Aktuelles zur Atemphysiotherapie bei CF

16.4.2023

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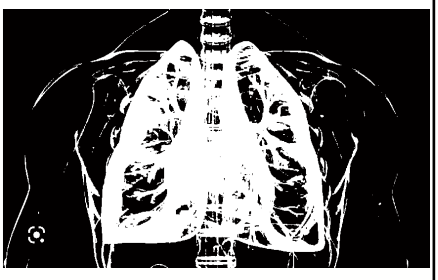
Überblick

- Atemphysiotherapie
  - Therapiekonzepte
  - Inhalation + Sputum Induktion
- Neue relevante Studienergebnisse
- Der ambulante Besuch
  - Häufigkeit
  - Vorbereitung
  - To do‘s/Worauf soll man achten
- Life Hacks



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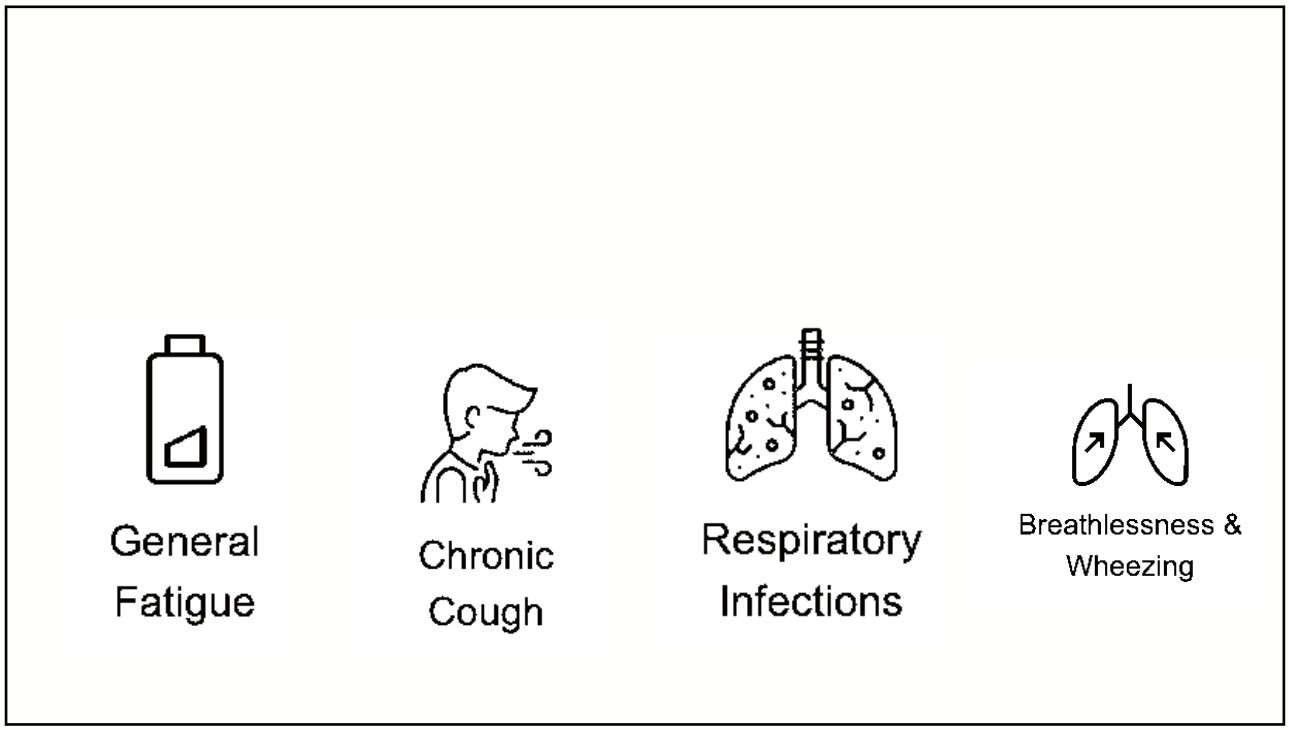

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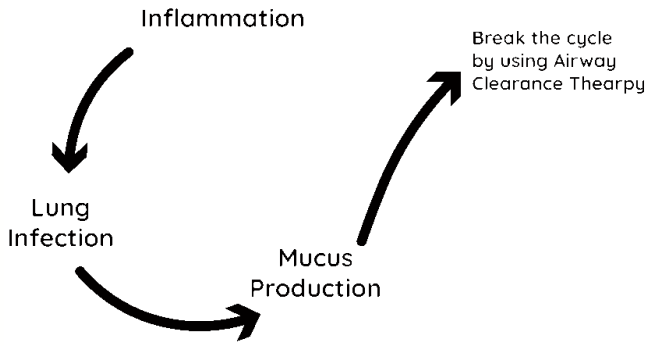
Warum Atemphysiotherapie bei CF?



- Entzündungsprozesse
- Infektionen der Lunge
- Sekretproduktion

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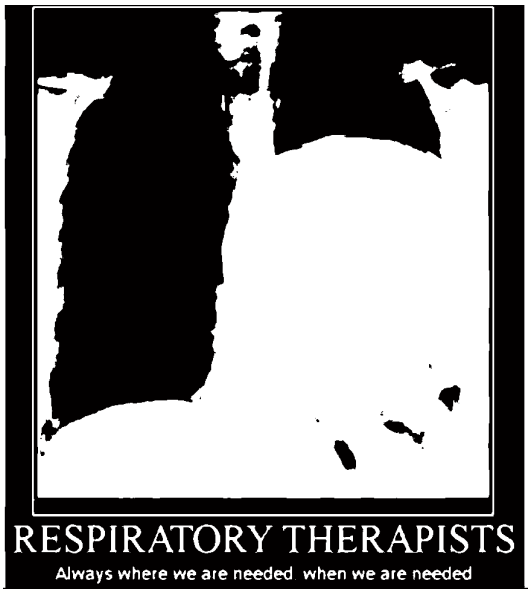
Hallo Leute!



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Physiotherapie bei CF
Anwendungen

- Reinigung der Luftwege
- Inhalationstherapie
- Bewegung und Sport
- Thoraxmobilisation

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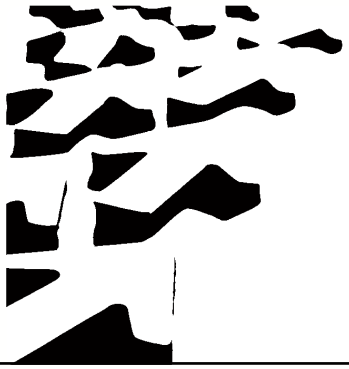
Physiotherapie bei CF - Ziele

- Gleichmäßige Ventilation der Lunge
- Verbesserung der mukozilliären Reinigung
- Optimierung des Hustens
- Sekret-Entfernung
- Atemmuskeltraining
- Verbesserung der Inhalationstechnik
- Ausdauerleistung steigern
- Steigerung der Lebensqualität



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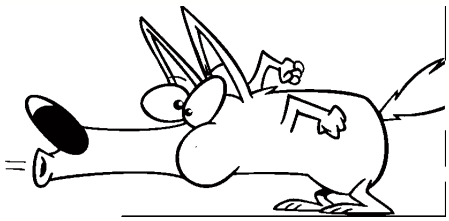
Atemphysiotherapie
Wie wird das Sekret transportiert?

- Mukozilliäre Reinigung
- Gas-Liquid-Pumping
- Forcierte Exspiration



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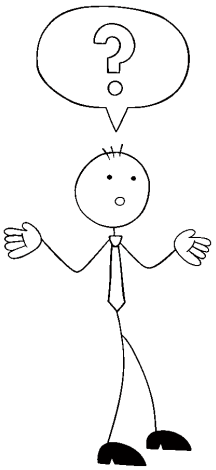

Sekrettransport Schwierigkeiten

Instabile Bronchien

Vorzeitiges Kollabieren der Bronchien bei forcierter Exspiration

Atelektasen (keine Luft hinter dem Sekret)

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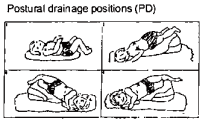
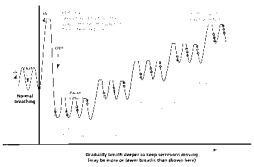
Techniken zur Reinigung der Atemwege

- Lagerungsdrainage & Perkussion/Vibration
- Forcierte Exspiration (FET) /Huffing
- PEP-Therapie (High-Pressure/Low-Pressure; Baby-PEP)
- Autogene Drainage (AD)/Assistierte AD
- Active Cycle of Breathing Techniques
- Oszillierende PEP-Therapie
- HFCWO (Vibrating Vest)





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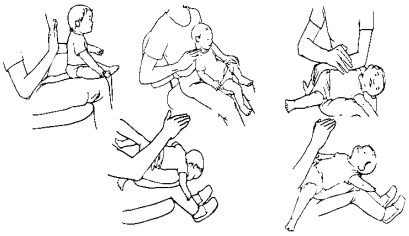
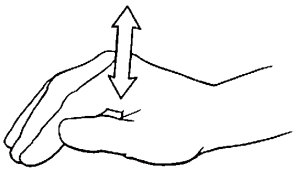
Lagerungsdrainage + Perkussion/Vibration

- Therapie der Wahl in den 80ern
- Umverteilung der Luft und damit Sekrettransport durch Lagerung in unterschiedlichen Positionen
- Kombiniert mit Perkussion und Vibration



http://www.pedilungdocs.com/education/cpt_infant.pdf



Blue booklet IPG/CF 2018

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- Forcierte Exspirationen
- Lungenvolumen je nach Sekretlokalisation
- Kein Husten damit der peribronchialen Druck möglichst gering gehalten wird

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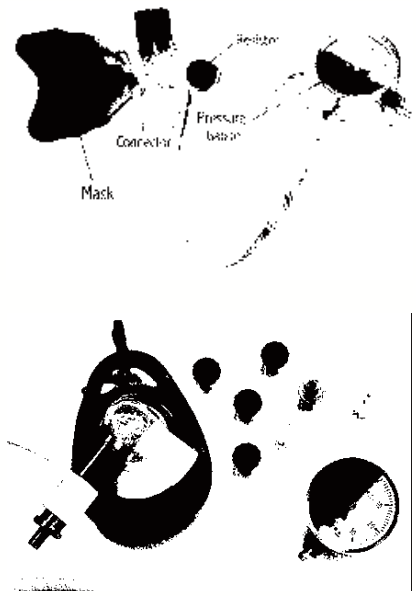

Positive Expiratory Pressure (PEP)

- Schienung der Atemwege durch Staudruck
- Luftfluss in den kleinen Atemwegen ↑
- Ventilation wird homogenisiert
- Überblähung wird (kurzfristig!) reduziert
- Atemmuskeltraining

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Baby-PEP

Prinzip:

- Ventilationshomogenisierung durch Volumssteigerung
- Sekrettransport über manuell assistierte forcierte Exspiration

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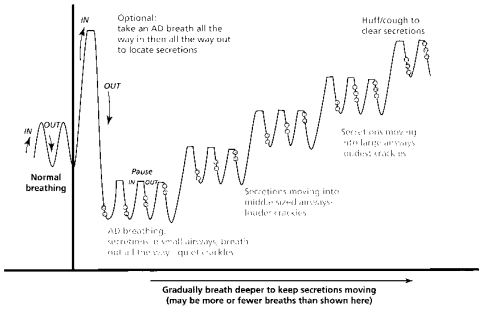
Autogene Drainage

- Modulation von Flussraten und dem Level des AZV
- Verschieben des des Tidal-Volumens in das exspiratorische Reservevolumen
- Dosieren der exspiratorischen Kraft um:
  - Luftwegswiderstand gering halten
  - vorzeitige Luftwegskompression verhindern
- Husten vermeiden



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Assistierte Autogene Drainage

- Manuelles Verschieben des Tidal-Volumens in das exspiratorische Reservevolumen
- Keine plötzlichen Druckänderungen am Thorax – verursacht Widerstand des Patienten

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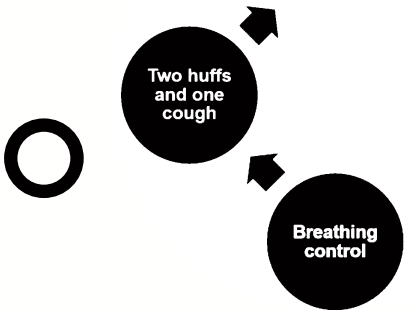
Active Cycle of Breathing Techniques

Kontrolliertes Atmen (Breathing Control)

Dehnung des Brustkorbes – Dehnung der Lunge (Thoracic Expansion Exercises)

Forcierte Ausatemtechnik (Forced Expiration Technique)



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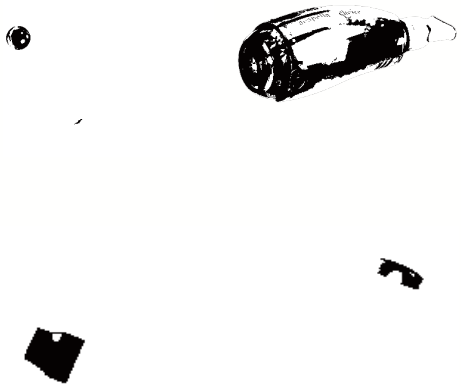
Oszillierender PEP



Endobronchiale Oszillation kombiniert mit PEP

- Veränderung der rheologischen Eigenschaften des Sekrets
- PEP Effekt

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Oszillierende PEP-Therapie Unterschiede zu PEP

Oszillation

Niedrigere Drucke (Atemmuskeltraining!)

Keine Druckkontrolle

Patientenanpassung nur nach Gefühl

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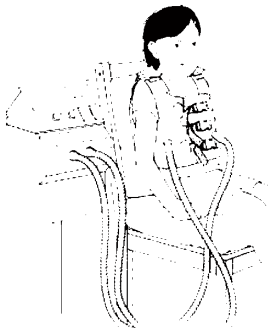
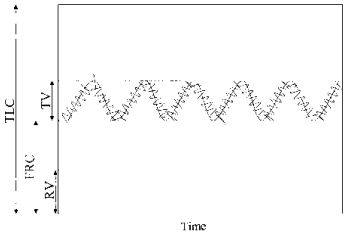
High Frequency Chest Wall Oscillation (HFCWO)

Verbessert die mukozilliäre Reinigung:

- Veränderung der rheologischen Eigenschaften des Sekrets
- Durch gesteigerten exspiratorischen Fluss wird das Sekret transportiert





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Airway Clearance Technique Which one is best?

Airway clearance is recommended to be performed on a regular basis in all patients with CF

There is no ACT recommended to be superior to others

Health Quality Ontario. Ont Health Tech Ass Ser 2009

Lannefors et al. Eur Resp J 1992

McIlwaine et al. Pediatr Pulmonol 2010

Miller et al. Thorax 1995

Pisi et al. Acta Biomed 2009

ain. Paed Resp Rev 201

Newton. Resp Care 2009

Mckoy et al. Coch Dat Rev 2016

McIlwaine et al. J Ped 2001

Morrison et al. Coch Dat R 2014

App et al. Chest 1998

Lester et al. Resp Care 2009

Flume et a Resp Care 2009

Elkins et al. Coch Dat Rev 2004

McIlwaine et al. Coch Dat Rev 2015

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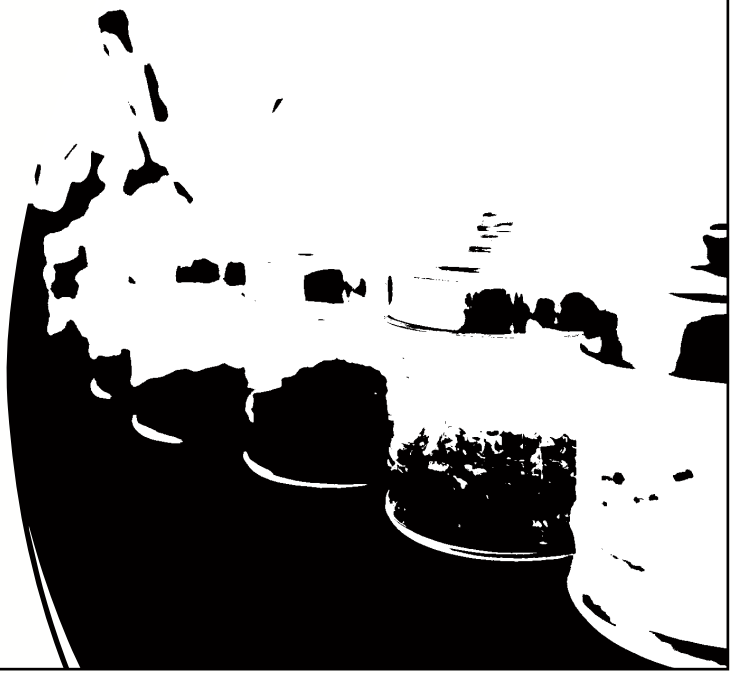
Reihenfolge bei der APT

- Bronchien erweitern - Inhalation
- Sekret transportfähig machen - Inhalation
- Sekret entfernen
- Antibiotikum inhalieren

Nicht direkt nach dem Essen



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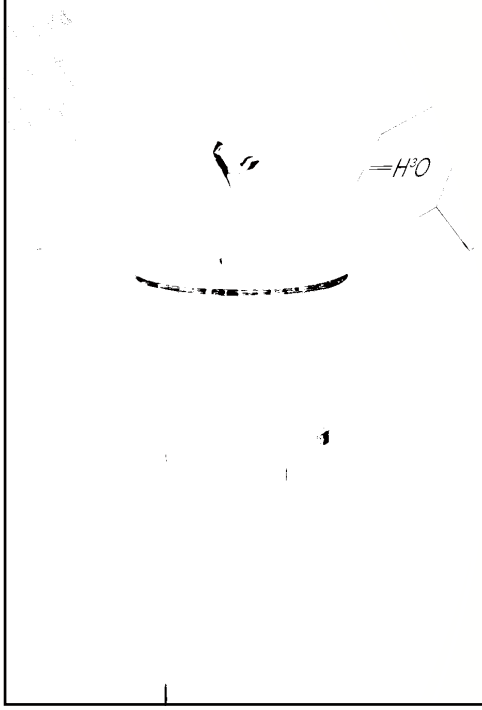

Inhalation - Substanzen

- Bronchienerweiternde Inhalation
- **Hydratoren**
- Mucolytika
- Antibiotika

- Steroide

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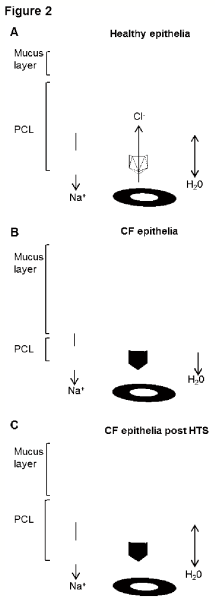
Hydratoren - Wirkung



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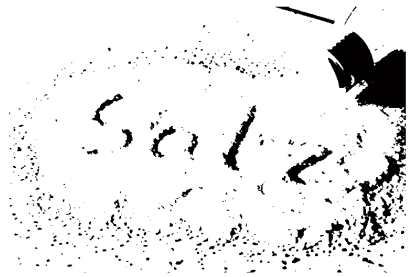

Was sind Hydratoren?

- Osmotisch wirksame Substanzen
- Flüssigkeit aus der Zelle auf die Zelloberfläche

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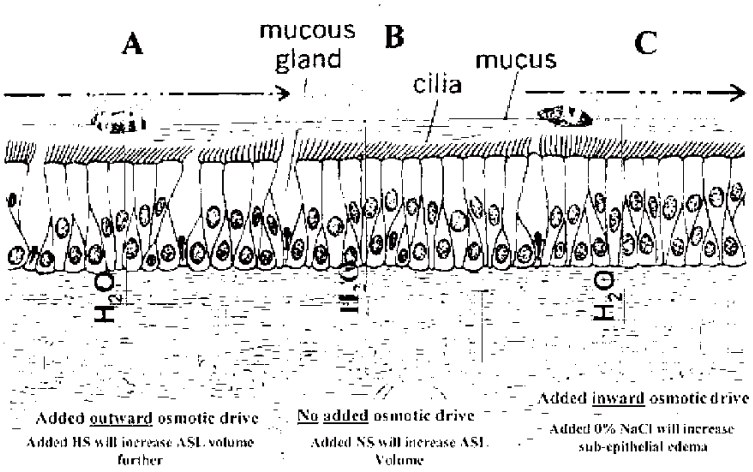
Was passiert bei der Inhalation von NaCl



Mandelberg & Amirav Pediatr Pulmonol 2010;45:36-40

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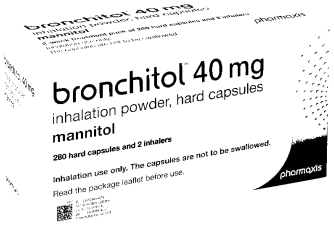
Hydratoren

- MucoClear 3%,6% → 4ml
- Nebusal 7% → 4ml
- Hyaneb 7% → 5ml
- Bronchitol → 10 Hartkapseln



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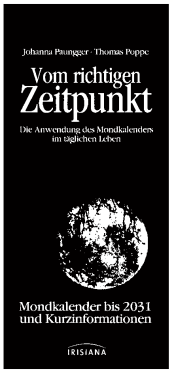
Hydrator - Timing

Bronchodilatator

Hydrator: vor oder während Atemtherapie

Agent, Parrott. Breathe 2015



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The CF-Sputum Induction Trial (CF-SpIT) to assess lower airway bacterial sampling in young children with cystic fibrosis: a prospective internally controlled interventional trial

Medical University of Graz

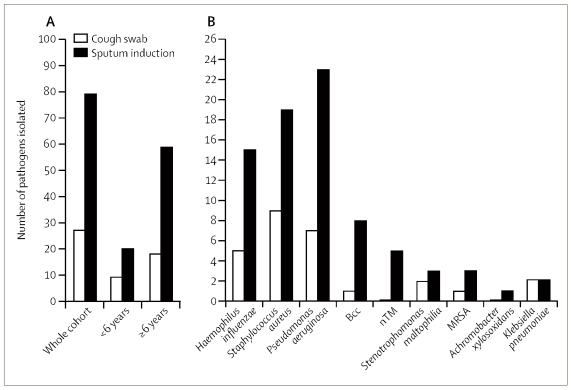

Figure 2: **Pathogen yields from concurrent cough swab and sputum induction in 167 paired samples**
(A) Total pathogen yield in the whole cohort (n=167) and in subgroups of children younger than 6 years (n=62) and those aged 6 years or older (n=105). (B) Specific pathogen yields in the whole cohort (n=167). Bcc=*Burkholderia cepacia* complex. MRSA=meticillin-resistant *Staphylococcus aureus*. nTM=non-tuberculous Mycobacteria.

Ronchetti et al. Lancet Respir Med 2018

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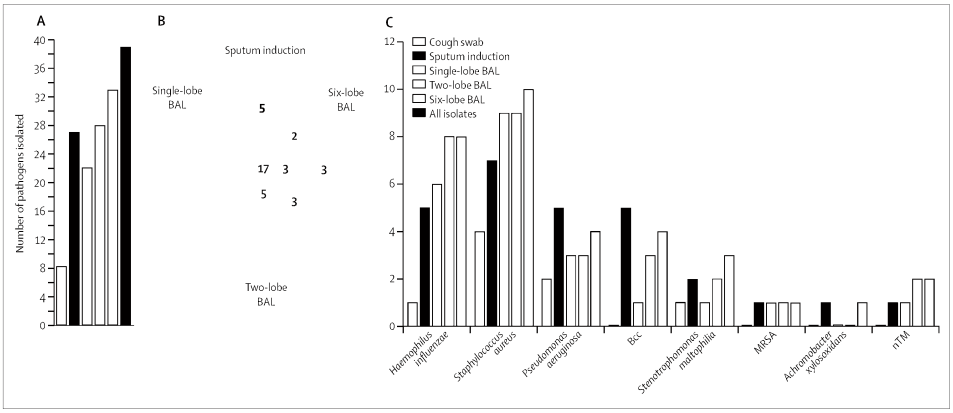

Figure 3: **Pathogen yield for concurrent cough swab, sputum induction, and single-lobe, two-lobe, and six-lobe BAL in 41 matched samples**
(A) Total pathogen yield from each technique. (B) Numbers of unique and overlapping pathogen isolates for the different techniques. (C) Specific pathogen yield. BAL=bronchoalveolar lavage. Bcc=*Burkholderia cepacia* complex. MRSA=meticillin-resistant *Staphylococcus aureus*. nTM=non-tuberculous *Mycobacteria*.

Ronchetti et al. Lancet Respir Med 2018

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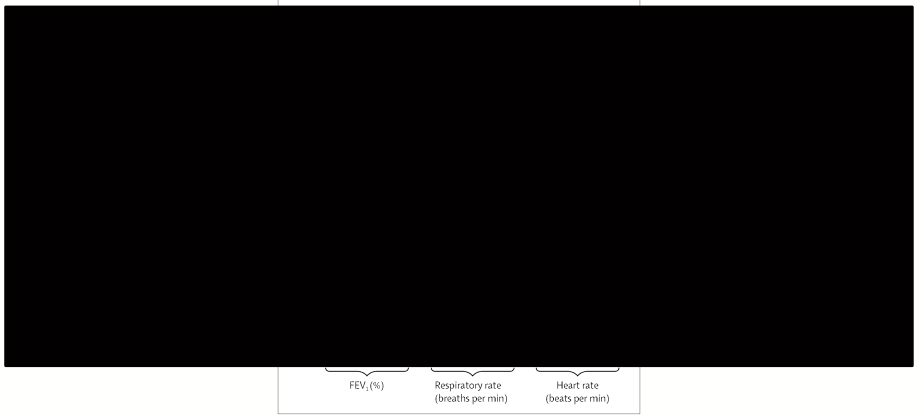

Figure 5: **Objective assessment of tolerance to the sputum-induction procedure in 200 attempted procedures**
Before and after procedure measurements of FEV_1 (where applicable), respiratory rate, and heart rate.

Ronchetti et al. Lancet Respir Med 2018

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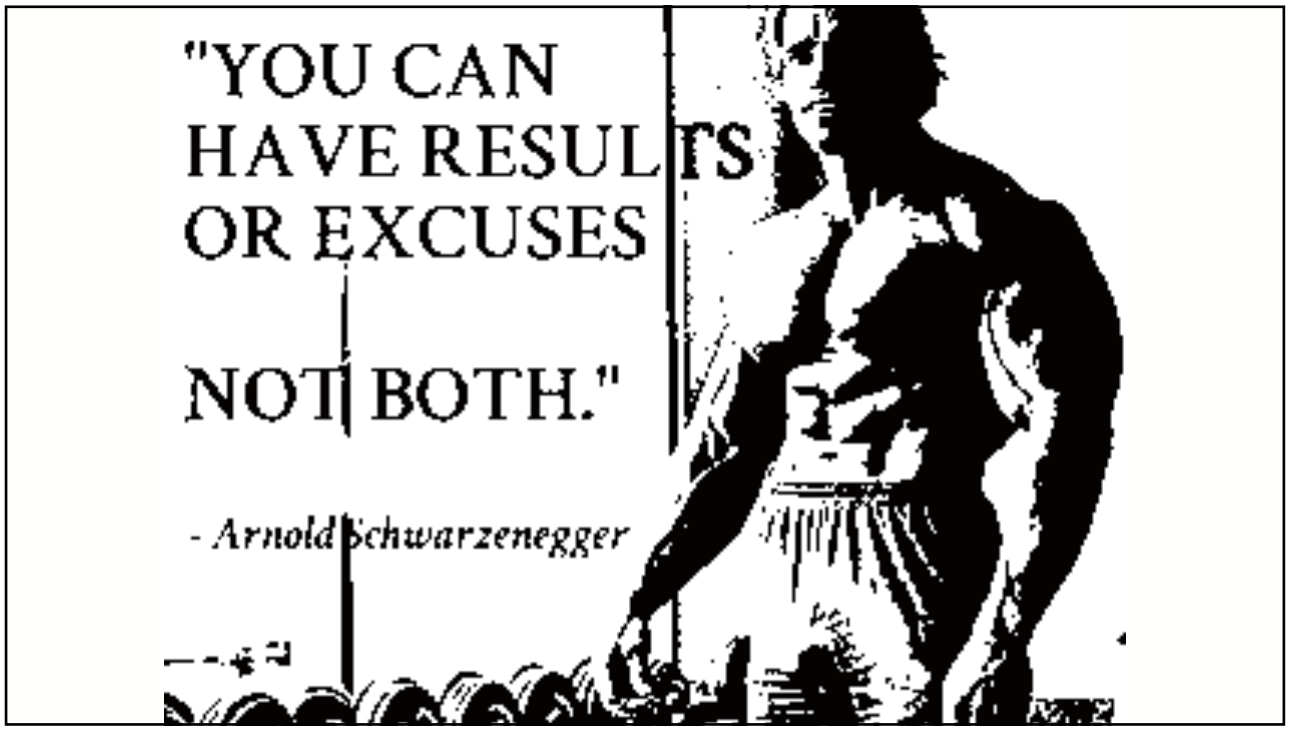

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Aktuelle Studienlage zu HTS Inhalation & Co

- Treatment preference... 2022
- Simplify 2022
- PRESIS – Preventive inhalation of HTS in Infants with CF 2019
- SHIP 2019
- SHIP-CT 2022

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TABLE 4] Willingness to Accept a Reduction in $ppFEV_1$ or Additional Life Expectancy Against Other Treatment Outcomes

Attribute	Acceptable Reduction in $ppFEV_1$ (95% CI)	Acceptable Reduction in Additional Life Expectancy[a] (95% CI)
Excellent improvement (+20%) in QoL	8.2 (5.8-10.7)	4.2 (3.1-5.4)
Able to fully stop physiotherapy	6.1 (3.6-8.7)	3.2 (1.8-4.5)
Abdominal symptoms improved and enzymes reduced	5.3 (3.3-7.3)	2.7 (1.6-3.8)
A large reduction in time spent (−50%) on inhaled medicines	4.4 (2.6-6.3)	2.3 (1.3-3.3)
Abdominal symptoms improved	4.2 (1.7-6.8)	2.2 (0.8-3.5)
Good improvement (+10%) in QoL	3.5 (1.2-5.8)	1.8 (0.7-2.9)
Time spent on physiotherapy is halved	2.7 (1.2-4.3)	1.4 (0.6-2.2)
IV days halved	2.4 (0.7-4.1)	1.2 (0.3-2.2)
Per-year increase in life expectancy	1.9 (1.5-2.4)	…
A modest reduction in time spent (−25%) on inhaled medicines	1.9 (0.0-3.8)	1.0 (0.0-2.0)
Per 1% increase in predicted FEV_1	…	0.5 (0.4-0.6)

$ppFEV_1$ = FEV_1 % predicted; QoL = quality of life.
[a]Additional life expectancy should be interpreted as the additional life expectancy conferred by the hypothetical treatments presented in the discrete choice experiment, beyond existing life expectancy.

Cameron et al. Chest 2022

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Study Question: What treatment outcomes matter to people with cystic fibrosis, and what trade-offs would they make to realize these outcomes?

Results: Improving life expectancy was found to be the most important outcome in this study, but people with cystic fibrosis were prepared to accept substantial reductions in this outcome, and in lung function to reduce their treatment burden.

Interpretation: Awareness of the priorities of people with cystic fibrosis with regards to their treatment outcomes may improve decision making both at the policy and at the clinic levels.

Cameron et al. Chest 2022

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SIMPLIFY

Evaluating the impact of stopping chronic therapies after Modulator Drug Therapy in CF

SIMPLIFY is a master protocol poised to test the impact of discontinuing versus continuing two commonly used chronic therapies in people with CF who are at least 12 and older and stable on ETI therapy.

The protocol is comprised of two concurrent randomized, controlled trials designed to evaluate the independent short-term effects of discontinuing hypertonic saline or dornase alfa, enabling individuals on both therapies to participate in one or both trials.

The primary objective for each trial is to determine whether discontinuing treatment is *non-inferior* to continuing treatment after establishment of ETI, as measured by the 6-week absolute change in forced expiratory volume in one second (FEV1) % predicted.

Mayer-Hamblett et al. Ann Am Thorac Soc 2021

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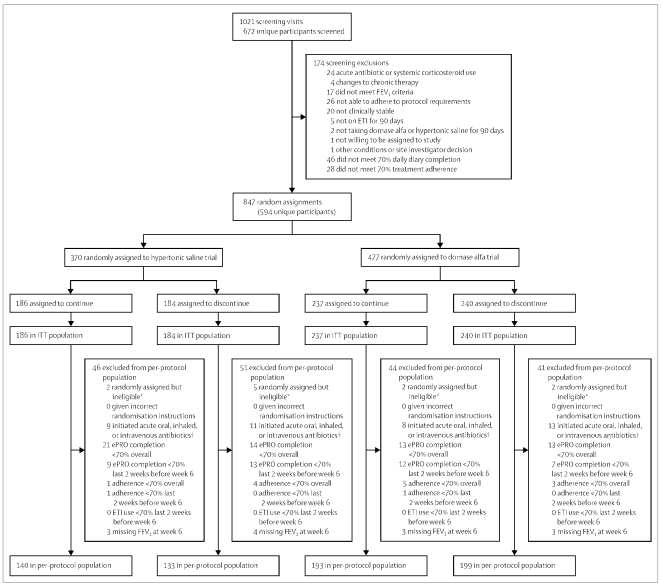
SIMPLIFY

Discontinuation versus continuation of hypertonic saline or dornase alfa in modulator treated people with cystic fibrosis: results from two parallel, multicentre, open-label, randomised, controlled, non-inferiority trials

- Mayer-Hamblett et al. Lancet Respir Med 2022



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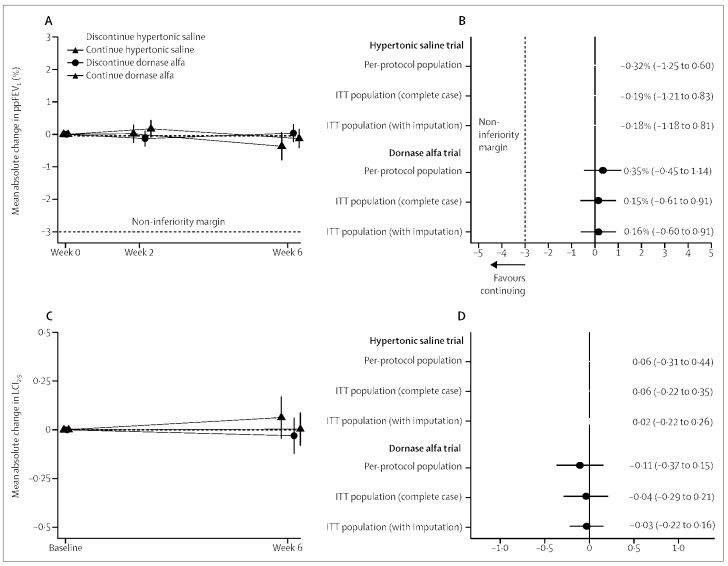

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SIMPLIFY

Discontinuation versus continuation of hypertonic saline or dornase alfa in modulator treated people with cystic fibrosis:

results from two parallel, multicentre, open-label, randomised, controlled, non-inferiority trials

- In summary, the results of SIMPLIFY indicate that, among a study population of adolescents and adults with cystic fibrosis who have and are , clinically meaningful reduction in pulmonary function did not occur with of daily use of inhaled medications that work on downstream manifestations of CFTR dysfunction in the airway, specifically . Clinicians and people with cystic fibrosis should work together to make with available evidence from SIMPLIFY and forthcoming studies regarding the continuance of chronic hypertonic saline or dornase alfa in the setting of ETI use. It is reasonable to hypothesise that people with cystic fibrosis on potent modulator drug therapy

  . A substudy measuring changes in mucociliary clearance through nuclear medicine imaging was done in SIMPLIFY and will be published separately. …

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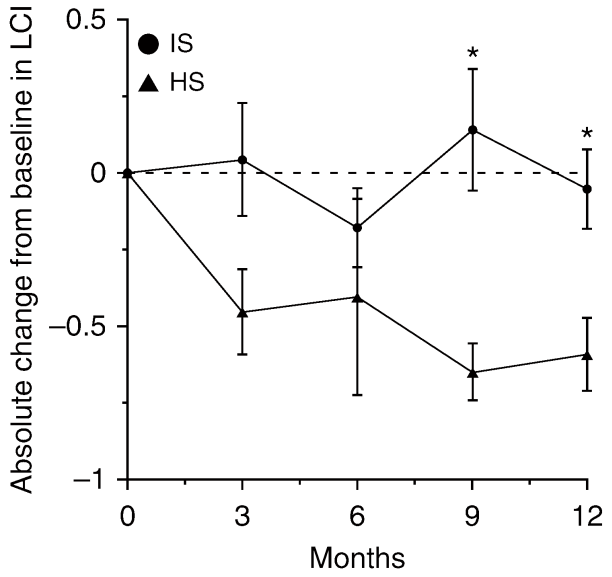
PRESIS

Preventive Inhalation of Hypertonic Saline in Infants with Cystic Fibrosis
A randomized, Double-Blind, Controlled Study

- 42 infants with CF <4 months of age randomized across five sites to twice-daily inhalation of 6% HS (n = 21) or 0.9% IS (n = 21)
- for 52 weeks



Stahl et al. Am J Respir Crit Care Med 2019

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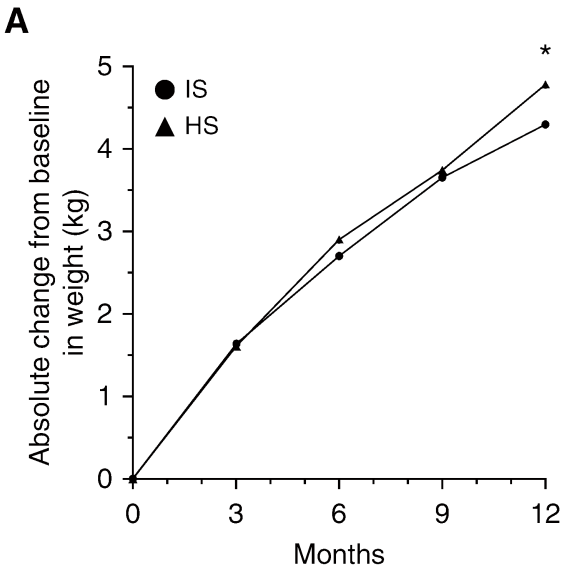

Stahl et al. Am J Respir Crit Care Med 2019

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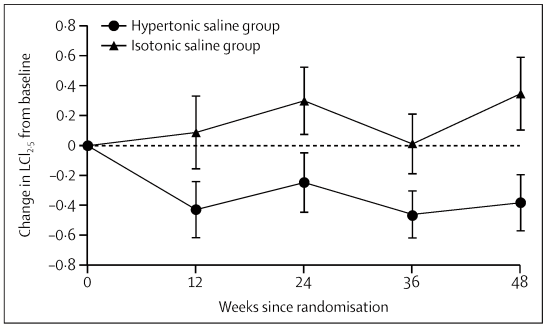

	Mean $LCI_{2.5}$—hypertonic saline group (95% CI)	Mean $LCI_{2.5}$—isotonic saline group (95% CI)	Treatment difference (95% CI)	p value
Change from baseline to week 12	−0·43 (−0·85 to −0·01)	0·09 (−0·32 to 0·51)	−0·40 (−0·86 to 0·06)	0·08
Change from baseline to week 24	−0·25 (−0·65 to 0·16)	0·30 (−0·16 to 0·76)	−0·62 (−1·14 to −0·10)	0·014
Change from baseline to week 36	−0·46 (−0·79 to −0·14)	0·01 (−0·40 to 0·43)	−0·40 (−0·84 to 0·03)	0·06
Change from baseline to week 48*	−0·38 (−0·77 to 0·001)	0·35 (−0·15 to 0·85)	−0·63 (−1·10 to −0·15)	0·010

Mean $LCI_{2.5}$ and treatment effect estimates are from linear regression models that included observed and imputed values and that were adjusted for baseline $LCI_{2.5}$, height, sex, and age. When data for baseline $LCI_{2.5}$ were missing, data for participants' $LCI_{2.5}$ at screening used instead. $LCI_{2.5}$=lung clearance index. *Primary endpoint visit.

Table 2: **Change from baseline in mean $LCI_{2.5}$**

SHIP

Inhaled hypertonic saline in preschool children with cystic fibrosis:
a multicentre, randomised, double-blind, placebo-controlled trial

150 CF children
36-72 months of age randomized across 25 sites to twice-daily inhalation of 7% HS (n = 76) or 0.9% IS (n = 74)

for 48 weeks

Ratjen et al. Lancet Respir Med 2019

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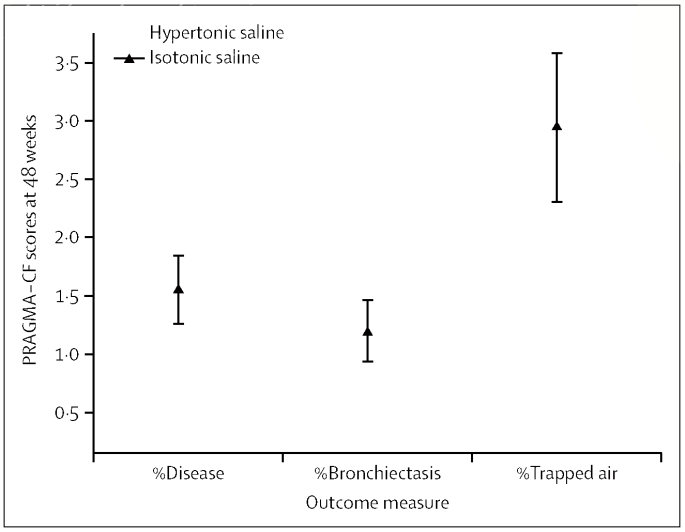
SHIP-CT

The effect of inhaled hypertonic saline on lung structure in children aged 3-6 years with cystic fibrosis: a multicentre, randomised, double-blind, controlled trial

- 116 CF children
3-6 years of age randomized across 23 sites to twice-daily inhalation of 7% HS (n = 56) or 0.9% IS (n = 60)
- for 48 weeks



Tiddens et al. Lancet Respir Med 2022

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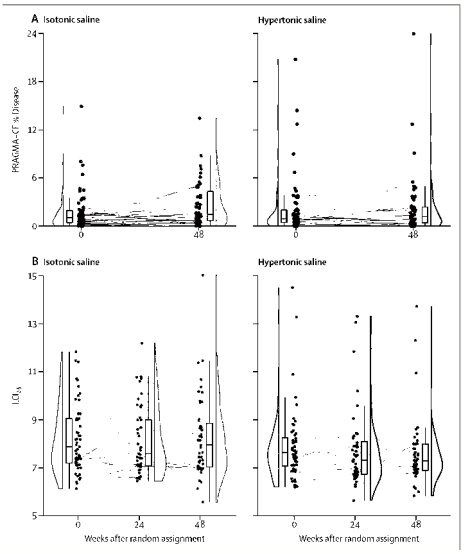
SHIP-CT

The effect of inhaled hypertonic saline on lung structure in children aged 3-6 years with cystic fibrosis: a multicentre, randomised, double-blind, controlled trial

> Interpretation Inhaled hypertonic saline for 48 weeks had a positive effect on structural lung changes in children aged 3–6 years with cystic fibrosis relative to isotonic saline. This is the first demonstration of an intervention that alters structural lung disease in children aged 3–6 years with cystic fibrosis.



Tiddens et al. Lancet Respir Med 2022

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- Inhaliertes hypertones Kochsalz für alle *jungen* Kinder
- besonders jene ohne Zugang zu CFTR Modulatoren

↓ der Entwicklung einer strukturellen Lungenerkrankung

Verzögerung oder Prävention struktureller Veränderungen in der Lunge

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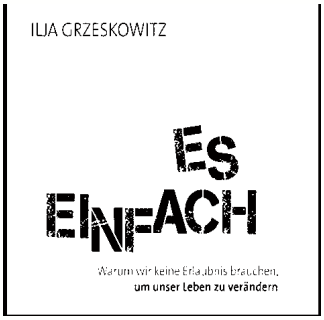

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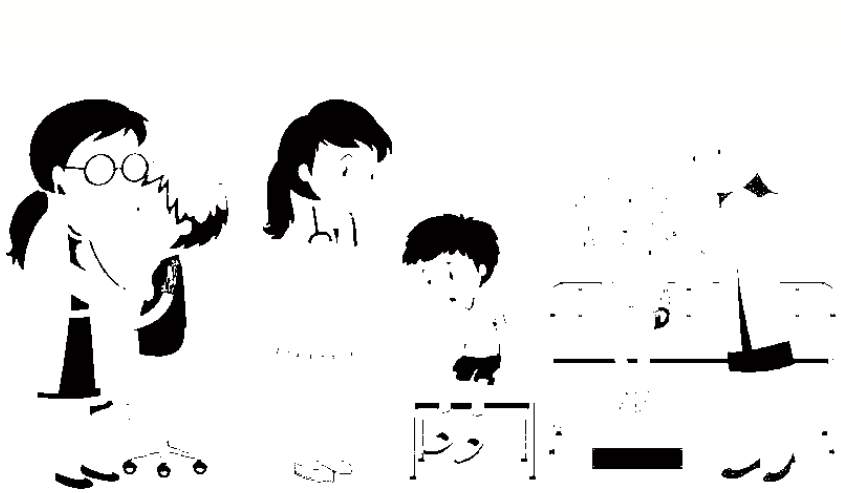

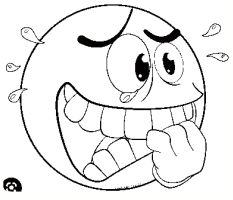

Der ambulante Besuch

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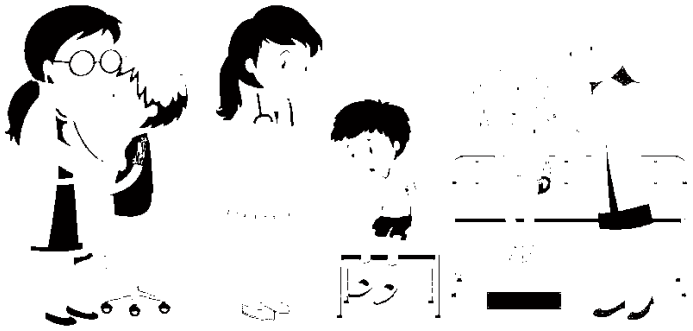
Der ambulante Besuch Häufigkeit

- 0-1 Jahr: alle (2) 4 Wochen
- Danach alle 6 Wochen zur Sputumentnahme
- Bei chron. Ps.aerug. Infektion: alle 3 Monate



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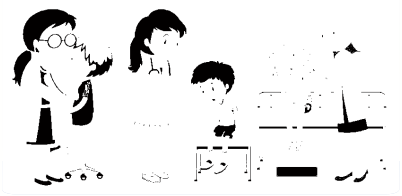
Vorbereitung auf einen Ambulanzbesuch

- Fragen?
- Brauche ich eine Verordnung?
- Keine Therapie (HTS Inhalation + PEP –Therapie) am Morgen der Kontrolle
- Keine Antibiotikum Inhalation
  - → Am Abend vor der Kontrolle
  - → Am Morgen der Kontrolle
- Therapiegerät mitnehmen!



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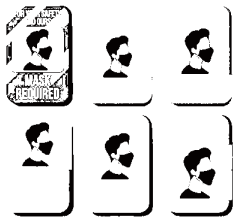
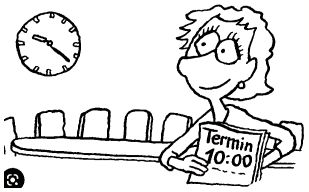
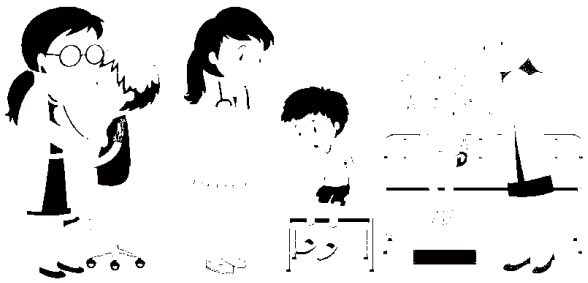
Der ambulante Besuch
Good to know







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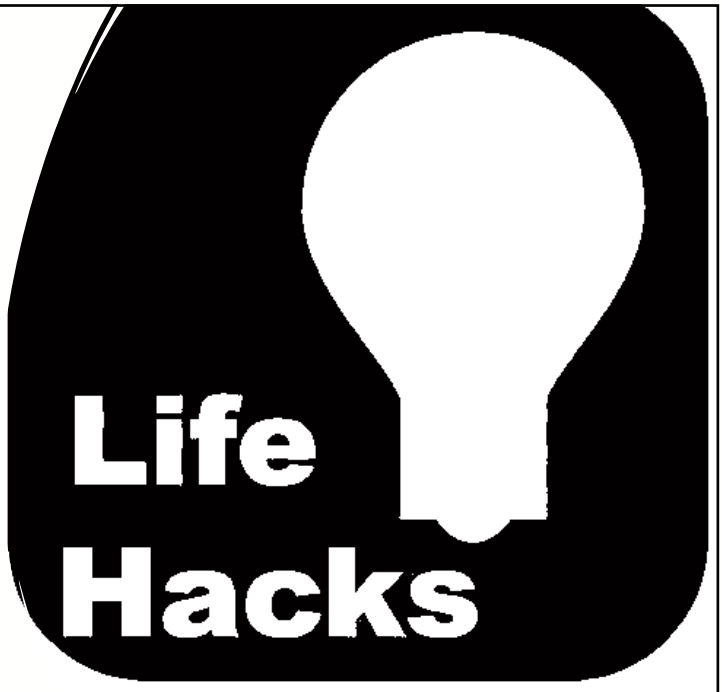

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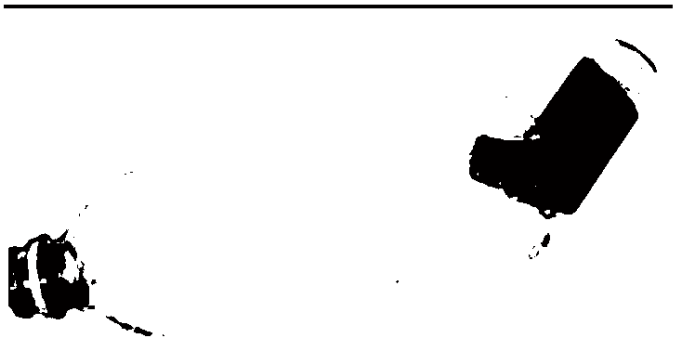

Don't have a spacer? Make one!
This is an empty plastic bottle

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- Mind setting – Therapie als Chance und nicht als Bürde!
- Positive Einstellung der gesamten Familie ist wichtig!
- Einstellung gegenüber der Therapie von Beginn an!
- Darf ich mit den Therapiesachen spielen?
- Bücher in denen Kinder auch therapieren müssen
- Wie gehe ich mit Widerstand um?
- Viele Eltern sind KH Neulinge → wie man das KH kennen lernen kann
- Fixe Termine mit den einzelnen Berufsgruppen
- Positives Erlebnis im KH schaffen

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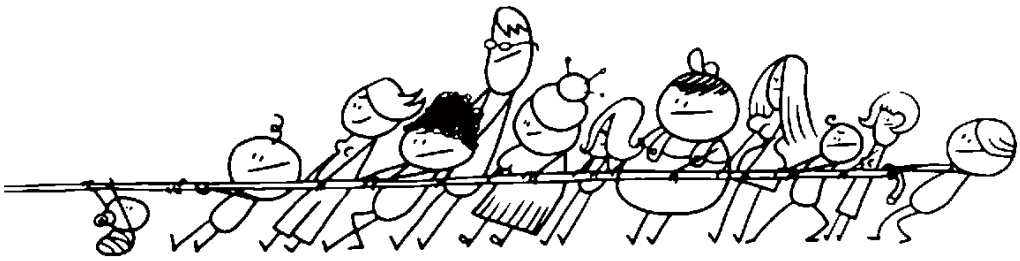

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