Cleaning and Infection Control of Devices in CF Patients

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General

- Cystic Fibrosis is a life shortening disease.
- There is decreased mucociliary clearance and impaired host defenses.
- Bacterial infection plays a major role in the process leading to respiratory failure in CF.

* Cohen-Cymberknoh at el, Am J Respir Crit Care Med 2011, Jun 1 183(11):1463-1471

* Ehre, Int J Biochem Cell Biol 2014, Jul 52:136-145

* Peckham at el, J Cyst Fibros 2015, Jun 20 pii:S1569-1993(15)00153-8

General

- Respiratory physiotherapy:
  - Improves and assists in airway clearance.
  - Keeps airways hygiene.
  - Improves medication delivery.

- Many of our CF patients use at least one respiratory device in the physiotherapy session.

* Rand, Paediatr Respir Rev. 2013 Dec;14(4):263-9

General

- Most of the literature refers to the contamination and cleaning of nebulizers.
- It is unclear if a device can contaminate the patient.
- Staphylococci and enterococci survival on plastic more then 90 days.

* Peckham at el, J Cyst Fibros 2015 Jun 20;pii:S1569-1993(15)00153-8
* Saiman at el, Infect Control Hosp Epidemiol. 2014 Aug;35 Suppl 1:S1-67
* Saiman, Clin Microbiol Rev 2004 Jan;17(1):57-71
* Neely, J Clin Microbiol 2000 Feb;38(2):724-6
* Reychler, J Cyst Fibros 2005 Sep;4(3):183-7

Organism transmission routes

Organism	Transmission routes
Pseudomonas aeruginosa	Person-to-person, Environmental reservoir, Environmental surface
Burkholderia cepacia comlex	Person-to-person >Environmental surface
Stenotrophomonas maitophilia	Environmental surface, Environmental reservoir > person-to-person
Achromobacter xylosoxidans	Environmental surface > person-to-person
Non-tuberculous Mycobacterium	Environmental reservoir > > person-to-person
Aspergillus species	Environmental reservoir > > person-to-person + airborne

O'Malley, Respir Care 2009 May;54(5):641-657

CFF guideline for nebulizers

- Cleaning nebulizer parts with dish detergent and water.
- Disinfect with one of the following options, if permitted by the manufacturer.
- Air-dry completely.

* O'Malley, Respir Care 2009 May;54(5):641-657

* Saiman at el, Infect Control Hosp Epidemiol. 2014 Aug;35 Suppl 1:S1-67

Aim

- To determine if the respiratory devices can be contaminated following use.

- To determine if the cleaning guidelines for nebulizers are effective for respiratory devices.

Method

- The patient brought his/her respiratory device to the clinic, following use without cleaning.
- Just the devices that can be taken apart.
- Since March 2015 and ongoing.

Method

- Swab (10 ml SRK swab, Copan Italy) before cleaning.
- Cleaning: The parts of the device were soaked in hot water (not boiling) + standard dish detergent, for 10 min
- Left to dry.
- Swab again from the same places.
- Sent to the laboratory.

* Saiman, Clin Microbiol Rev 2004 Jan;17(1):57-71

Laboratory

- Swabs were transferred to the microbiology laboratory within 2 hours.
- 100 µl aliquots were spread on Brain Heart Infusion agar plates and were incubated for 48h at 37°C with 5% CO_2.
- Total count CFU (colony forming units) was determined from the plates and predominant colonies were identified using MALDI-TOF MS technology (Vitek-MS, Biomerioux, France).

Method

- Questionnaire:
  - How often do you use your device?
    - Once a day / several times a week / once a week / once in two week / once a month / not at all
  - How often do you clean your device?
    - Once a day / several times a week / once a week / once in two week / once a month / not at all
  - How do you clean the device?
  - Which cleaning agent do you use?

Results

patient	Samples	Age Av.	PI	FEV1 Av.
18	20	16.64 (0.6-50)	13	63.47 (32-97%)

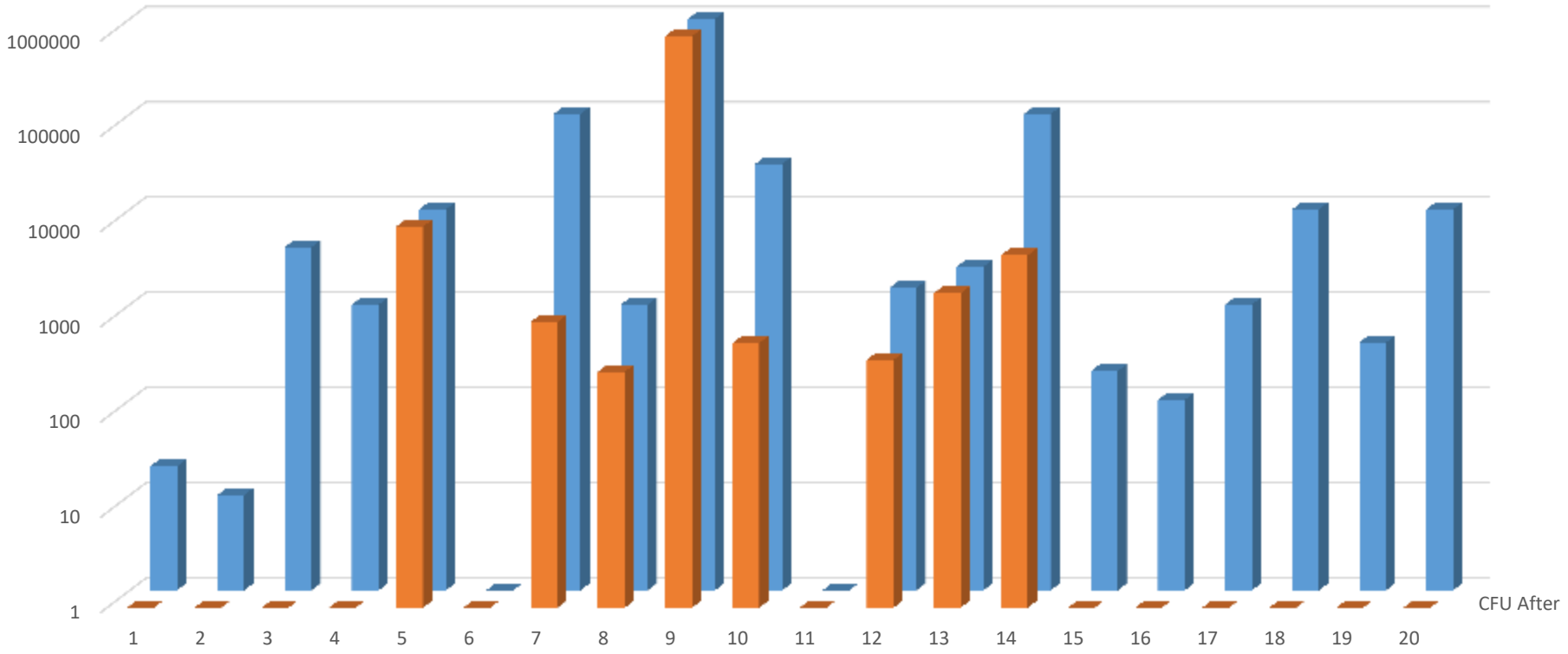
Devices	
IPV	11
Ressistex	3
Flutter	2
Aerobika	2
Pipep	1
Acapella choice	1

Results

Devices use	
Daily	11
Several times a week	6
Once in 2 weeks	2
Once a year	1

Devices cleaning	
Daily	8
Several times a week	2
Once a week	5
Once a month	2
Never	3

Results



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Results

- In 10 samples - cleaning completely eradicate all CFU.
- In 2 samples - no CFU before and after cleaning.
- In 6 samples - cleaning was partially effective.
- In 2 samples - cleaning was ineffective.

CFU before Av.	CFU after Av.	Paired T-test
63,586.5	50,965	0.036186

Results

Bacterial Colonies

Before cleaning	After cleaning	Sputum culture
Staphylococcus pasteuri	ללא שינוי בכמות/ממצאים	Candida
Pseudomonas stuzeri, Staph warneri, Corynebacterium sp.	ללא שינוי באורגניזם ירידה של פי 100 בכמות המושבות	Candida, Achromobacter xyloso., staph aur.
Corynebacterium sp	ללא שינוי בכמות/ממצאים	Candida, Pseudomonas aer.
Moraxella sp	ללא צמיחה כלל	Candida, Aspergillus niger.
סטרפטוקוקים	ללא צמיחה כלל	Candida, Serratia marc.

Limitations

- Small sample.
- Cleaning and usage extent were reported by patients.
- The interval from the last cleaning was not determined.
- Environmental swabs do not enable diagnosis of specific bacteria.

Conclusions

- Respiratory devices are contaminated following use.
- Appropriate cleaning reduces contamination.
- It is known that patients can be infected by contact with environmental surfaces (e.g pseudomonas, Burkhlderia).
- It is plausible that patients can be cross infected from the devices.

Conclusion

- The respiratory devices have to be cleaned after each use.
- There is a need for infection control guidelines of the growing list of respiratory devices.
- Recommendation - periodically refresh the device cleaning process.

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