) (Table I); 9, isolate from sterilized drape (set no: 5).

# Textile in CSSD!



# Flash (immediate-use) sterilization



# A Hospital-Wide Initiative to Eliminate Preventable Causes of Immediate Use Steam Sterilization

[Lorraine Hutzler](#), BA, [Kandy Kraemer](#), MSN, RN, [Lou Iaboni](#), BS, LPN, RCST, CPM, [Nancy Berger](#), MS, RN, NE-BC, FACHE, [Joseph A. Bosco III](#), MD

DOI: <http://dx.doi.org/10.1016/j.aorn.2013.10.006>

[Abstract](#)[Full Text](#)[Images](#)[References](#)

## Abstract

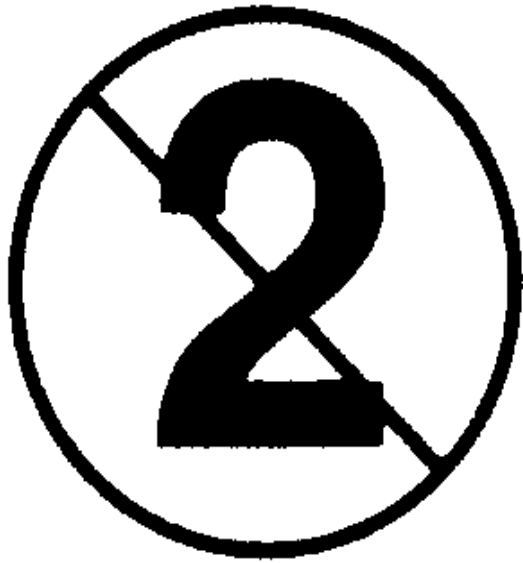
Instruments and implants sterilized by immediate use steam sterilization (IUSS), formerly called flash sterilization, can increase the patient's risk for acquiring a surgical site infection. We implemented a hospital-wide initiative to determine the reasons that perioperative personnel use IUSS to sterilize items and then designed a program to reduce the hospital's rates. Program initiatives included educating perioperative personnel, improving scheduling processes, holding vendor discussions, purchasing additional instrument sets, and transitioning from paper wrap to metal containers for instrument sets. In addition, we instituted a policy whereby nursing leaders are required to approve IUSS before it can be used and developed guidelines for immediate and rapid processing in the sterile processing department, and we monitor compliance daily and communicate results regularly to all team members. These efforts decreased our facility use of IUSS for implants from 10.22% in January 2008 to 0.09% in August 2012, and we decreased our use of IUSS for instruments from 79% in May 2010 to 7.5% in February 2012. We simultaneously implemented a process to reduce surgical site infection rates and saw an improvement in surgical site infection from 5.4% in the first quarter of 2010 to 1.4% in the fourth quarter of 2012.

# Regulation about resterilization

**REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**

**on medical devices, and amending Directive 2001/83/EC, Regulation (EC) No 178/2002  
and Regulation (EC) No 1223/2009**

**The institutions that reprocess single-use devices should  
be regarded as disposable device manufacturers and  
must meet all the requirements that apply to the  
disposable device manufacturers.**



**DO NOT REUSE**

???

# Postoperative endophthalmitis caused by an *Enterobacter* species

- 6 patients who were operated upon during the same day developed bacterial endophthalmitis on the following day
- 7 eyes were affected.
- 4 eyes eviscerated



Mirza G. E., Karakucuk S., Doganay M., Caglayangil A.  
J Hosp Infect; 1994, 26, pp. 167-172

# Scandal after cataract surgery

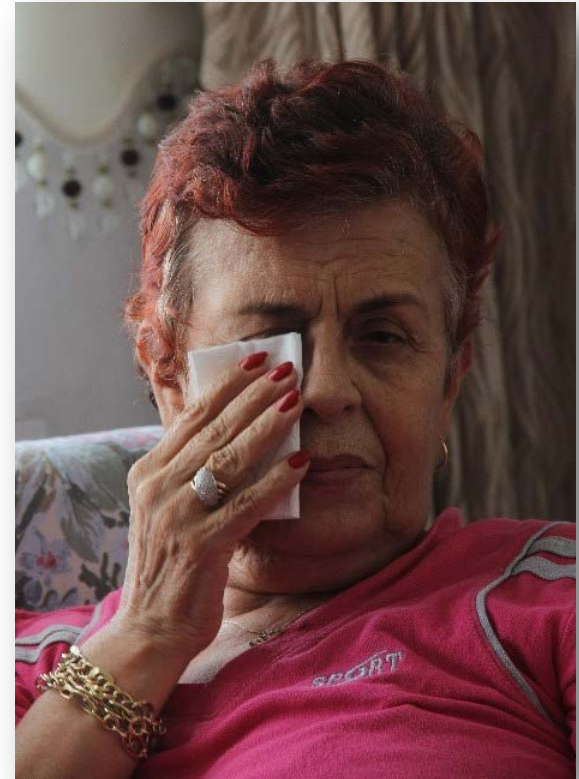


01.12.2010 - 15:15

7 old patients having cataract surgery on the same day lost eyesight

**2010**

# 2016 !



# Kingdom of Ophtalmology !



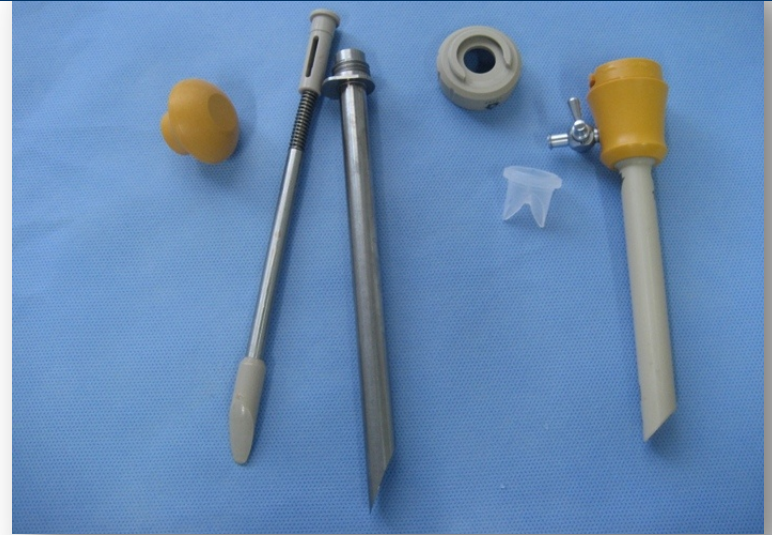
Resim 5.



# Reasons for post cataract eendophthalmitis

- No centralization
- No adaptation
- No standardization
- No education
- **Reuse of single use Phaco cassettes  
an tubings**
- End result is infection!

# Laparoscopic instruments: single use vs. reusables







Nach dem Sterilisationsprozess  
Achtung: nicht verwenden

Do not use if pouch is damaged. Avoidir l'usage si le sachet est endommagé.  
no use si el empaque está dañado. No usar si el empaque está dañado.

Nicht gebrauchen als Verpackungszustand beschädigt ist. Nicht verwenden wenn die Verpackung beschädigt ist. Nicht verwenden wenn die Verpackung beschädigt ist.

# Liquid sterilization ?



# Liquid sterilization ?

JOURNAL OF CLINICAL MICROBIOLOGY, July 2009, p. 2149–2155  
0095-1137/09/\$08.00+0 doi:10.1128/JCM.00027-09  
Copyright © 2009, American Society for Microbiology. All Rights Reserved.

Vol. 47, No. 7

## Epidemic of Postsurgical Infections Caused by *Mycobacterium massiliense*<sup>▽</sup>

Rafael Silva Duarte,<sup>1\*</sup> Maria Cristina Silva Lourenço,<sup>2</sup> Leila de Souza Fonseca,<sup>1</sup> Sylvia Cardoso Leão,<sup>3</sup>  
Efegenia de Lourdes T. Amorim,<sup>4</sup> Ingrid L. L. Rocha,<sup>4</sup> Fabrice Santana Coelho,<sup>5</sup> Cristina Viana-Niero,<sup>3</sup>  
Karen Machado Gomes,<sup>1</sup> Marlei Gomes da Silva,<sup>1</sup> Nádia Suely de Oliveira Lorena,<sup>6</sup>  
Marcos Bettini Pitombo,<sup>6</sup> Rosa M. C. Ferreira,<sup>2</sup> Márcio Henrique de Oliveira Garcia,<sup>7</sup>  
Gisele Pinto de Oliveira,<sup>8</sup> Otilia Lupi,<sup>9</sup> Bruno Rios Vilaça,<sup>1</sup> Lúcia Rodrigues Serradas,<sup>10</sup>  
Alberto Chebabo,<sup>11</sup> Elizabeth Andrade Marques,<sup>6</sup> Lúcia Martins Teixeira,<sup>1</sup>  
Margareth Dalcolmo,<sup>12</sup> Simone Gonçalves Senna,<sup>1</sup>  
and Jorge Luiz Mello Sampaio<sup>13</sup>

*Instituto de Microbiologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil*<sup>1</sup>; *Instituto de Pesquisa Evandro Chagas, Fundação Oswaldo Cruz, Rio de Janeiro, Brazil*<sup>2</sup>; *Departamento de Microbiologia, Imunologia e Parasitologia, Universidade Federal de São Paulo, São Paulo, Brazil*<sup>3</sup>; *Sérgio Franco Medicina Diagnóstica, Rio de Janeiro, Brazil*<sup>4</sup>; *Hospital Universitário Pedro Ernesto, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil*<sup>5</sup>; *Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil*<sup>6</sup>; *Secretaria de Vigilância em Saúde do Ministério da Saúde, Brasília, Brazil*<sup>7</sup>; *Instituto de Estudos de Saúde Coletiva, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil*<sup>8</sup>; *Secretaria Municipal de Saúde do Rio de Janeiro, Rio de Janeiro, Brazil*<sup>9</sup>; *Hospital de Clínicas Riomar, Rio de Janeiro, Brazil*<sup>10</sup>; *Hospital Universitário Clementino Fraga Filho, Rio de Janeiro, Brazil*<sup>11</sup>; *Centro de Referência Professor Hélio Fraga, Rio de Janeiro, Brazil*<sup>12</sup>; and *Instituto Fleury de Ensino e Pesquisa, São Paulo, Brazil*<sup>13</sup>

# Liquid sterilization ?

- An epidemic of infections after video-assisted surgery caused by rapidly growing mycobacteria (RGM) and involving 63 hospitals in the state of Rio de Janeiro, Brazil, occurred between 2006 and 2007
- High level disinfected instrument with 2% glutaraldehyde were used instead of sterilization
- 1051 possible cases!

# Home made gauzes!



# Home made gauzes !



# Gauze residues may cause foreign body reaction and infection!

Hinyokika Kyo. 2014 Feb;60(2):83-6.

**[An intravesical foreign body by migration of remnant gauze into the bladder: a case report].**

[Article in Japanese]

Kashima S<sup>1</sup>, Yamamoto R<sup>1</sup>, Miura Y<sup>1</sup>, Abe A<sup>1</sup>, Togashi H<sup>1</sup>, Ishida T<sup>1</sup>, Matsuo S<sup>1</sup>, Numakura K<sup>2</sup>, Habuchi T<sup>2</sup>.

 **Author information**

## **Abstract**

A 35-year-old female, who had undergone Caesarean sections in 2000 and 2001, presented with repeated candida vaginitis and cystitis. She reported that a piece of gauze was excreted through the urethra in 2005. The patient visited an outpatient clinic, but no foreign body was identified by cystoscopy. She again visited the clinic in 2012 complaining of miction pain, and a calcified mass was identified in the bladder. The patient was then referred to our hospital. During a transurethral operation, crushed stones, which included the gauze, were removed from the bladder. We concluded that remnant gauze left in the abdominal cavity during the previous pelvic surgery, had migrated into the bladder and formed a calcified mass.

PMID: 24755819 [PubMed - indexed for MEDLINE]

**THE ONLY REASON  
FOR STERILIZATION FAILURE  
IN ALL THESE CASES  
IS  
NON-STANDARD AND BAD  
STERILIZATION PRACTICES!!!**

# For good sterilization practices:



Good team leader



Educated and motivated CSSD staff



Well written and well understood SOPs



Routine control, validation, and documentation of sterilization process



Monitorization of compliance to the SOPs, guidelines and norms

# References

- Percin D. Sterilization practices and hospital infections: is there a relationship? Int J Antisep Disinfect Steril 2016;1(1):19–22.
- Renders W. Dare to change. Int J Antisep Disinfect Steril 2016;1(1):13–8.
- Robert Koch Institute. “Hygienic requirements for processing of medical devices”. Bundesgesundheitsbl. Gesundheitsforsch. Gesundheitsschutz 2001, 44: 1115-1126, Springer Verlag.
- Rutala WA, Weber DJ, and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008.
- Tosh PK, Disbot M, Duffy JM, et al. Outbreak of *Pseudomonas aeruginosa* surgical site infections after arthroscopic procedures: Texas, 2009. Infect Cont Hosp Epidemiol 2011; 32:1179-86.
- Dancer SJ, Stewart M, Coulombe C, Gregori A, Viridi M. Surgical site infections linked to contaminated surgical instruments. J Hosp Infect 2012;81:231-8.
- Percin D, Sav H, Hormet-Oz HT, Karauz M. The relationship between holding time and the bacterial load on surgical instruments. Indian J Surg 2015;77(1):16-8.
- Brophy T, et al. Quality of surgical instruments. Ann R Coll Surg Engl. 2006;88(4):390-3.