

An unknown danger in operating rooms: Open system filling adaptors

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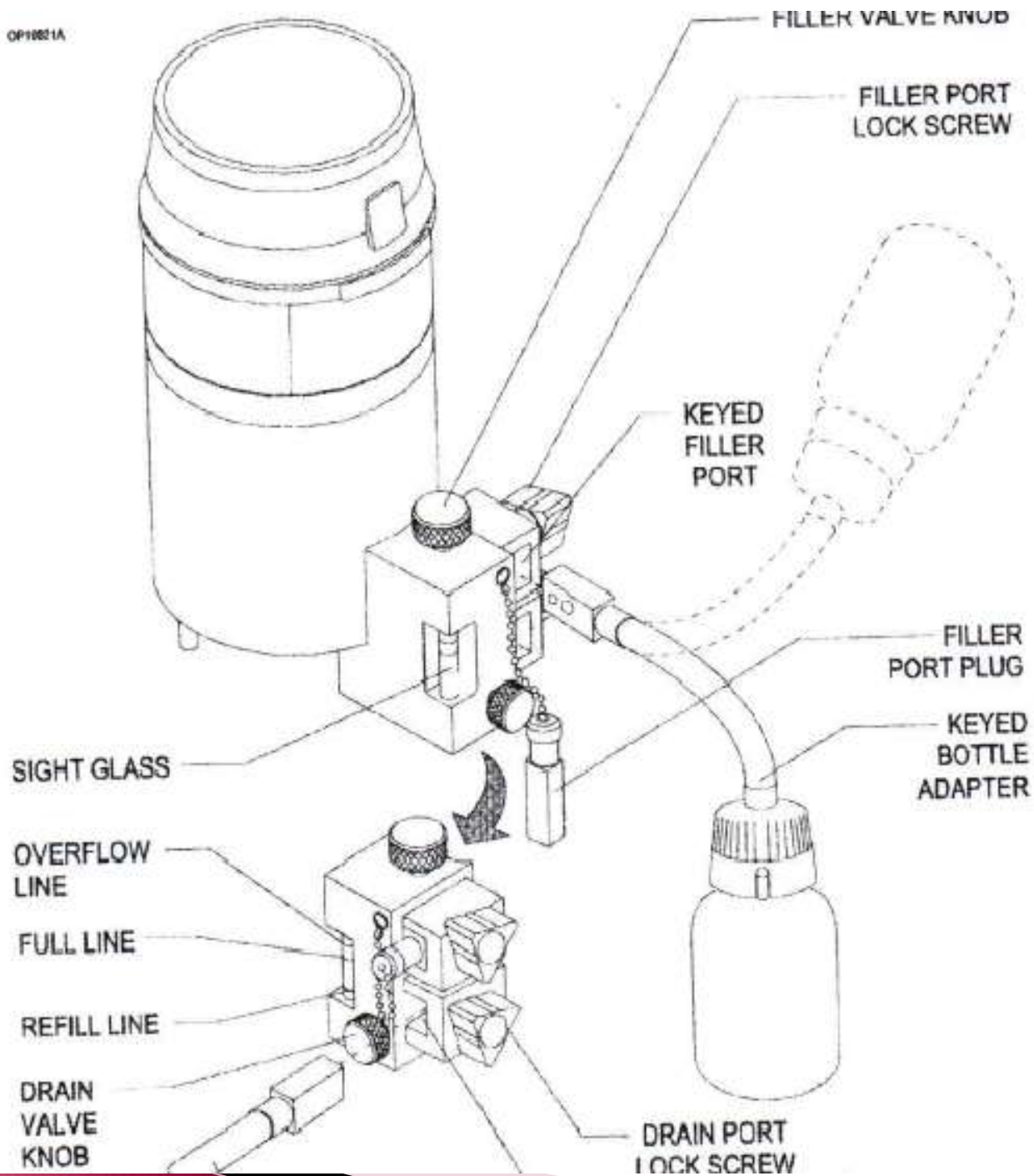




Filling adaptors

- ▶ They are used to fill vaporizers with anesthesia drugs like
 - Isoflurane
 - Halothane
 - Sevoflurane






Different bottles and adaptors



Problems

- ▶ Reusable filling adaptors that are dedicated to the operating room not to the bottle
 - ▶ The bottles which have not been emptied yet, may stand for a few days in operating rooms
 - ▶ They are reused without disinfection of filling adaptors
- 

Known risks with reusable FA

- ▶ Safety problems
 - Pollution of the room
- ▶ Chemical contamination
- ▶ Misuse



Safety risk

Anesth Analg. 2006 Jul;103(1):124-5, table of contents.

A surprising twist: an unusual failure of a keyed filling device specific for a volatile inhaled anesthetic.



Keresztury MF¹, Newman AG, Kode A, Wendling WW.

 Author information

Abstract

We describe two cases in which keyed filling devices for sevoflurane were inadvertently screwed onto isoflurane bottles. The mishaps were possible because the collars on sevoflurane and isoflurane bottles are mirror images of each other. The particular keyed filling device was designed with a flexible outer sleeve and could be screwed onto the wrong bottle while slightly gouging its soft plastic collar. The keyed filling adapters for sevoflurane and isoflurane could each be manipulated to fit the other's bottle. A manufacturer (Southmedic, Inc., Barrie, Canada) has modified their keyed filling adapters to prevent this unusual circumstance from recurring.

PMID: 16790639 [PubMed - indexed for MEDLINE]



Safety risk

- ▶ Wrong adaptors may cause
 - Wrong anaesthetic agent to go to the patient
 - Pollution in the operating room
 - Compromize the safety of staff
 - DNA damage
 - Increased risk for Parkinson Disease

Chemical contamination (1)

■ CASE REPORTS

Anesthesiology

78:1175-1177, 1993

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J. B. Lippincott Company, Philadelphia

Contamination of Anesthetic Vaporizer Contents

Maurice Lippmann, M.D., Wayne Foran, M.D.,† Richard Ginsburg, M.D.,† Joan Lewis, M.D.‡*

- ▶ 47 y man – elective mitral valve replacement
- ▶ Routine filling of vaporizer with isoflurane
- ▶ Strange odor in OR ???
- ▶ Same pungent odor from the near-empty bottle
- ▶ Samples were sent for chemical analysis

Chemical contamination (2)

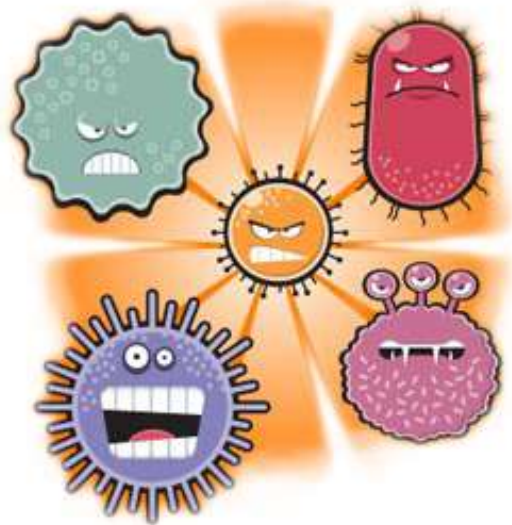
- ▶ Sample 1: Near-empty bottle
 - Contaminated (Methylmethacrylate, Dimethyl-para-toluidine, and Hydroquinone)
- ▶ Sample 2: Drained from vaporizer
 - Contaminated (Methylmethacrylate, Dimethyl-para-toluidine, and Hydroquinone)
- ▶ Sample 3: Sealed and unused bottle from the same production lot
 - Pure isoflurane
 - Not contaminated

Chemical contamination (3)


- ▶ No control for bottles
- ▶ Partially used bottles are left in the drawers
- ▶ Potential for tampering
- ▶ Contamination in the drawer with
 - Radiopaque Bone Cement
 - Methylmethacrylate
 - Dimethyl-para-toluidine
 - Hydroquinone

Unknown risk:

Microbial contamination of
filling adaptors



Aims of the study

- ▶ To evaluate microbial contamination risk
 - ▶ To evaluate the infection risk for the patients due to filling adaptors
 - ▶ To investigate the methods for disinfection for re-used filling adaptors
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Step 1: Point prevalence

- ▶ On the same day microbiological sampling of 13 selvoflurane bottle adaptors attached on the opened bottle
- ▶ Inoculation onto sheep blood agar and 24 hours incubation at 35°C
- ▶ Identification of microorganisms using conventional microbiological methods

Results of Step 1

- ▶ Four of 13 (30.8%) opened bottles were found to be contaminated with
 - Coagulase negative staphylococci
 - Coryneform bacilli
 - *Bacillus* spp.
- ▶ 1–10 CFU

Step 2: Evaluation of disinfection methods

- ▶ 4 unused FA were inoculated with (10^8)
 - *Staphylococcus aureus* ATCC 25923
 - *Enterococcus faecalis* ATCC 29212
 - *Pseudomonas aeruginosa* ATCC 27853
 - *Candida albicans* ATCC 10231

Step 2: Evaluation of disinfection methods

- ▶ Comparison of two different disinfection methods
 - Immersion in 2% peracetic acid solution
 - Thermal disinfection at 90°C for 5 min
- ▶ After contact time FA were put in physiological saline, vortexed and samples were cultured onto sheep blood agar
- ▶ Results were evaluated after 24 h incubation at 35°C

Results of Step 2

- ▶ No growth was observed any of FA disinfected either with
 - Peracetic acid
 - Thermal disinfection

User manual says

**Do not
adapte
may re**

Disinfecting

Use surface disinfectants for disinfection. For reasons of material compatibility use disinfectants based on:

- aldehydes,
- alcohols,
- quaternary ammonium compounds.

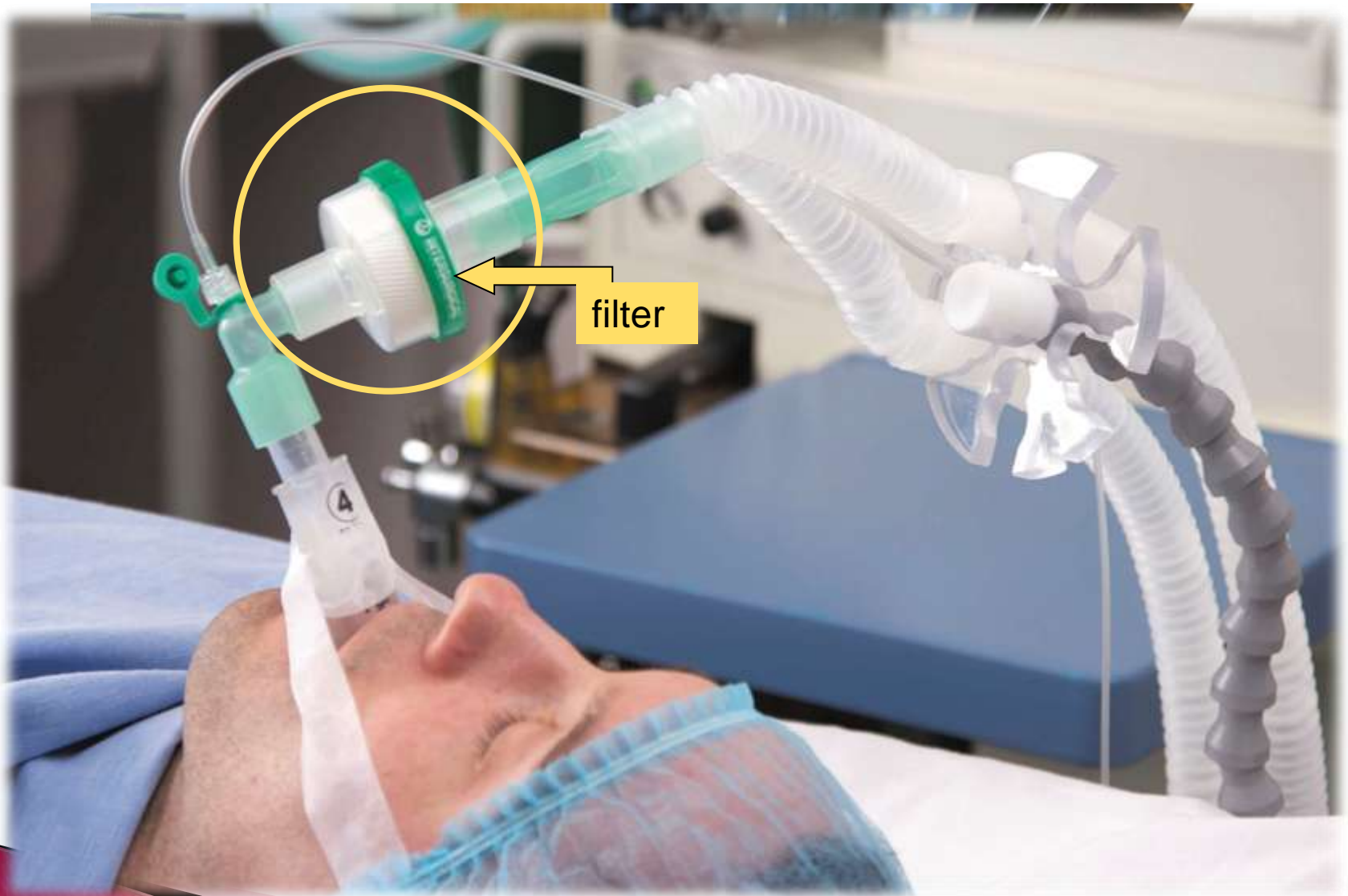
Ensure that all disinfectants are registered with the U.S. Environmental Protection Agency for use as intended.

Always follow the instruction labels specifically with respect to prescribed concentrations and the necessary exposure times.

Do not use preparations which are based on

- halogen-releasing compounds,
- strong organic acids,
- oxygen-releasing compounds.


Semicritical items ???



Conclusions (1)

- ▶ FA should be accepted as semi-critical items together with the anesthesia tubes
- ▶ High level disinfection is required
- ▶ Although the bacteria grew on the bottles we studied are not pathogenic and we did not investigate presence of viruses, this study proves that the filling adaptors are open for microbial contamination

Conclusions (2)

- ▶ Bottles of volatile agents, open or sealed, may not be left in the anesthesia machine drawers and operating rooms
 - ▶ Empty bottles should be discarded and not to be left in drawers and used as a repository for other liquids
 - ▶ Reusable filling adaptors might be cheaper but they compromise the patient safety and quality
- 

Best practice for patient safety

Small volume bottles with safety seal

AND

Single use adaptors



THANK YOU

