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# **Carbon dioxide insufflation in routine colonoscopy: safe and more comfortable**

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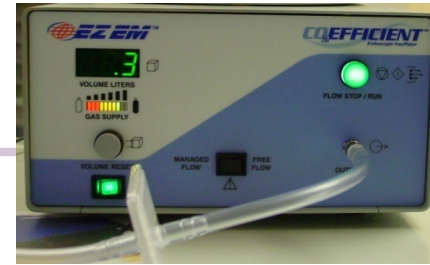
# Background I

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- Carbon dioxide (CO<sub>2</sub>) insufflation has been recommended during colonoscopy to eliminate the risk of combustion and to reduce patient discomfort.
- Air insufflation is, however, still the standard method.
- This is largely due to a lack of suitable CO<sub>2</sub> insufflators tailored for endoscopy.
- To our knowledge there is a striking absence of a large, randomised trial comparing CO<sub>2</sub> and air in colonoscopy.
- The use of CO<sub>2</sub> could interfere with the body's acid-base balance (rise in arterial pCO<sub>2</sub>).

Becker GL. Surg Gynecol Obstet 1953; 97:463  
Bretthauer M, Endoscopy 2007; 39: 58-64  
Bretthauer M, Endoscopy 2005; 37: 706-709.  
Bretthauer M, Gut 2002; 50: 604-607.

# Background II



## CO2 Studies:

*Studies during colonoscopies, ERCP and enteroscopy:*

Reduction in postprocedural abdominal pain and discomfort

## CO2 Insufflator:

- CO2-Efficient Insufflator of EZEM launched in May 2006
- Basal flow rate 0.5 l per minute increasing to 2.4 l per minute
- Demand controlled with standard air valve
- CO2 supplied over tubing set connected to a branch connection to water bottle tube

Bretthauer M, Endoscopy 2005; 37: 706-709.

Bretthauer M, Gut 2002; 50:604-607.

Bretthauer M, Endoscopy 2007; 39: 58-64

Domagk D, Endoscopy 2007; 39: 1064-7.

Saito Y, Gastrointest Endosc 2007; 65(3): 537-42

# Aim

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to compare the effect of CO<sub>2</sub> insufflation with standard air insufflation with respect to pain experienced after colonoscopy in 200 randomized patients referred for routine investigation

# Method I

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## **1° Endpoint**

*Pain and bloating assessed on 10 pts VAS:*  
after procedure, at discharge, 1, 3, 6 & 24h post endoscopy

## **2° Endpoints**

- Time to ileum, withdrawal time, intervention
- Propofol® dosage
- Continuous transcutaneous CO<sub>2</sub> measurement
- Number of polyps, histology
- Complications

# Method II

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**Subjects:** at least 200 consecutive patients referred for routine colonoscopy in a single GI practice

**Study design:** double-blind, randomised

**Technique:** insufflation of either CO<sub>2</sub> or standard air

**Calculations & Statistical Analyses** Data presented as mean  $\pm$  SD  
Box-Whisker plot  
Unpaired t-test, Chi-Square test ( $p < 0.05$ )

# Results: Baseline

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## **A total number of 219 patient examined:**

110 pts in CO2 group, 109 pts in normal Air group

**Gender:** CO2: 62% women  
Air: 47% women p=0.03

**Age (years):** CO2: 58 ± 13  
Air: 62 ± 12 p=0.42

**Comorbidity:** CO2: ASA I 64.5%, ASA II+III 35.5%; COPD 2.7%  
Air: ASA I 61.5%, ASA II+III 38.5%; COPD 2.8%

**Propofol dosage:** CO2: 134 mg ± 56  
Air: 120 mg ± 120 p=0.88

# Results: 2° Endpoints

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## **Time to ileum (intubation rate 97.3%, 1% obstructions)**

- CO2	7.7 ± 4.7 min	
- Air	6.7 ± 4.1 min	p=0.18

## **Withdrawal time**

- CO2	14 ± 6 min	
- Air	13 ± 6 min	p=0.99

## **Intervention time**

- CO2	3.3 ± 4.5 min	
- Air	3.2 ± 4.6 min	p=0.99

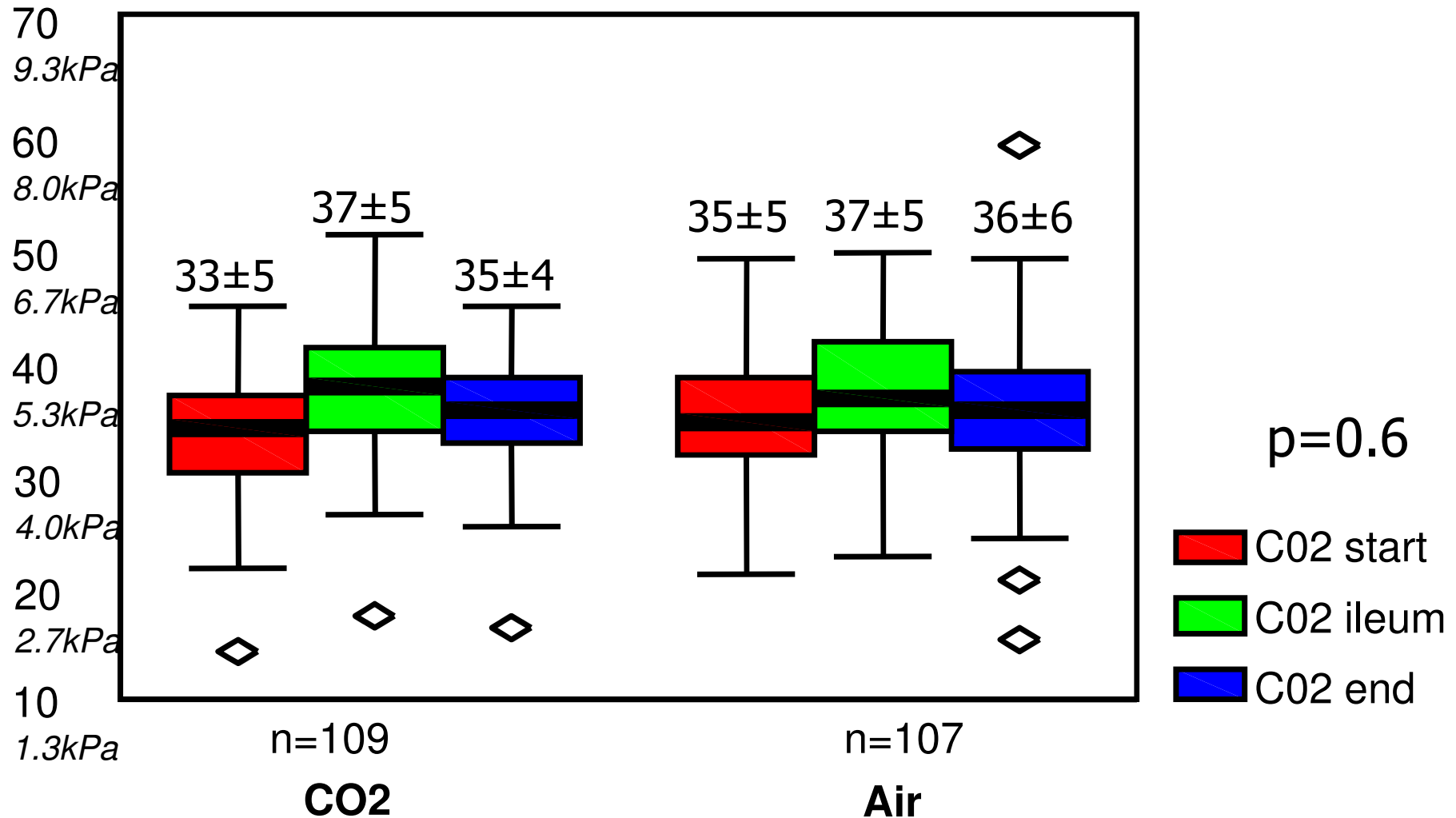
## **Polyps (villous, serrated, > 1cm, dysplastic)**

- CO2	CA 0.9%, sig 10.9%, small 34.5%, hyp 13.6%	
- Air	CA 1.8%, sig 7.3%, small 33.9%, hyp 14.7%	p=0.77



# Results: CO<sub>2</sub> (mmHg)

No relevant respiratory side effects

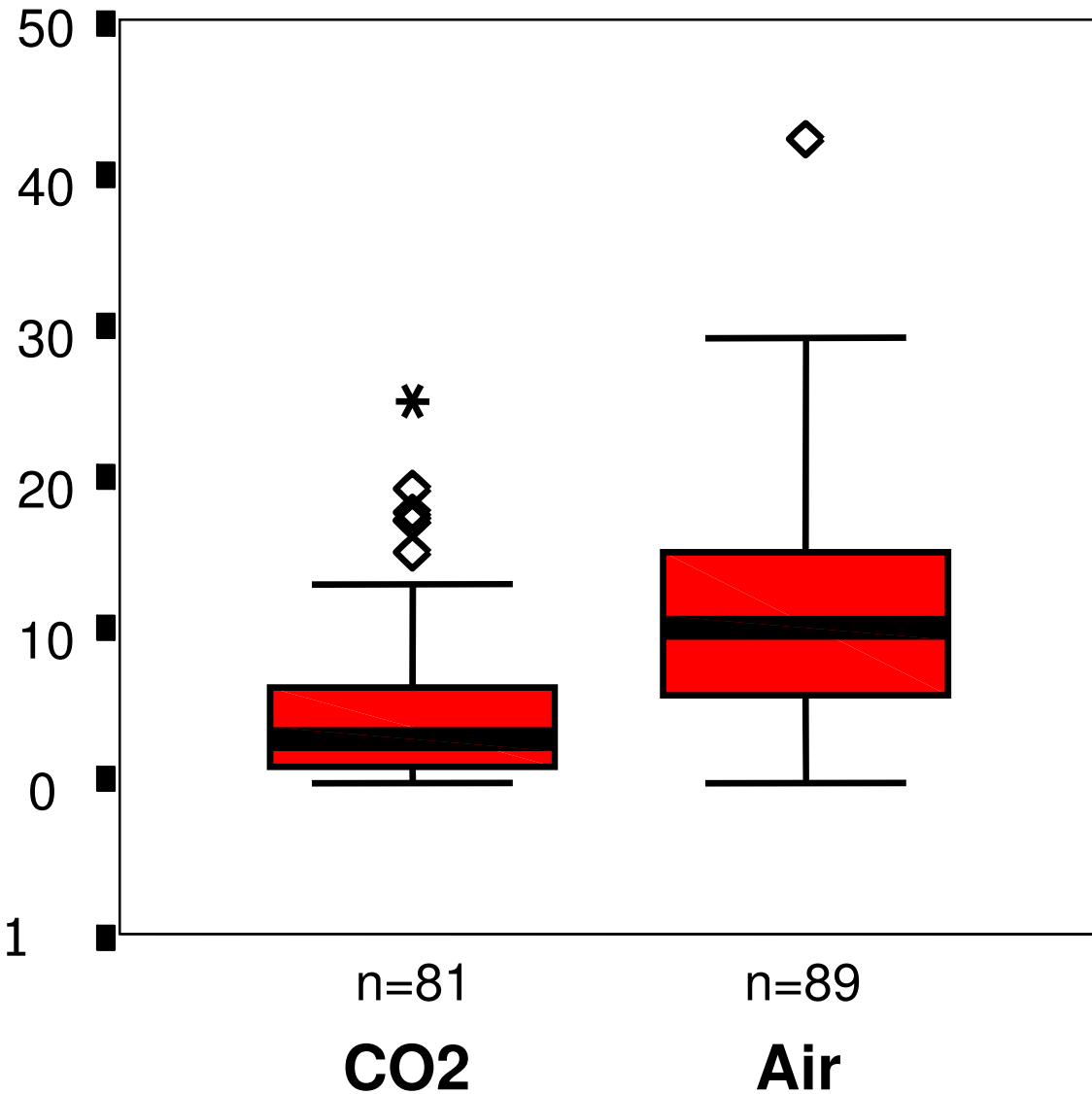


# Results: Bloating (VAS sum score)

- CO2  $4.9 \pm 5.2$

- Air  $10.8 \pm 7.8$

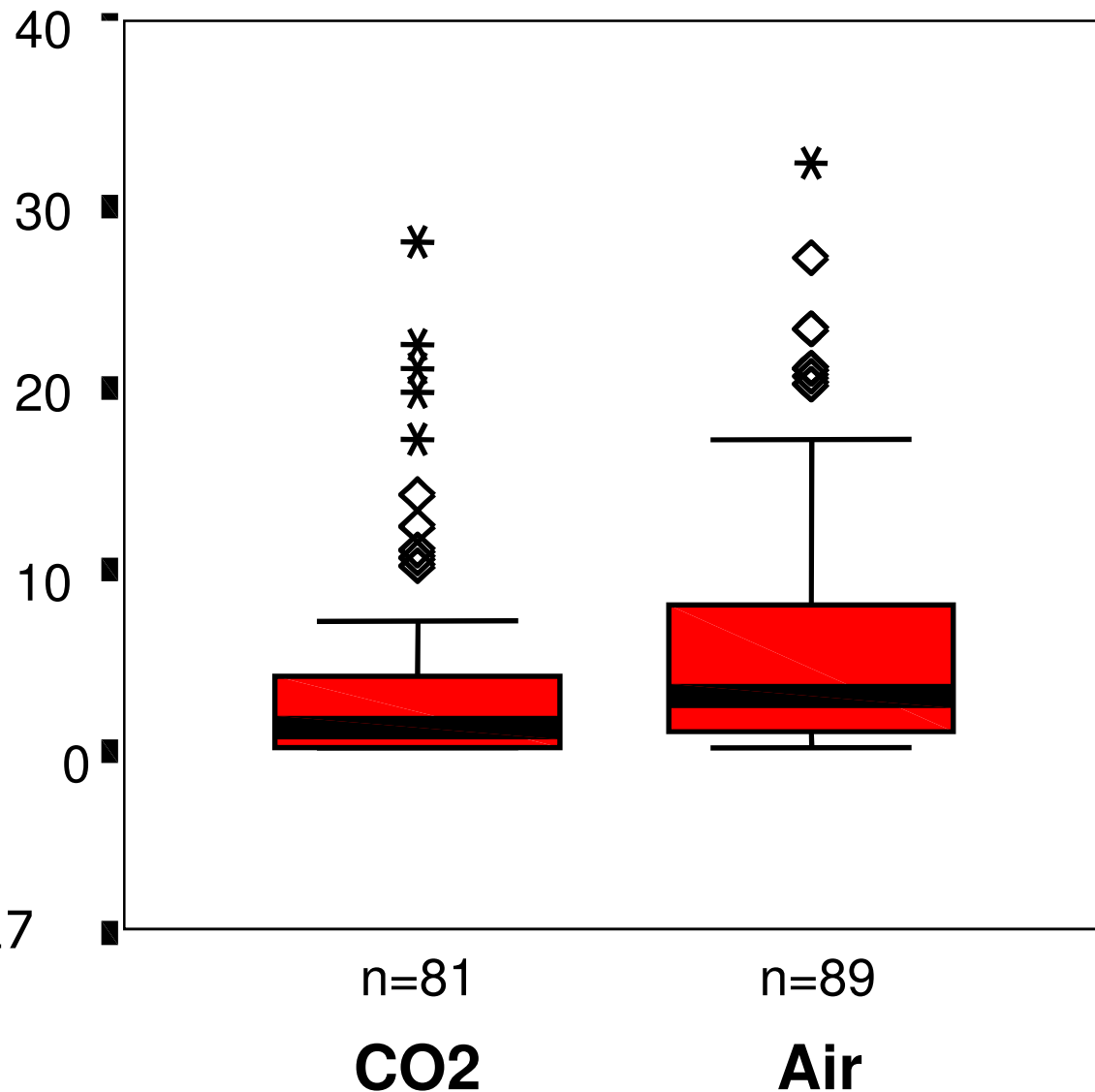
p=0.001



# Results: Pain (VAS sum score)

- CO2      **3.6 ± 5.8**  
- Air        **6.1 ± 7.4**

p=0.017



## Results: Satisfaction VAS 0-10

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CO<sub>2</sub> 9.54 ± 0.7

Air 9.31 ± 1.0

p=0.04

# Summary

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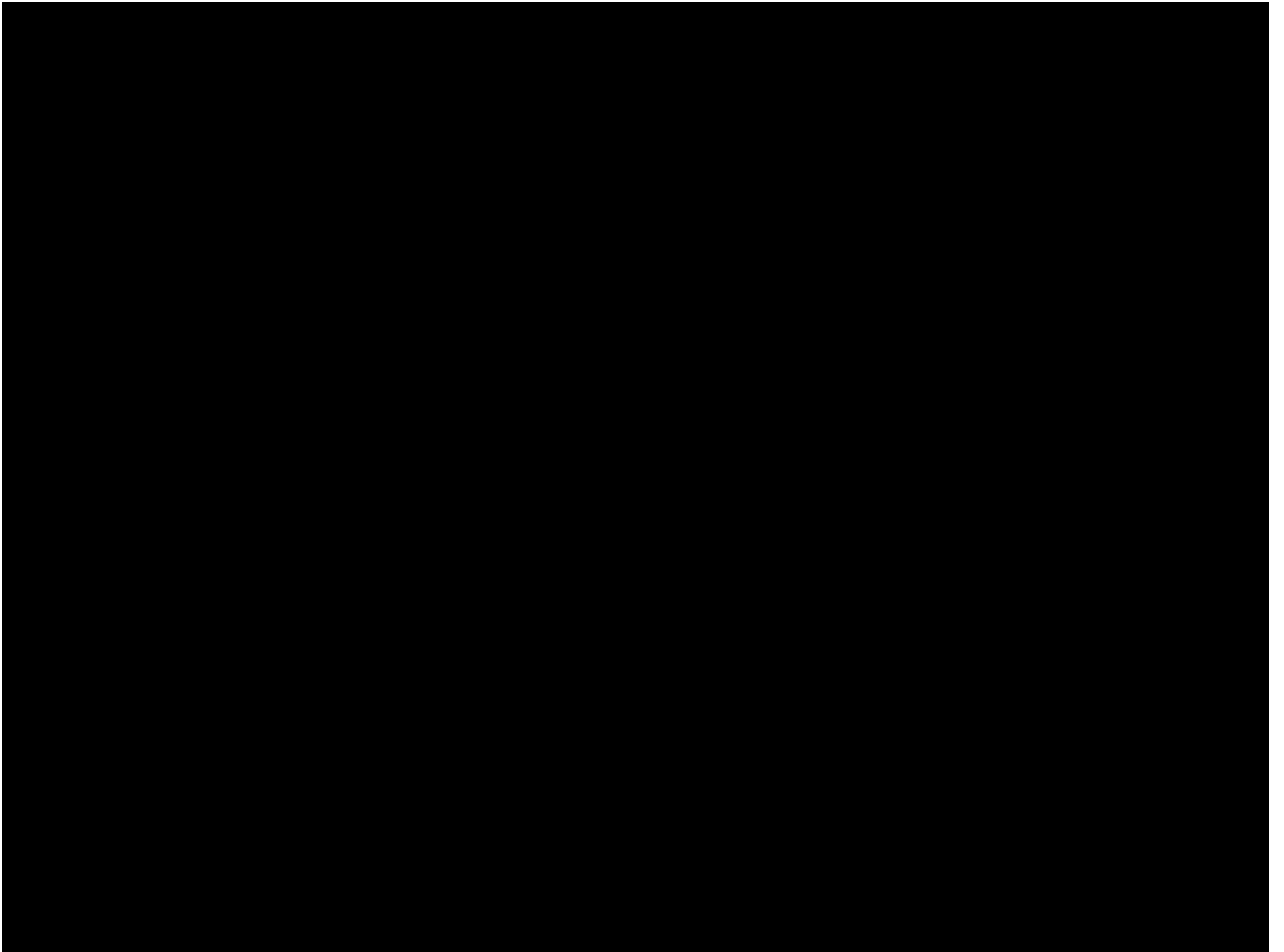
## **Carbon dioxide insufflation during routine colonoscopy**

- significantly reduces postprocedural bloating and pain
- is safe and easy to use
- is not associated with increased adverse effects
- overall good acceptance of colonoscopy was slightly better in patients with CO<sub>2</sub> insufflation

# CONCLUSION

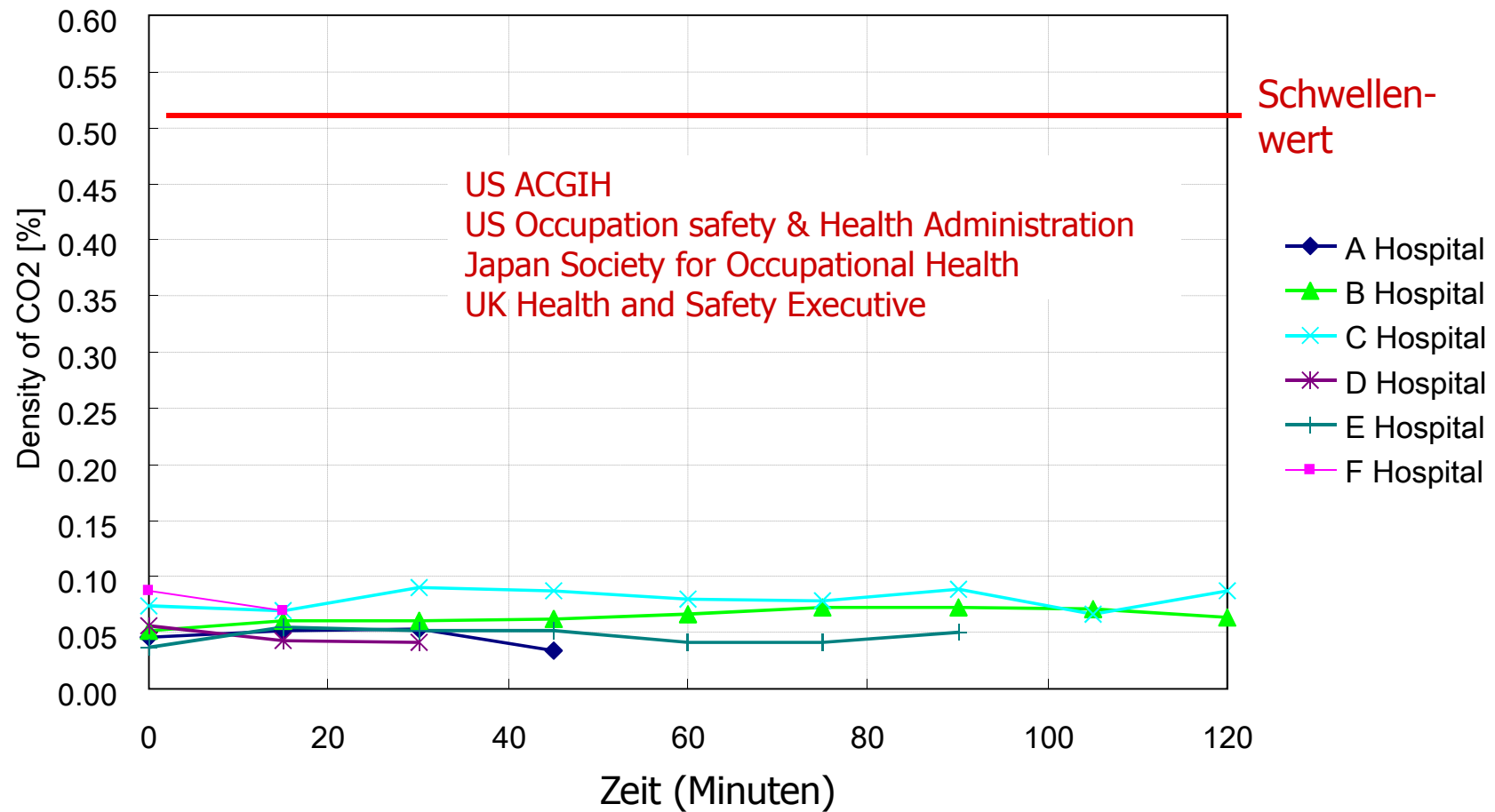
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- Carbon dioxide should be the standard gas used for insufflation in colonoscopy.
- A wider use of CO<sub>2</sub> in different fields of endoscopy (e.g. endosonography, ERCP, Balloon enteroscopy, ESD) should be encouraged.
- Further studies should help to establish a safe and innovative technology.



# CO<sub>2</sub> in der Endoskopie-Unit: Bedenklich?

- Anteil CO<sub>2</sub> in der Raumluft durch Entweichen via Luft/Wasserventil





# Studien: Ballon-Enteroskopie

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Ballon-Enteroskopie: 58 Pat. Raumluft, 54 CO2

## Propofol-Dosis

- CO2 290mg
  - Raumluft 380mg
- p=0.02

## DD-Intubationstiefe (v.a. für oraler Zugang!)

- CO2 230cm
  - Raumluft 177cm
- p=0.008

<b>Schmerz</b>	nach 1h	nach 3h (VAS)
• CO2	2.8	3.1
• Raumluft	5.9	6.7

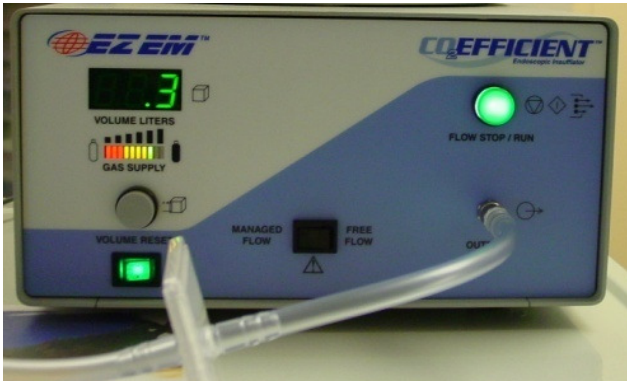
# Insufflatoren: EZEM CO2 Efficient Insufflator



Tubing-Set

Gasflasche

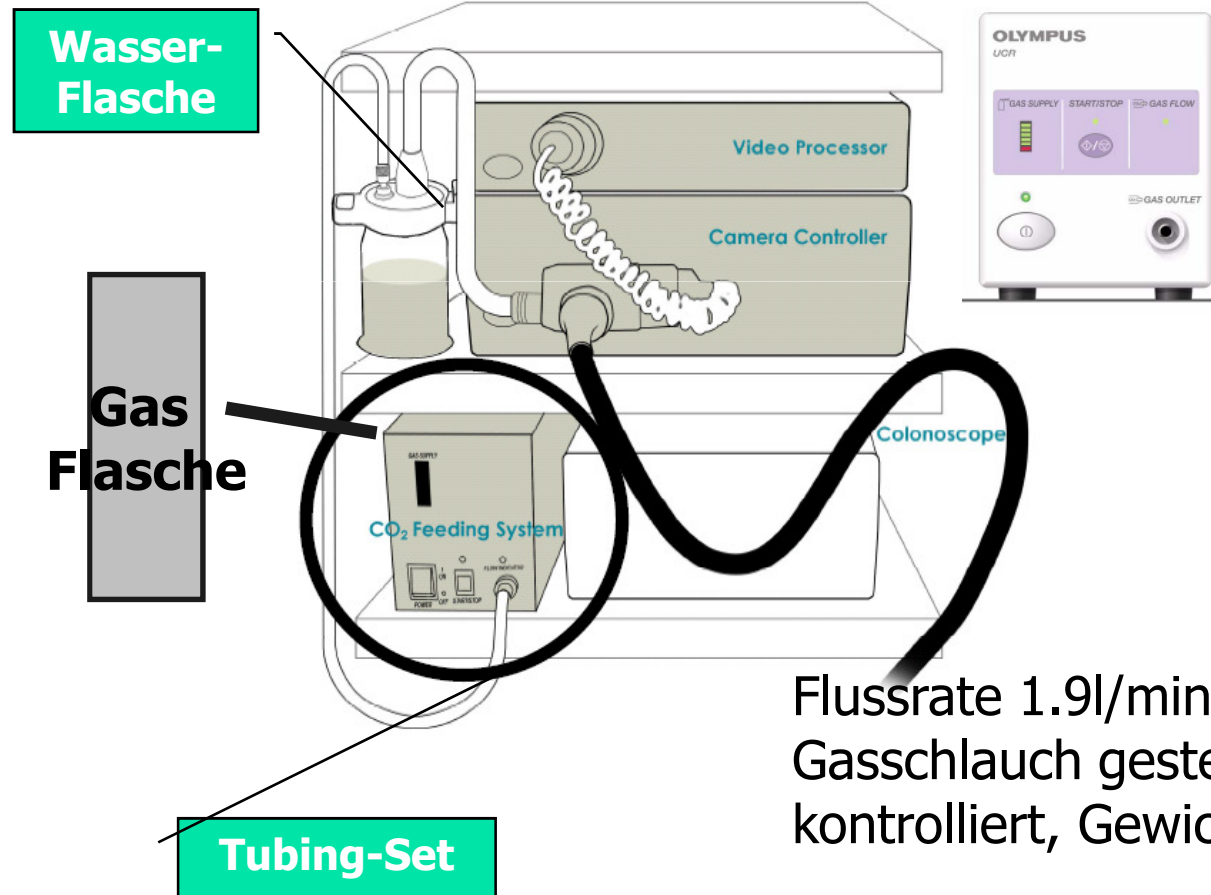
T-Stück Anschluss  
Wasserflaschen-Schlauch



Flussrate 1.8-2.4l/min, Bedarfs-  
kontrolliert, elektronisch gesteuert,  
Gewicht 9kg

Erhältlich seit 5/06 USA, in CH Firma  
Medisis

# Insufflatoren: Olympus UCR-CO2-Regulation



Flussrate 1.9l/min (Flussrate über Gasschlauch gesteuert), elektrisch kontrolliert, Gewicht 4.9kg

Erhältlich per sofort 8/08