



Deutsche Gesellschaft für Pneumologie  
und Beatmungsmedizin e.V.

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Digitalisierung in der Pneumologie/ Inneren Medizin  
**Sicht und Strategie der Fachgesellschaft**

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Pneumologisches Facharztzentrum Teuchern  
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1996 verlor Schachweltmeister Garri Kasparow erstmals gegen die Computersoftware "Deep Blue".

Mittlerweile haben Menschen keine Chance mehr gegen die Maschinen.

# Messung der Lungenfunktion

1891

heute





## Artificial intelligence outperforms pulmonologists in the interpretation of pulmonary function tests

Marko Topalovic<sup>1</sup>, Nilakash Das<sup>1</sup>, Pierre-Régis Burgel <sup>2</sup>, Marc Daenen<sup>3</sup>, Eric Derom<sup>4</sup>, Christel Haenebalcke<sup>5</sup>, Rob Janssen<sup>6</sup>, Huib A.M. Kerstjens <sup>7</sup>, Giuseppe Liistro<sup>8</sup>, Renaud Louis<sup>9</sup>, Vincent Ninane<sup>10</sup>, Christophe Pison<sup>11</sup>, Marc Schlessler<sup>12</sup>, Piet Vercauter<sup>13</sup>, Claus F. Vogelmeier<sup>14</sup>, Emiel Wouters<sup>15</sup>, Jocke Wynants<sup>16,17</sup> and Wim Janssens<sup>1</sup> on behalf of the Pulmonary Function Study Investigators

 @ERSpublications

There is poor accuracy and substantial disagreement between pulmonologists when interpreting complex pulmonary function data. Automating interpretation with artificial intelligence provides a powerful decision support tool in clinical practice. <http://ow.ly/Tj9h30nxw4U>

Cite this article as: Topalovic M, Das N, Burgel P-R, *et al.* Artificial intelligence outperforms pulmonologists in the interpretation of pulmonary function tests. *Eur Respir J* 2019; 53: 1801660 [<https://doi.org/10.1183/13993003.01660-2018>].

**ABSTRACT** The interpretation of pulmonary function tests (PFTs) to diagnose respiratory diseases is built on expert opinion that relies on the recognition of patterns and the clinical context for detection of specific diseases. In this study, we aimed to explore the accuracy and interrater variability of pulmonologists when interpreting PFTs compared with artificial intelligence (AI)-based software that was developed and validated in more than 1500 historical patient cases.

120 pulmonologists from 16 European hospitals evaluated 50 cases with PFT and clinical information, resulting in 6000 independent interpretations. The AI software examined the same data. American Thoracic Society/European Respiratory Society guidelines were used as the gold standard for PFT pattern

Wir kennen unsere Stärken und Schwächen,  
und würden gerne beides verbessern.

# Wir kennen unsere Stärken und Schwächen, und würden gerne beides verbessern.

limitierte ärztliche Verfügbarkeit, zeitlich, örtlich

Diagnose-Findung

Diagnose-Sicherheit

Therapie-Sicherheit

Risiko-Bewertung eines Krankheitsfalls

Compliance mit der Therapie

Verschlechterung im Krankheitsverlauf (erkennen, handeln)

Modifikation von Verhalten (Rauchen, Ernährung)

Wissen, Fortbildung

weitere

## **Problemfeld**

**limitierte ärztliche Verfügbarkeit, zeitlich, örtlich**

### **Telemedizin**

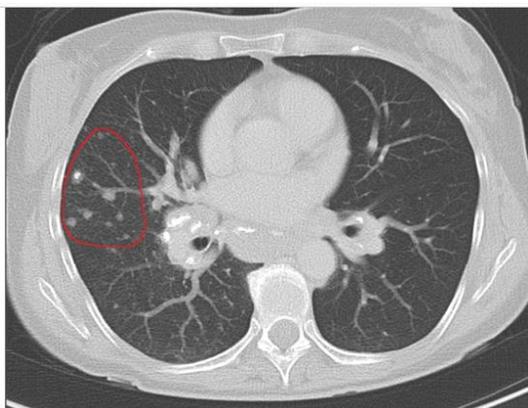
Radiologie,  
Konsiliar-Leistungen von Arzt zu Arzt  
Notfallmedizin

### **Videosprechstunde**

zwischen Arzt und Patient

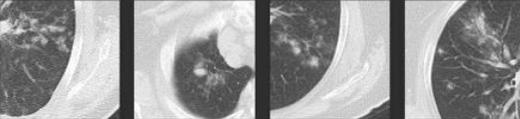
# Problemfeld

## Diagnose-Findung



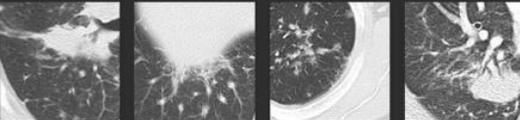
Tags: acute chronic bilateral focal apical basal infectious common very rare

**Pulmonary Granulomatosis with Polyangiitis (Wegener Granulomatosis)** chronic bilateral very rare



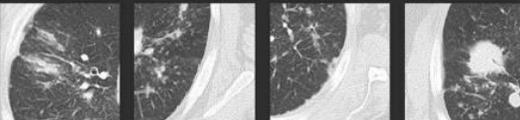
- Diffusely distributed round masses in both lungs without predominance, mostly multiple and of different size, rarely solitary, well delimited or with surrounding halo indicating haemorrhage.
- The masses may colliquate into thick-walled cavitations, which become thinner-walled with therapy and eventually disappear.
- Pulmonary consolidations and frosted-glass opacities, mostly indicating pulmonary haemorrhage.

**Pulmonary Sarcoidosis - Stage III** chronic bilateral



- Bilateral and mediastinal lymphadenopathy. Lymph node calcifications may appear in the late stage (usually incomplete, predominantly central, "icing sugar" pattern).
- Pulmonary nodules (2—3 mm) arranged in a perilymphatic distribution (along the interlobar fissures, pleura, and peribronchovascular bundle) like a "string of beads."
- The nodules may be grouped in clusters and may coalesce to form larger lesions, typically with perifocal

**Silicosis** chronic bilateral apical



- Simple pneumoconiosis: Nodules 1-3 mm diameter mostly in the upper lobes with perilymphatic (peribronchovascular and subpleural) distribution, may calcify.
- Complicated pneumoconiosis (progressive massive fibrosis): The nodules coalesce into larger masses, often with elliptical configuration and paralleling the pleura; puckering results in emphysematous changes of the surrounding lung parenchyma.

## Content-Based Image Retrieval System

# Problemfeld Diagnose-Findung

An advertisement for the Ada app. At the top, a dark blue banner with white text reads 'Nimm deine Gesundheit selbst in die Hand' (Take your health into your own hands). To the right of the text is an illustration of a person sitting on a chair, talking to a dog. Below the banner is a white smartphone displaying the app's interface. The screen shows a question 'Hast du Fieber?' (Do you have a fever?) with a sub-question 'Wie hoch ist dein Fieber?' (How high is your fever?). There are three buttons: 'Ja' (Yes), 'Nein' (No), and 'Ich bin nicht sicher' (I'm not sure). At the bottom of the screen, there is a 'Weiter' (Next) button. To the right of the phone, the text says 'Sag Ada, wie es dir geht' (Tell Ada how you feel). Below this, it explains: 'Ada stellt dir einfache Fragen und vergleicht deine Antworten mit Tausenden von ähnlichen Fällen, um die wahrscheinlichsten Ursachen für deine Symptome zu ermitteln' (Ada asks you simple questions and compares your answers with thousands of similar cases to determine the most likely causes for your symptoms).

**Apps für Laien zur Diagnosefindung**  
[www.ada.com/de/](http://www.ada.com/de/)

# Problemfeld Therapie-Sicherheit



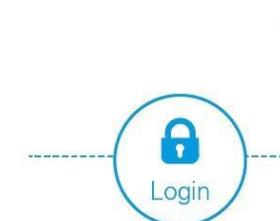
Patienten, die AirSense 10- oder AirCurve 10 Geräte mit aktivierter Funktechnologie nutzen.



AirView geprüftes  
sicheres Daten-Center.



AirView-Benutzer  
(z. B. Leistungserbringer, Ärzte)



## Überwachung der Therapiegeräte in Schlafmedizin und außerklinische Beatmung

[www.resmed.com](http://www.resmed.com)

# Problemfeld

## Risiko-Bewertung eines Krankheitsfalls



Screening von (psychiatrischen) Symptomen im zeitlichen Verlauf  
[www.wuv.de](http://www.wuv.de)

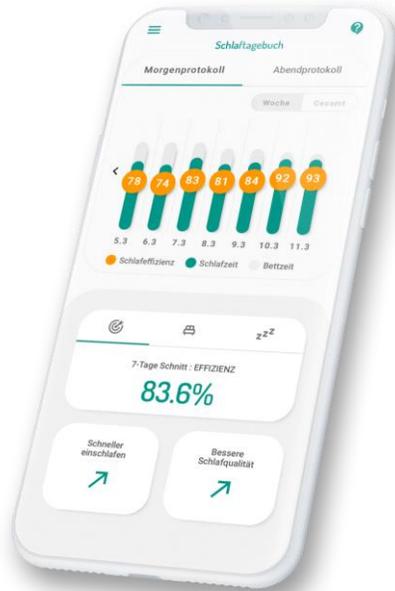
# Problemfeld

## Compliance mit der Therapie

**Screening der (korrekten) Medikamenten-Einnahme**  
[www.propellerhealth.com](http://www.propellerhealth.com)

# Problemfeld

## Modifikation von Verhalten (Rauchen, Ernährung, Schlaf,...)



- Herz und Kreislauf
- Hormone und Stoffwechsel
- Krebs
- Muskeln, Knochen und Gelenke
- Nervensystem
- Nieren und Harnwege
- Ohren
- Psyche
- Sonstiges (z. B. Burnout)
- Verdauung

**Digitale Gesundheitsanwendungen („App auf Rezept“)**  
[www.bfarm.de](http://www.bfarm.de)

# Problemfeld Wissen, Fortbildung

Vollständiger Text  
der Leitlinie



Integr. Scores



Empfehlung



Pathways, Scores



Suche



Apps für das schnelle Abrufen von Wissen (aus Leitlinien)  
[www.leila.de](http://www.leila.de)

# Ist der Einsatz von KI effektiv?

# Ist der Einsatz von KI effektiv?

PLOS ONE

RESEARCH ARTICLE

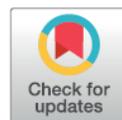
## Artificial intelligence-assisted clinical decision support for childhood asthma management: A randomized clinical trial

Hee Yun Seol<sup>1,2</sup><sup>✉</sup>, Pragma Shrestha<sup>1,3</sup><sup>✉</sup>, Joy Fladager Muth<sup>3</sup>, Chung-II Wi<sup>1,3</sup>, Sunghwan Sohn<sup>4</sup>, Euijung Ryu<sup>5</sup>, Miguel Park<sup>6</sup>, Kathy Ihrke<sup>1,3</sup>, Sungrim Moon<sup>4</sup>, Katherine King<sup>5</sup>, Philip Wheeler<sup>1</sup>, Bijan Borah<sup>7</sup>, James Moriarty<sup>8</sup>, Jordan Rosedahl<sup>8</sup>, Hongfang Liu<sup>4</sup>, Deborah B. McWilliams<sup>3</sup>, Young J. Juhn<sup>1,3</sup><sup>\*</sup>

1 Precision Population Science Lab, Mayo Clinic, Rochester, Minnesota, United States of America, 2 Department of Internal Medicine, Pusan National University Yangsan Hospital, Yangsan, Korea, 3 Department of Pediatric and Adolescent Medicine, Mayo Clinic, Rochester, Minnesota, United States of America, 4 Department of Artificial Intelligence and Informatics, Mayo Clinic, Rochester, Minnesota, United States of America, 5 Division of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, Minnesota, United States of America, 6 Division of Allergic Diseases, Mayo Clinic, Rochester, Minnesota, United States of America, 7 Department of Health Service Research, Mayo Clinic, Rochester, Minnesota, United States of America, 8 Kern Center for the Science of Health Care Delivery, Mayo Clinic, Rochester, Minnesota, United States of America

 These authors contributed equally to this work.

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 OPEN ACCESS

**Citation:** Seol HY, Shrestha P, Muth JF, Wi C-I, Sohn S, Ryu E, et al. (2021) Artificial intelligence-assisted clinical decision support for childhood asthma management: A randomized clinical trial. PLoS ONE 16(8): e0255261. <https://doi.org/10.1371/journal.pone.0255261>

**Editor:** Christophe Leroyer, Universite de Bretagne Occidentale, FRANCE

**Received:** April 6, 2021

### Abstract

#### Rationale

Clinical decision support (CDS) tools leveraging electronic health records (EHRs) have been an approach for addressing challenges in asthma care but remain under-studied through clinical trials.

# Ist der Einsatz von KI effektiv?

Prospektive, randomisierte Studie zum Einsatz von KI zur Analyse von klinischen Daten aus der Elektronischen Patientenakte.

Daraus wurden über ein Clinical Decision Support System Empfehlungen zum Management von kindlichem Asthma gegeben.

**PLOS ONE**

RESEARCH ARTICLE

Artificial intelligence-assisted clinical decision support for childhood asthma management: A randomized clinical trial

Hee Yun Seol<sup>1,2\*</sup>, Pragna Shrestha<sup>1,2\*</sup>, Joy Fladager Muth<sup>3</sup>, Chung-Il Wi<sup>1,3</sup>, Sunghwan Sohn<sup>4</sup>, Euijung Ryu<sup>5</sup>, Miguel Park<sup>6</sup>, Kathy Ihrke<sup>1,3</sup>, Sungrim Moon<sup>4</sup>, Katherine King<sup>7</sup>, Philip Wheeler<sup>7</sup>, Bijan Borah<sup>7</sup>, James Moriarty<sup>8</sup>, Jordan Rosedahl<sup>8</sup>, Hongfang Liu<sup>4</sup>, Deborah B. McWilliams<sup>9</sup>, Young J. Juhn<sup>1,3</sup>

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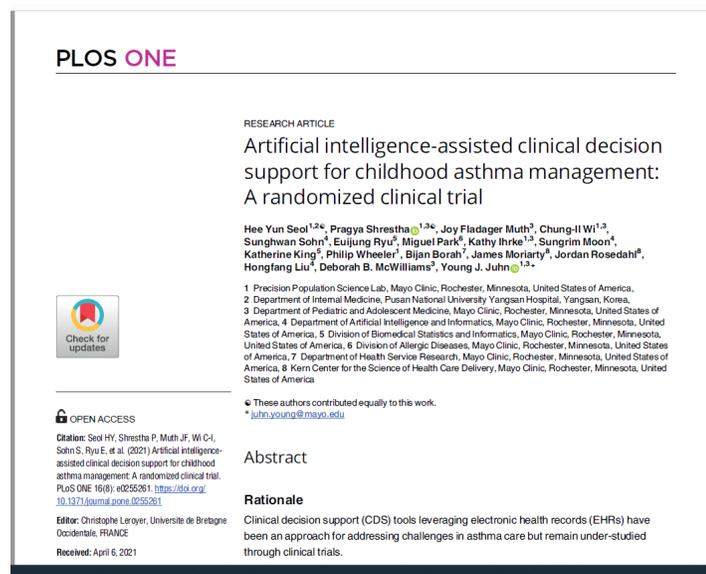
# Ist der Einsatz von KI effektiv?

Prospektiv, randomisiert, nicht verblindet, single center

Intervention: Asthma-Management mit/ohne  
Asthma-Guidance and Prediction System (AGPS)

90 bzw. 94 Teilnehmer, 8 Jahre, 1 Jahr Beobachtungszeit

Primary outcome: Asthma Exazerbationen



**PLOS ONE**

RESEARCH ARTICLE

Artificial intelligence-assisted clinical decision support for childhood asthma management: A randomized clinical trial

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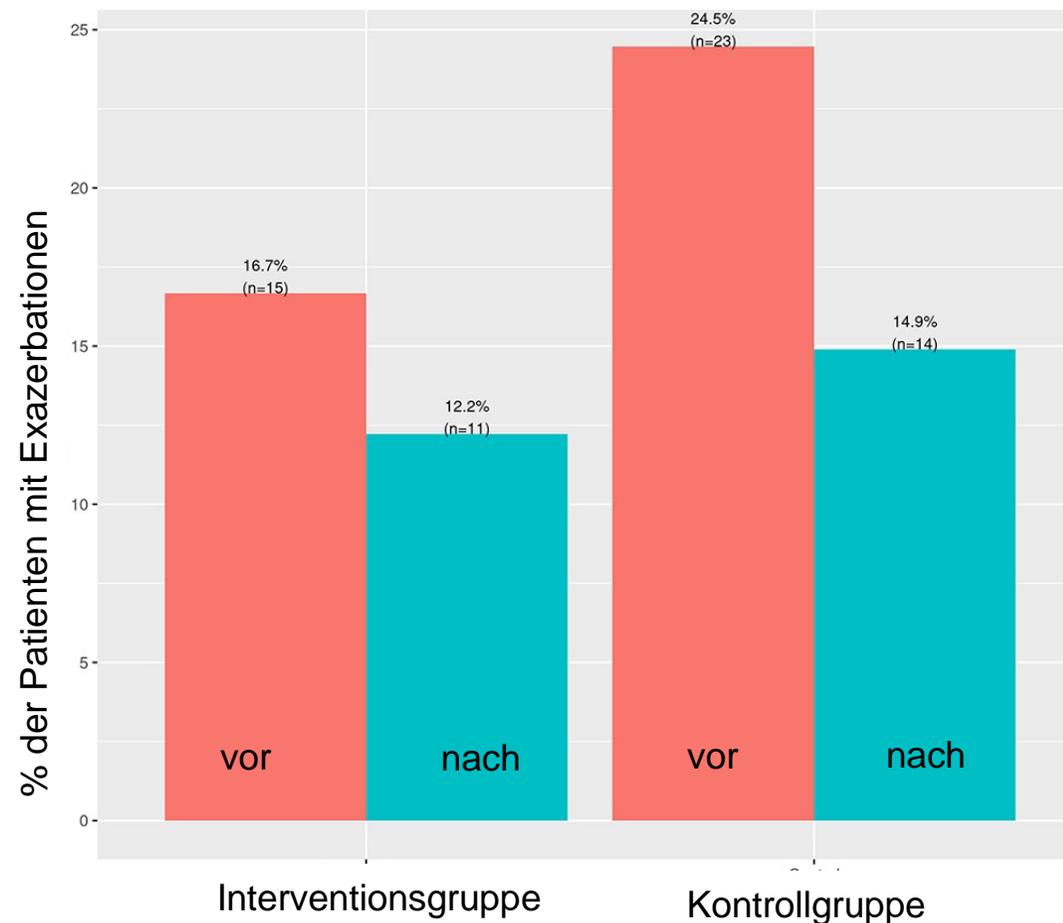
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# Ist der Einsatz von KI effektiv?



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Vielen Dank für die  
Aufmerksamkeit!

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