

Set up of a CPAP centre

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**European Respiratory Society
Fellowship**

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Introduction

AIMS

- How to make the change for the better?
- The natural growth of a pediatric home ventilation center
- What were the critical practice changing time points?

Question 1

Is there a pediatric NIV center at your hospital?

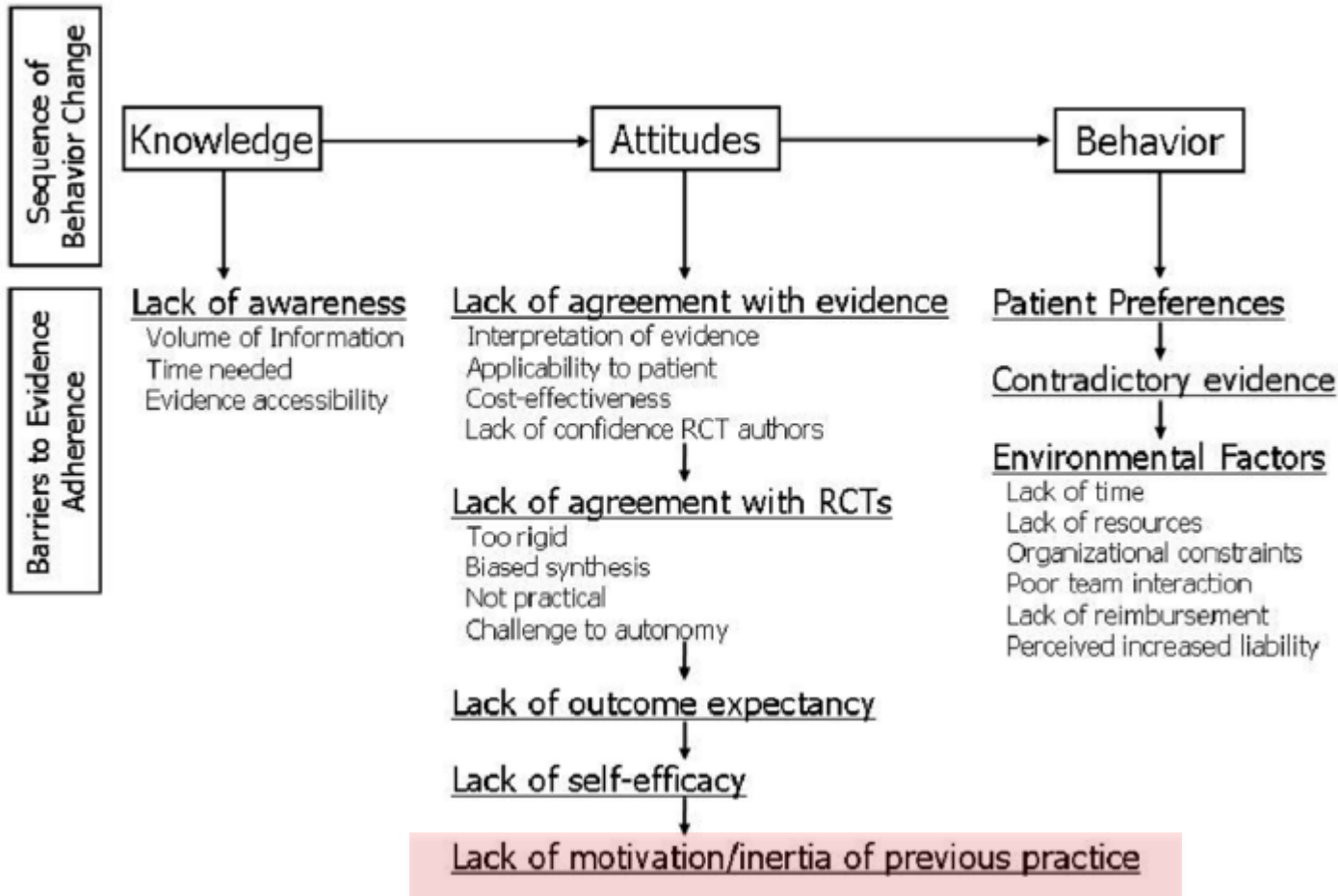
- 1. Yes, pediatric NIV center present**
- 2. NIV is delivered, but no pediatric NIV center present**
- 3. Pediatric NIV not available**

Question 2

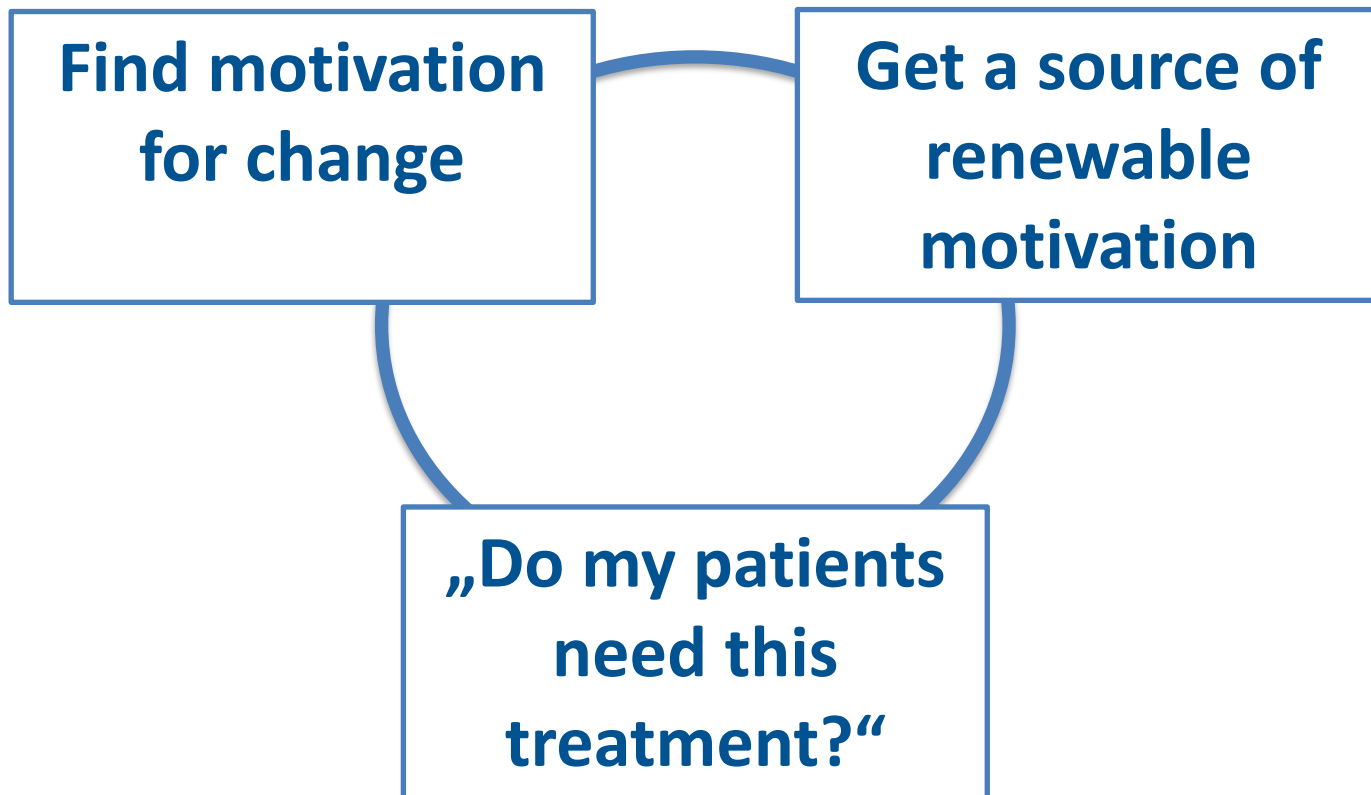
What holds you back THE MOST from making a new / a significantly better NIV program at your hospital?

- 1. Respiratory staff inadequately trained**
- 2. Physicians lack knowledge**
- 3. Equipment not appropriate**
- 4. Poor previous experience**
- 5. Technical complexity**
- 6. Lack of support from the hospital (autorisation + support)**

Why evidence doesn't become practice?



Motivation



Reasons for not using NIV



Maheshwari V et al. Chest. 2006 May;129(5):1226-33

How to start?

How to Initiate a Noninvasive Ventilation Program: Bringing the Evidence to the Bedside

Dean R Hess

Respiratory Care February 2009, 54 (2) 232-245;

"Clinical champion"	An early adopter, regular and enthusiastic user of NIV – YOU.
Training	Training is key to successful NIV, should be theoretical and hands-on.
Adequate personnel	Successful NIV program needs appropriate resources.
Equipment	Unsuitable equipment is a barrier to successful NIV, make the right choices.
Guidelines and Protocols	Standards lead to improvement, uniformity of care, reduction of errors .
Realistic expectations	NIV does have effectiveness limits.
Experience	Only practice will lead to the needed experience.

How we did it?

History

Invasive home ventilation in children

1976 ICU Clinic for infectious diseases

1990 ICU Department of Pediatric surgery and intensive care

Non-invasive home ventilation in children

1994 University children's hospital Ljubljana (UCHL)
(collaboration with a Rehabilitation center and a
Chronic care center)

At the beginning

Ordinary ward

Clinical champion

- Motivated physician with ICU background

Advantages

- Good out-of-hospital support (provider, rehabilitation center, chronic care center, reimbursement policy)
- Parent's/patient's support

Obstacles

- Reluctant staff – fear of new, apparent technical complexity

After the first 10 years

About 20 patients

NMD, chest, spinal cord injury

Settings

- no change, PG at neurology department
- good regular ward care, „HDU“ – staff’s approach shift

Good interactions with the chronic care center, the provider and the reimbursement authorities

ICU interactions challenging

Question 3

What would you do to FOSTER COLLABORATION at this point?

- 1. Get visibility and promote your work**
- 2. Invite speakers from the ICU to dedicated events**
- 3. Rationalise the use of common resources**
- 4. Encourage open attitudes and restrain from any exclusivity**
- 5. Keep having „the open door policy“**
- 6. Have a positive attitude to rejection**

Time for change

Planning for a new hospital –

an opportunity for an improvement of NIV program

- Anticipate / designing appropriate settings
- Resources (limited) for education and equipment

Essentials

- **Motivated people**
- NIV education (leader → staff)
- Basic sleep diagnostics (overnight polygraphy)
- High dependency unit

Motivated people

A leading pair: physician + registered nurse

Committed staff: „delivering the best care to our patients“

Getting ready

Education: Up-to-date international standards

ERS School

Visiting leading centers → connections/advice

Fellowship

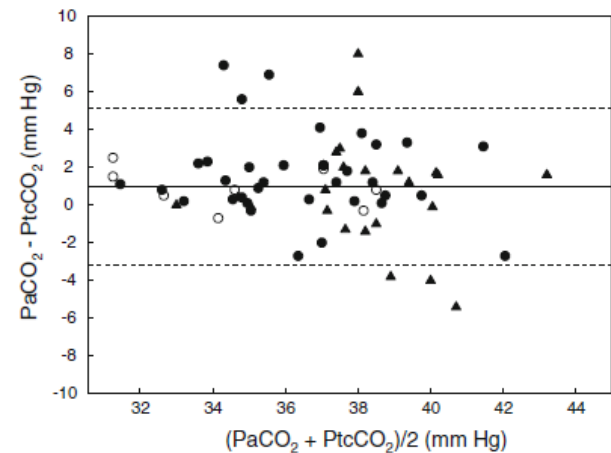
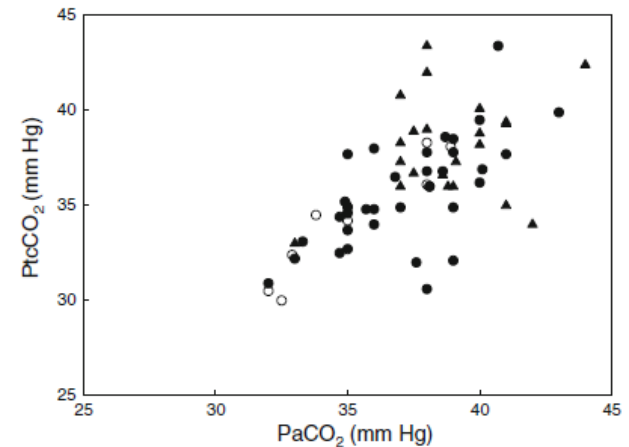
Sharing knowledge

Staff's (physicians/nurses) education project –
theory & „hands-on“

Go! – Adopting changes

Established management protocols

- **Lung function:** flow/volume, PCF, IP_{max} EP_{max} , correct references (ulnar length correlation)
- **Capillary blood gasses**
- **Transcutaneous PCO_2 monitoring**



Sleep disordered breathing

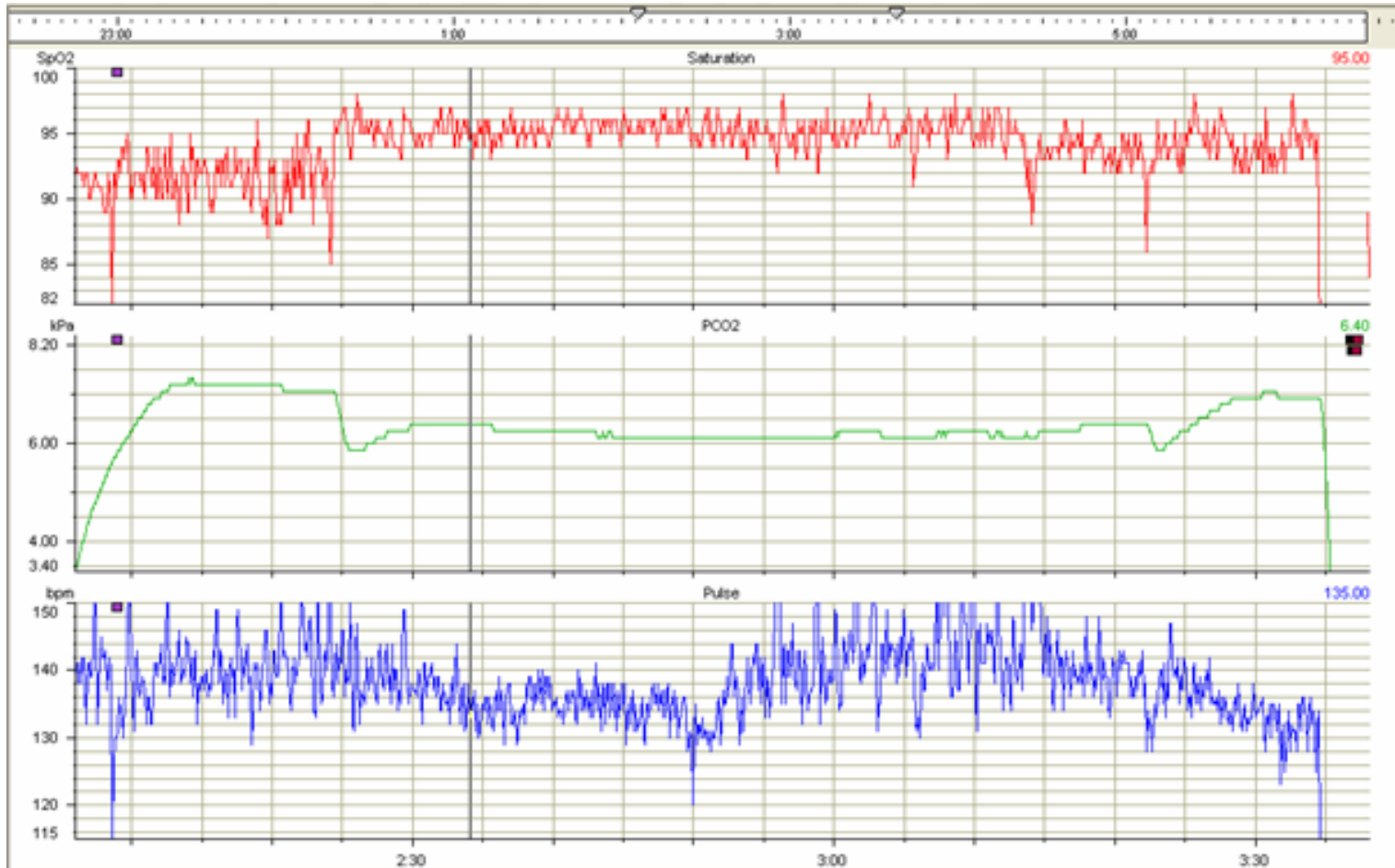
Education

- Collaboration with the Dep. of neurology
- ERS Sleep Medicine (handbook, conference)

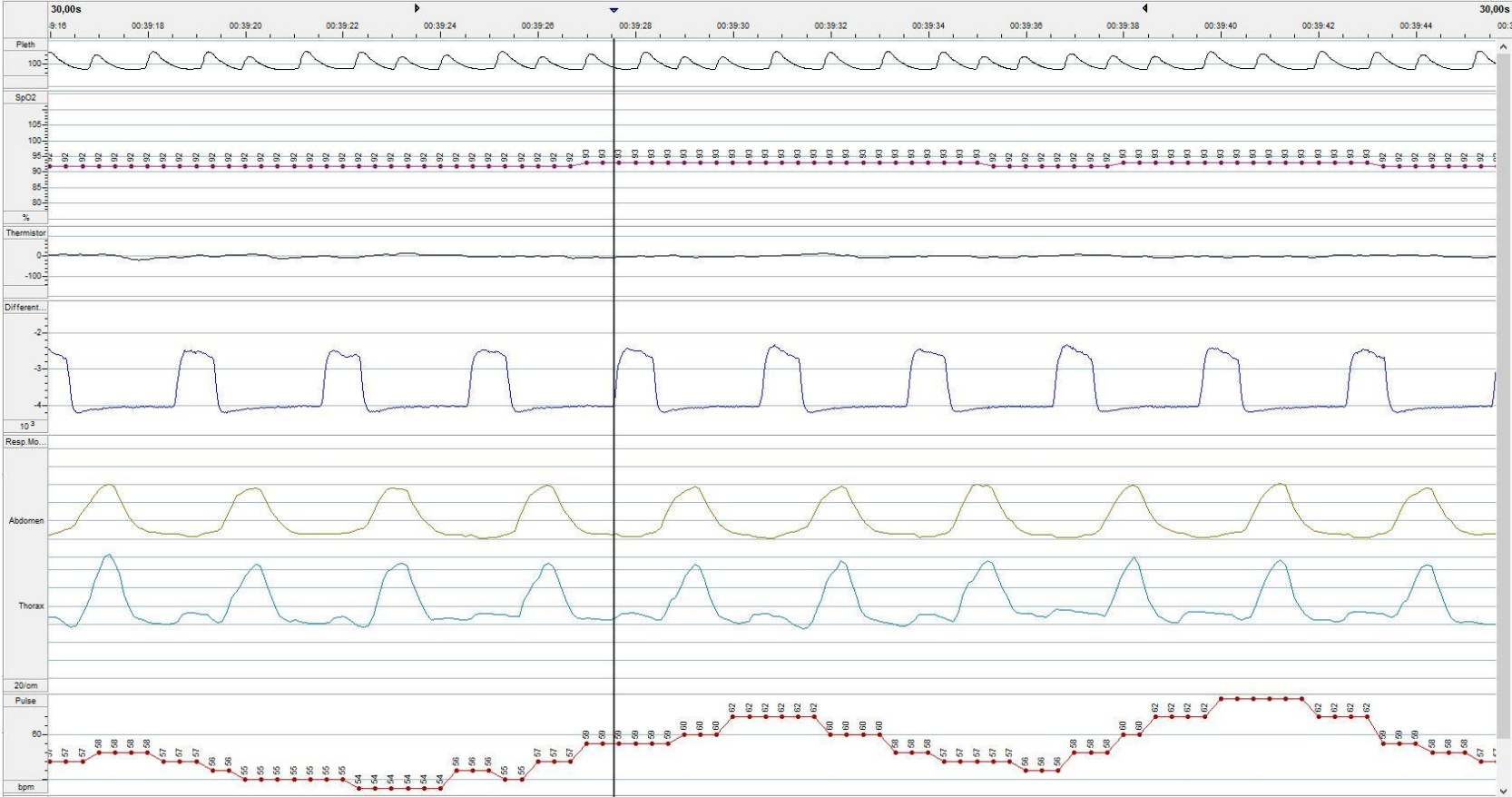
Equipment

- SpO₂ / Pulse rate / Respiratory rate monitors
- SpO₂ / P_{tc}CO₂ (Tosca™ / Sentec™)
- P_{tc}O₂ / P_{tc}CO₂ (TCM40™)
- Polygraphy (Embla)
- Polysomnography (Nicolet) – Dep. of neurology

SpO₂/PtcCO₂/PR monitoring

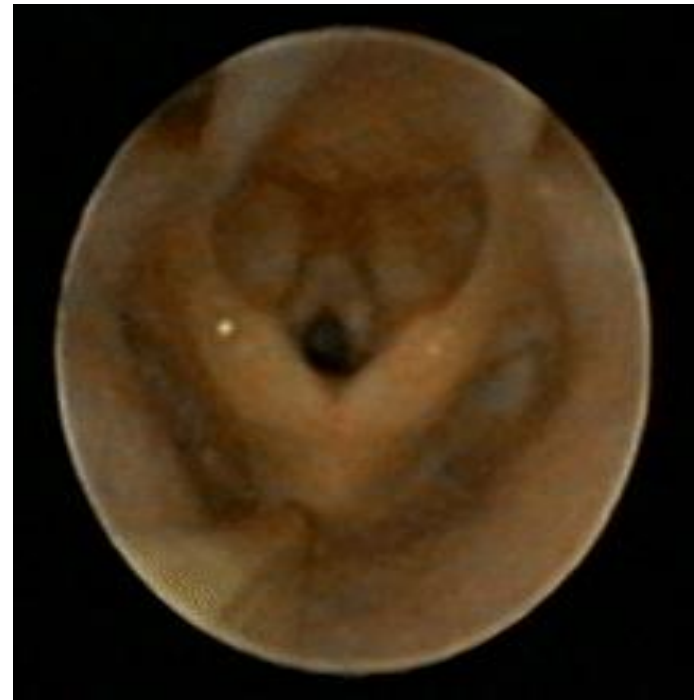


Overnight polygraphy



Induced sleep endoscopy

- Preterm baby boy (33 w)
- Admitted at 7 weeks of age (at term) for an apparent life-threatening event
- Sleep study: severe OSA



Question 4

What would be your **FIRST LINE** treatment?

1. Oral caffeine
2. Home oxygen treatment (low flow)
3. CPAP
4. HFNC with FiO_2 0.21
5. Gastroesophageal reflux treatment

Starting NIV protocol

NIV introduction as in-hospital activity

During the day

- Start and make confident with the appropriate interface and home ventilator
- First application
- Modifications and explanations (!)

During the night

- Use of NIV during the night
- Nurse help / supervision
- SpO₂ monitoring
- Modifications

Gradually achieving tolerance

Parents' structured therapeutic education (!)

Follow-up

Daytime ventilation

Mouth piece ventilation

Providing comfort:

- Relief from dyspnea
- Improves speech: loudness and making longer sentences
- Facilitates swallowing and breathing during eating

NIV during physiotherapy

- Effective secretions' management in combination with Cough Assist
- Enhanced exercise tolerance

Acute respiratory infection

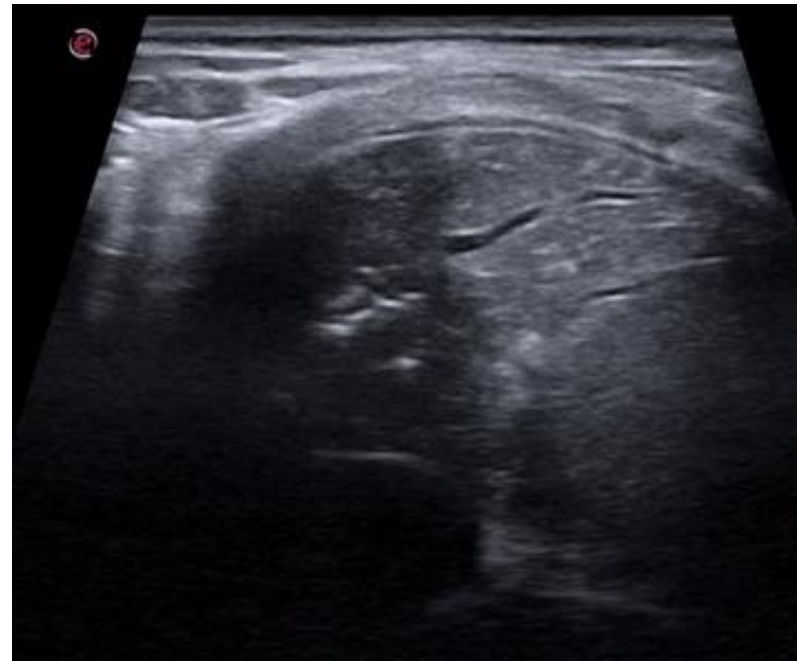
HDU if one organ system failure
(respiration)

Acute hypoxemic and
hypercapnic respiratory failure

- \uparrow FiO_2
- Ventilatory settings change
(to \downarrow CO_2)
- Cough Assist

If deteriorating despite \uparrow NIV
support \rightarrow ICU, but

HE/SHE REMAINS YOUR
PATIENT (!)



Question 5

A 4-year-old girl with SMA type 2, with left sided pneumonia.

On home NIV, FiO_2 0.4, SpO_2 93%, RR 40 /min, pH 7.33, PCO_2 57 mm Hg. ↑↑ work of breathing.

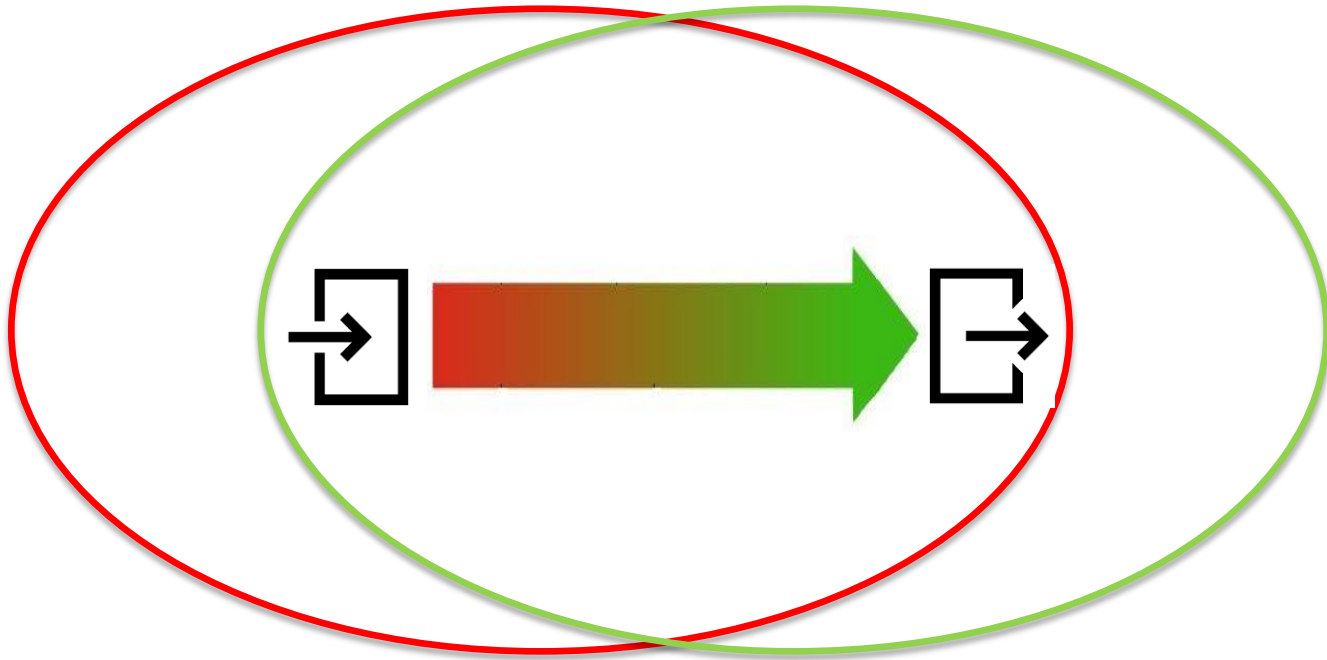
What would you do?

1. ↑ FiO_2
2. IV fluid bolus 20 ml/kg
3. ↑ IPAP and respiratory rate
4. Intubate and transfer to the ICU
5. Morphine for dyspnea relief

Collaboration with the ICU

ICU

HDU / Ward / Home care



Collaboration with the ICU

NIV in the ICU

- Acute respiratory failure
- Weaning from invasive ventilation
- Secretions management

Efficient communication

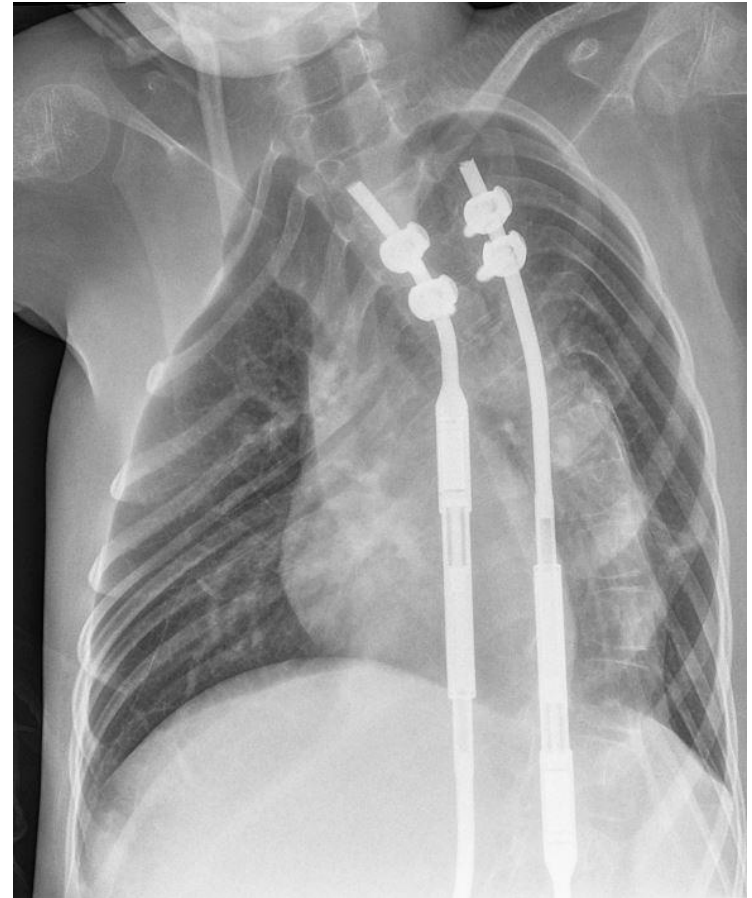
- Get actively involved
- Gather/deliver information
- Offer advice and support to the ICU staff
- Timely arrange transfer



Anticipated planning for surgery

Collaboration with
orthopedic surgery

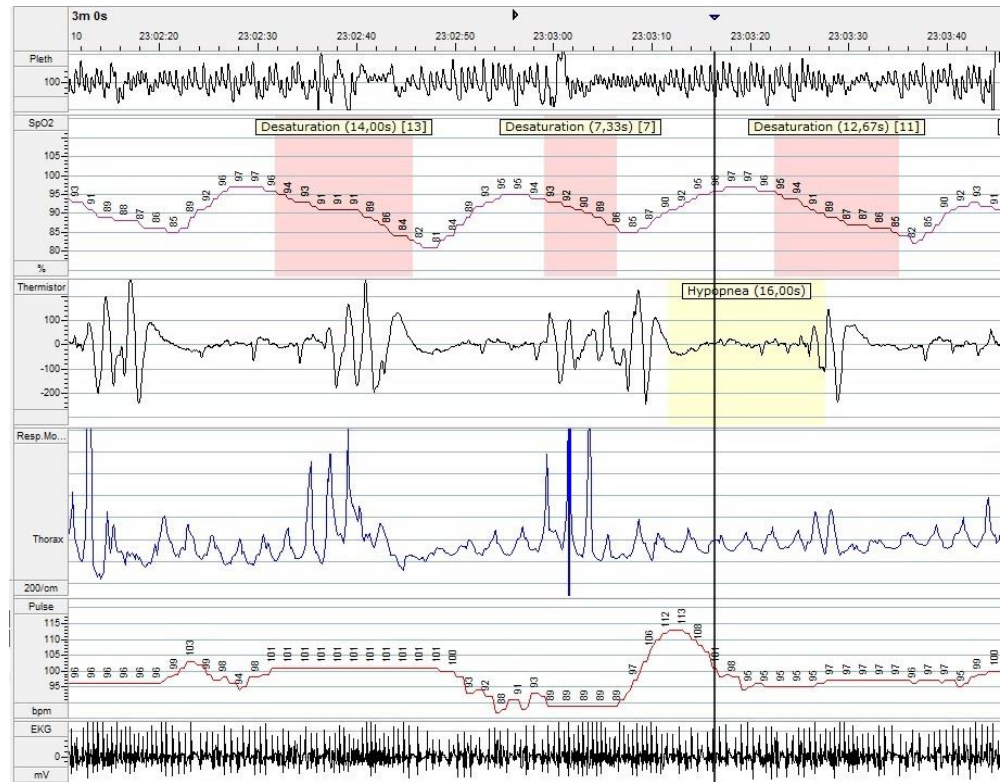
NIV adaptation prior to
spine surgery



Severe upper airway pathology

Collaboration with

- ENT surgery
- Maxillofacial surgery



Sharing / spreading knowledge

Regular staff „refreshing“ workshops

(for new staff members / for updating knowledge and experience)

Local symposia on NIV

- Physicians
- Respiratory therapist / nurses

Motivating „new“ clinical champions – NIV promoters

Our center today

Our settings today

Unit for Pulmonary Diseases

- Beds: 14 (4 HDU)
- Staff: 6 pediatricians, 26(5) nurses, 2(1) physiotherapists
- Admissions: 1.200/yr
- Outpatient visits: 6.000/yr
- LF diagnostics: 5.000/yr
- Pediatric bronchoscopy: 150/yr
- Home ventilation center
- Pediatric & adolescent CF center
- Close collaboration with other 9 departments (pediatric neurology, gastroenterology, endocrinology, hematology, neonatology, ICU)

Activity

Period 2001 – 2019

- 132 pediatric/adolescent patients (NIV - 60%)
- 72 currently on home ventilation (NIV - 65%)
 - 6 INV to NIV
 - 1 NIV to INV
 - 26 transferred to adult care
 - 41 stopped ventilation
 - 18 died

Current patients

Current	All	Noninvasive	Invasive
No.	72	49 (68%)	23
% male	65	59	47
Mean age (SD, yrs)	16.3 (7.1)	14.9 (7.5)	12.0 (7.5)
Time on ventilation (SD, yrs)	6.5 (4.8)	5.5 (4.4)	8.5 (5.0)
Age at start (SD, yrs)	8.4 (6.3)	10.7 (5.7)	3.5 (4.5)
Home care (No, %)	66 (92)	49 (100)	17 (74)
Institutional care (No., %)	6 (8)	0	6 (26)
Prevalence (pop. 400.000)	18 / 100.000		

Practice changing time points

- **Recognition of the need for improvement**
- **Grabbing the opportunity (new hospital)**
- **Going abroad for education – learning from the best**
- **Shift from a single leader to a leading pair (physician / nurse)**
- **Home team's education project**

Question 6

What motivates you THE MOST for making a new / a significantly better NIV program at your hospital?

- 1. My boss's order**
- 2. Willingness to use the new knowledge in real life**
- 3. Commitment to deliver best possible care**
- 4. Opportunity to strengthen the team spirit of the department**
- 5. Excitement of the new**

It is feasible.

It can be repeated anywhere.

Conclusions

- **Obstacles for adopting new evidence into clinical practice can be overcome by strong motivation.**
- **The „clinical champion“ – a physician or a pair (physician / nurse, physician / respiratory physiotherapist) should take the lead.**
- **A structured planning is needed for the most efficient allocation of resources.**

Conclusions

- **NIV can significantly improve clinical management in many different aspects of the patients' care.**
- **Learning from the best and visiting well established NIV centers are essential for a successful program.**

Thank you for your attention!
Questions?