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ADMILSON MARIN

DISPOSITIVOS DE OSCILAÇÃO DE ALTA FREQUÊNCIA DA PAREDE TORÁCICA – HFCWO: PERSPECTIVAS CIENTÍFICAS SOBRE EFICÁCIA, TENDÊNCIAS E ESTRUTURA REGULATÓRIA.

DISSERTAÇÃO DE MESTRADO

MESTRADO EM ENGENHARIA BIOMÉDICA

PROGRAMA DE PÓS-GRADUAÇÃO STRICTO SENSU

São José dos Campos, março/2024

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Orientador: Prof. Ovidiu Constantin Baltatu, Dr.

Coorientadora: Profa. Luciana Aparecida Campos Baltatu, Dra.

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Para meus filhos Nicholas, Sophia e Marina. Papai ama...pra sempre !

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"A respiração é a ponte que liga a vida à consciência, que une seu corpo e seus pensamentos." - Thich Nhat Hanh

RESUMO

Introdução: Dispositivos de oscilação de alta frequência na parede torácica (HFCWO, sigla em inglês) são utilizados para auxiliar desobstrução das vias aéreas em várias condições respiratórias. Este estudo avalia de forma abrangente as evidências sobre eficácia e segurança, identifica tendências em publicações científicas e patentes e lista os requisitos regulatórios em todas as regiões geográficas. Métodos: Este estudo utilizou uma abordagem integrada, combinando pesquisa bibliográfica e bibliométrica com ferramentas de inteligência artificial (IA). A pesquisa bibliográfica sintetizou as evidências seguindo as diretrizes PRISMA® e Cochrane®, para revisões sistemáticas. A Plataforma Dimensions® foi empregada para análise bibliométrica, fornecendo insights sobre o panorama global. As seguintes ferramentas de IA foram utilizadas para aprimorar as capacidades de extração de dados: Nested Knowledge®, SciSpace® e Elicit® com engenharia de prompts Cadeia de Pensamento (CoT) e Árvore de Pensamentos (ToT). Resultados: A meta-revisão identificou 12 revisões sistemáticas que confirmaram a eficácia da HFCWO em melhorar parâmetros de função pulmonar, características do escarro, dispneia, escores de saúde e qualidade de vida em condições que incluem fibrose cística, bronquiectasias, doença pulmonar obstrutiva crônica (DPOC) ou doenças neuromusculares, embora com evidências variadas de certeza. A análise bibliométrica revelou um aumento no interesse global, com 230 publicações de pesquisa, 137 patentes e 56 ensaios clínicos nas últimas duas décadas. A análise do cenário regulatório revelou processos de aprovação distintos em diversos países e regiões. Conclusões: Este estudo destaca a significância clínica dos dispositivos de HFCWO em pacientes com condições respiratórias crônicas específicas. A integração interdisciplinar de ferramentas de IA e engenharia de prompts contribui para uma compreensão detalhada das evidências disponíveis. Essa investigação científica multifacetada fornece uma base abrangente para a tomada de decisões informada e avanços na medicina respiratória.

Palavras-chave: Engenharia Biomédica. HFCWO. Doenças respiratórias. Meta-revisão. Inteligência artificial.

ABSTRACT

HIGH-FREQUENCY CHEST WALL OSCILLATION DEVICES: INSIGHTS INTO THE SCIENTIFIC AND INNOVATION FRAMEWORK

Background. High-frequency chest wall oscillation (HFCWO) devices are used to improve airway clearance in various respiratory conditions. This study comprehensively assesses the evidence on efficacy and safety, identifies trends in scientific publications and patents, and lists regulatory requirements across geographic regions. Methods. This study utilized an integrated approach, combining bibliographic and bibliometric research with artificial intelligence (AI) tools. Bibliographic research synthesized the evidence followed PRISMA® and Cochrane® guidelines, for systematic reviews. The Dimensions platform was used for bibliometric analysis to provide insights into the global landscape. The following AI tools were used to enhance data extraction capabilities: Nested Knowledge®, SciSpace®, Elicit® with prompt engineering Chain-of-Thoughts (CoT), and Tree of Thoughts (ToT). Results. The metareview identified 12 systematic reviews supporting the effectiveness of HFCWO in improving pulmonary function parameters, sputum characteristics, dyspnea, health scores, and quality of life in conditions including cystic fibrosis, bronchiectasis, chronic obstructive pulmonary disease (COPD), or neuromuscular diseases, albeit with varying evidence of certainty. Bibliometric analysis revealed a surge in global interest, with 230 research publications, 137 patents, and 56 clinical trials over the past two decades. Analysis of the regulatory landscape unveiled distinct approval processes across diverse countries and regions. Conclusions. This study highlights the clinical significance of HFCWO devices in patients with specific chronic respiratory conditions. The interdisciplinary integration of AI tools and prompt engineering contributes to a nuanced understanding of the available evidence. This multifaceted scientific inquiry provides a comprehensive foundation for informed decision-making and advances in respiratory medicine.

Keywords: Biomedical engineering. HFCWO. Respiratory diseases. Metareview. Artificial intelligence.

LISTA DE FIGURAS

LISTA DE QUADROS

LISTA DE ABREVIATURAS E SIGLAS

AB - Andrei Brateanu - Instituto de Medicina, Cleveland Clinic, Cleveland, OH, USA.

ACBT - Active Cycle of Breathing Techniques: Ciclo Ativo de Técnicas Respiratórias.

ACTs - Técnicas de Limpeza das Vias Aéreas.

AM - Admilson Marin - Centro de Inovação, Tecnologia e Educação (CITE), Universidade Anhembi Morumbi, Instituto Anima, Parque Tecnológico São José dos Campos, São Jose dos Campos, Brasil.

AMSTAR-2® - A MeaSurement Tool to Assess systematic Reviews-2: Uma Ferramenta de Medição para Avaliar Revisões Sistemáticas-2.

CINAHL® - Cumulative Index of Nursing and Allied Health Literature: Índice Cumulativo de Literatura em Enfermagem e Ciências Aliadas.

CoT - Chain-of-Thoughts: Cadeia de Pensamentos.

CPT - Conventional Physiotherapy: Fisioterapia Convencional.

CVF - Capacidade Vital Forçada

DLCO - Capacidade de Difusão do Monóxido de Carbono.

DPOC - Doença Pulmonar Obstrutiva Crônica.

ECR - Ensaios Clínicos Randomizados.

ELTGOL - L'Expiration Lente Totale Glotte Ouverte en décubitus Latéral: Expiração Total Lenta, Glote Aberta em Decúbito Lateral.

FC - Fibrose Cística.

FEF25-75% - Fluxo Expiratório Forçado entre 25% e 75% da Capacidade Vital.

FEV1 - Volume Expiratório Forçado em 1 Segundo.

FRC - Capacidade Residual Funcional.

FVC - Capacidade Vital Forçada.

GRANTS - Subsídio, relacionado à produção científica.

HFCWO - High Frequence Chest Wall Oscillation: Vibração de Alta Frequência da Parede Torácica.

HRQoL - Qualidade de Vida Relacionada à Saúde e Hospitalização.

IA - Inteligência Artificial.

LAC - Luciana Aparecida Campos - Centro de Inovação, Tecnologia e Educação (CITE), Universidade Anhembi Morumbi, Instituto Anima, Parque Tecnológico São José dos Campos, São Jose dos Campos, Brasil.

LCI - Índice de Depuração Pulmonar.

LLM - Large Language Models: Modelos de Linguagem de Grande Escala.

MD - Mirela Dobre - Divisão de Nefrologia e Hipertensão, University Hospitals, Cleveland, OH, USA.

MEP - Pressão Expiratória Máxima.

MIP - Pressão Inspiratória Máxima.

OCB - Ovidiu Constantin Baltatu - Centro de Inovação, Tecnologia e Educação (CITE), Universidade Anhembi Morumbi, Instituto Anima, Parque Tecnológico São José dos Campos, São Jose dos Campos, Brasil.

OPEP - Pressão Expiratória Positiva Oscilante.

PaO2 - Pressão Parcial de Oxigênio Dissolvida no Sangue Arterial.

PaCO2 - Pressão Parcial de Gás Carbônico Dissolvida no Sangue Arterial.

PDF - Portable Document Format: Formato de Documento Portátil.

PEP - Pressão Positiva Expiatória.

PFTs - Testes de Função Pulmonar.

PICO - Patient/Population, Intervention, Comparison and Outcomes: Paciente/População, Intervenção, Comparação e Resultados.

PLN - Processamento de Linguagem Natural.

PRISMA® - Preferred Reporting Items for Systematic Reviews and Meta-Analyses: Itens Preferenciais para Relato de Revisões Sistemáticas e Metanálises.

RV - Volume Residual.

SP - Surfactante Pulmonar.

CPT - Conventional Physiotherapy - Técnicas de Fisioterapia Convencional.

TFP - Testes de Função Pulmonar.

TLC - Capacidade Pulmonar Total.

ToT - Tree of Thoughts: Árvore de Pensamentos.

VPI - Ventilação Percussiva Intrapulmonar

VCC - Victória Cônsoli Chiaradia - Centro de Inovação, Tecnologia e Educação (CITE), Universidade Anhembi Morumbi, Instituto Anima, Parque Tecnológico São José dos Campos, São Jose dos Campos, Brasil.

SUMÁRIO

1 INTRODUÇÃO

O manejo efetivo das secreções brônquicas e a manutenção das vias aéreas desobstruídas podem ser desafiadores em pacientes com condições respiratórias, neuromusculares ou no período pós-operatório de cirurgias torácicas ou abdominais.

Além dos sistemas de drenagem postural, fisioterapia manual da parede torácica e pressão positiva expiratória (PEP), dispositivos mecânicos têm sido cada vez mais utilizados para facilitar a mobilização e eliminação de secreções.

Os dispositivos funcionam fornecendo oscilação de alta frequência ou compressão e oscilação de alta frequência da parede torácica.

Eles induzem forças vibracionais desde a parede torácica externa, melhorando a mobilidade da secreção e potencialmente alcançando a desobstrução das vias aéreas dentro da árvore brônquica.

Os dispositivos de oscilação de alta frequência da parede torácica (HFCWO) fornecem vibrações eletromecânicas de alta frequência na parede do tórax do paciente. Móveis, são constituídos por colete ou cinta contendo elementos de vibração.

Os dispositivos de compressão e oscilação de alta frequência da parede torácica utilizam compressor para realizar a compressão e vibrações pneumática de alta pressão no tórax do paciente. Não móveis, são constituídos de colete ou cinta insuflados por compressor.

De acordo com Leemans et al., 2020, ambos dispositivos têm eficácia comparável, portanto, neste estudo os nomearemos HFCWO, abreviatura utilizada internacionalmente para referenciar os dispositivos e a técnica.

Evidências empíricas destacaram a eficácia dos dispositivos de HFCWO para desobstrução das vias aéreas em uma variedade de condições médicas.

Pacientes com bronquiectasias relataram melhora na dispneia, tosse e qualidade de vida após o uso de dispositivos de HFCWO (NICOLINI; GRECCHI; BANFI, 2022).

Em pacientes com exacerbações da doença pulmonar obstrutiva crônica (DPOC), os dispositivos de HFCWO impactaram favoravelmente nos parâmetros gasométricos, marcadores inflamatórios e regulação do cortisol (CHENG et al., 2022), aumentou a expectoração de escarro e diminuiu a duração da hospitalização (HUANG et al., 2022).

Em pacientes queimados e inalação de fumaça, a HFCWO pode melhorar a função pulmonar e pode ser incluída nos protocolos abrangentes de reabilitação pulmonar (ALLAM; BADAWY, 2021).

Entre os pacientes com fibrose cística (FC), as investigações destacaram a eficácia comparável dos dispositivos de HFCWO móveis e não móveis em termos de depuração do escarro e alterações resultantes da geometria das vias aéreas (LEEMANS et al., 2020).

Em pacientes com lesão craniocerebral grave, a terapia com dispositivos de HFCWO está associada à melhora dos níveis de oxigenação, melhor complacência pulmonar e aumento das concentrações de proteína surfactante pulmonar (SP) nas vias aéreas (GE et al., 2023).

A terapia com dispositivos de HFCWO exibiu segurança, tolerabilidade e maior adesão entre pacientes pediátricos com paralisia cerebral e distúrbios neuromusculares (YUAN et al., 2010).

Além disso, em pacientes ventilados mecanicamente com secreções excessivas, a HFCWO emergiu como uma terapia adicional valiosa para melhorar a aeração pulmonar (LONGHINI et al., 2020).

Revisões sistemáticas e metanálises recentes têm sido conduzidas para oferecer uma estimativa mais precisa da eficácia dos dispositivos de HFCWO.

O objetivo deste estudo é avaliar de forma abrangente as revisões e determinar a aplicação clínica dos dispositivos de HFCWO em pacientes com doenças pulmonares.

2 DESENVOLVIMENTO

2.1 FUNDAMENTAÇÃO TEÓRICA

Inicialmente desenvolvida para tratar a fibrose cística (FC) nos anos 1990, a terapia HFCWO tem sido amplamente estudada desde então.

A HFCWO funciona através de vários mecanismos para melhorar a função pulmonar e depuração de secreções.

O mecanismo primário é a geração de pressões oscilantes que são transmitidas para o espaço pleural, que por sua vez mobiliza secreções através da vibração e estimulação da tosse (ALLAM; BADAWY, 2021; CHENG et al., 2022; ZUCKER; SKJODT; JONES, 2008).

O nível de fluxo oscilado gerado está diretamente relacionado com a efetividade da HFCWO e o fluxo oscilado é dependente da pressão de pulso transmitida ao esôfago e parede torácica (ZUCKER; SKJODT; JONES, 2008).

A frequência ideal para eliminação de secreção e melhora da função pulmonar é de 15 Hz, independentemente do nível pressórico (ZUCKER; SKJODT; JONES, 2008).

A gestão efetiva das secreções brônquicas e a manutenção desobstruída das vias aéreas são elementos cruciais no cuidado de pacientes com condições respiratórias, neuromusculares ou no período pós-operatório de cirurgias torácicas ou abdominais.

A busca por métodos eficazes para mobilização e eliminação de secreções tem levado à crescente utilização de dispositivos mecânicos, em adição aos métodos tradicionais como sistemas de drenagem postural, fisioterapia manual e PEP.

Nossa abordagem metodológica integrada para pesquisa bibliográfica e bibliométrica combinou busca sistemática em bases de dados, diretrizes para seleção de artigos e análise abrangente.

O uso de ferramentas de inteligência artificial (IA) como Nested Knowledge®, SciSpace®, Elicit® e Dimensions® permitiu a extração de dados e automação de fluxos de trabalho, aprimorando modelos de linguagem para tarefas complexas.

Técnicas de engenharia de prompts, como Cadeias de Pensamentos (CoT) e Árvores de Pensamentos (ToT), foram aplicadas para estimular a capacidade do modelo de linguagem, oferecendo abordagens lógicas e estruturadas para lidar com questões complexas.

Essas diretrizes estabeleceram uma base metodológica sólida, garantindo a precisão na análise do conhecimento disponível.

2.1.1 Dispositivos de HFCWO na Prática Clínica

Os dispositivos de HFCWO têm ganhado destaque na prática clínica. Esses dispositivos podem fornecer oscilações eletromecânicas de alta frequência na parede do tórax do paciente, utilizando diferentes abordagens, como oscilação da parede torácica de alta frequência móvel e não móvel.

De acordo com Leemans et al. (2020), os dispositivos de oscilação da parede torácica de alta frequência, sejam móveis - com colete ou cinta contendo elementos de vibração ou não móveis - compressor realizando compressão e vibrações pneumáticas de alta pressão, demonstram eficácia comparável.

2.1.2 Evidências Clínicas da Eficácia dos Dispositivos de HFCWO

Evidências empíricas destacam a eficácia dos dispositivos de HFCWO em várias condições médicas. Em pacientes com bronquiectasias, houve relatos de melhora significativa na dispneia, tosse e qualidade de vida após o uso desses dispositivos (NICOLINI, GRECCHI, & BANFI, 2022).

Em casos de exacerbações da DPOC, os dispositivos de HFCWO impactaram positivamente nos parâmetros gasométricos, marcadores inflamatórios e regulação do cortisol, além de aumentar a expectoração de escarro e reduzir a duração da hospitalização (CHENG et al., 2022; HUANG et al., 2022).

Pacientes queimados e expostos à inalação de fumaça também se beneficiaram do uso de dispositivos de HFCWO, melhorando a função pulmonar e integrando-se aos protocolos abrangentes de reabilitação pulmonar (ALLAM & BADAWY, 2021).

Para pacientes com FC, as investigações destacam a eficácia comparável dos dispositivos de HFCWO móveis e não móveis em termos de depuração do escarro e alterações na geometria das vias aéreas (LEEMANS et al., 2020).

2.1.3 Impacto em Populações Específicas e Segurança do Uso

Em pacientes com lesão craniocerebral grave, a terapia com dispositivos de HFCWO está associada à melhoria nos níveis de oxigenação, complacência pulmonar e concentrações de proteína surfactante pulmonar (SP) nas vias aéreas (GE et al., 2023).

Notavelmente, em pacientes pediátricos com paralisia cerebral e distúrbios neuromusculares, os dispositivos de HFCWO exibiram segurança, tolerabilidade e maior adesão (YUAN et al., 2010).

Até mesmo em pacientes ventilados mecanicamente com secreções excessivas, a HFCWO emergiu como uma terapia adicional valiosa para melhorar a aeração pulmonar (LONGHINI et al., 2020).

2.1.4 Revisões Sistemáticas e Metanálises

Para oferecer uma visão mais abrangente da eficácia dos dispositivos de HFCWO, várias revisões sistemáticas e metanálises foram conduzidas recentemente. Esses estudos consolidam as evidências disponíveis, fornecendo uma estimativa mais precisa da utilidade clínica desses dispositivos no escopo da fisioterapia de doenças respiratórias.

2.1.5 Objetivos do Estudo Atual

Diante da crescente relevância dos dispositivos de HFCWO, este estudo tem como objetivo:

Resumir de maneira abrangente revisões sistemáticas e metanálises existentes sobre a eficácia e segurança dos dispositivos de HFCWO no tratamento de doenças respiratórias.

Identificar tendências em publicações científicas e patentes relacionadas a dispositivos de HFCWO.

Listar e resumir os requisitos regulamentares para dispositivos de HFCWO em diferentes regiões geográficas.

Os dispositivos de HFCWO representam uma abordagem inovadora e eficaz na gestão de secreções brônquicas em uma variedade de condições médicas.

As evidências clínicas destacam seus benefícios em diversas populações, desde pacientes com condições respiratórias crônicas até casos agudos pós-cirúrgicos.

A análise de revisões sistemáticas e metanálises, juntamente com a exploração de tendências e requisitos regulamentares, permitirá uma compreensão mais abrangente do papel desses dispositivos na prática clínica e seu potencial aplicação em diferentes contextos de cuidado à saúde.

2.2 MÉTODOS

Este estudo adotou uma abordagem integrada, unindo métodos de pesquisa bibliográfica e bibliométrica e fazendo uso de ferramentas de IA.

Na pesquisa bibliográfica, método de investigação que envolve a busca, análise e revisão de material já publicado, como livros, artigos, teses e outros documentos. foi realizada uma busca sistemática em diversas bases de dados, seguindo diretrizes estabelecidas para a seleção e síntese de artigos.

A análise bibliométrica, abordagem quantitativa que utiliza métodos estatísticos para analisar e medir a produção, disseminação e impacto da literatura científica em uma determinada área do conhecimento, utilizou a plataforma Dimensions®, realizando uma busca booleana para extrair dados relevantes dentro de um período específico.

Ferramentas de IA, como Nested Knowledge®, SciSpace®, Elicit® e Perplexity®, desempenharam um papel essencial na extração de dados, automação de fluxos de trabalho e aprimoramento das habilidades do modelo de linguagem para tarefas complexas.

Técnicas de engenharia de prompts, como Cadeia de Pensamentos (CoT) e Árvore de Pensamentos (ToT), aprimoraram a capacidade do modelo de linguagem em lidar logicamente com questões complexas.

A pesquisa bibliográfica seguiu diretrizes estabelecidas, como PRISMA® e recomendações Cochrane, abrangendo bases de dados como PubMed®, Europe PubMed Central®, Cochrane Database of Systematic Reviews® e CINAHL®.

A triagem dos artigos foi minuciosa e conduzida por uma equipe de pesquisadores sob supervisão de especialistas.

O instrumento AMSTAR-2® foi usado para avaliar a qualidade metodológica, considerando vários domínios e o referencial PICO, sigla em inglês para Paciente/População, Intervenção, Comparação e Resultados, estruturou as questões de pesquisa.

Os achados foram analisados para identificar temas comuns e concluiu-se uma análise comparativa do cenário regulatório para dispositivos de HFCWO em diferentes regiões geográficas.

As plataformas de IA foram fundamentais para gerenciar a literatura e automatizar a revisão, enquanto as técnicas de engenharia de prompts acrescentaram sofisticação às ferramentas de IA, permitindo raciocínio lógico em tarefas complexas.

Essa abordagem integrada proporcionou uma compreensão abrangente dos dispositivos de HFCWO e seus contextos regulatórios e de propriedade intelectual.

2.2.1 Pesquisa Bibliográfica

A pesquisa bibliográfica no presente estudo foi conduzida seguindo as diretrizes descritas no PRISMA® (PAGE et al., 2021) e nas recomendações Cochrane® para revisões guarda-chuva (CHOI; KANG, 2023; GATES et al., 2022).

A busca na análise bibliográfica incluiu artigos que se limitaram a sínteses de evidências originais, originais e revisadas por pares - por exemplo, revisões sistemáticas e metanálises.

2.2.2 Fontes Bibliográficas e Estratégias de Busca

PubMed®, Europe Pubmed Central®, Cochrane Database of Systematic Reviews®, e Cumulative Index of Nursing and Allied Health Literature (CINAHL®) foram pesquisados desde setembro de 2003 até setembro de 2023 para revisões sistemáticas com ou sem metanálises de ensaios clínicos randomizados (ECR) examinando a eficácia e segurança dos dispositivos de HFCWO para a desobstrução das vias aéreas e melhora da função pulmonar em qualquer doença pulmonar.

Foram excluídos artigos com títulos e resumos que não atendiam aos critérios de qualificação. As demais publicações foram lidas exaustivamente e avaliadas de acordo com os princípios do PRISMA®. Dois pesquisadores (AM e VCC) fizeram a triagem preliminar, revisão detalhada do texto completo e análise dos critérios de inclusão e exclusão sob a supervisão de pesquisadores seniores (MD, AB, LAC e OCB).

A busca no PubMed® na base de dados Medline utilizou o seguinte *query* para identificação de revisões sistemáticas e metanálises sobre dispositivos de HFCWO: ("chest wall oscillation" OR ("chest" AND "wall" AND "oscillation") OR "chest wall oscillation" OR ("high" AND "frequency" AND "chest" AND "wall" AND "oscillation") OR "high frequency chest wall oscillation" OR ("chest wall oscillation" OR ("chest" AND "wall" AND "oscillation") OR "chest wall oscillation" OR ("high" AND "frequency" AND "chest" AND "wall" AND "compression") OR "high frequency chest wall compression") OR (("chested" OR "thorax" OR "thorax" OR "chest" OR "chests") AND ("vibrate" OR

"vibrated" OR "vibrates" OR "vibrating" OR "vibration" OR "vibration" OR "vibrations" OR "vibrational" OR "vibrator" OR "vibrators")) OR "vibrotherapy") AND ((("airway" OR "airway s" OR "airways") AND ("clearance" OR "clearances")) OR ("sputum" OR "sputum" OR "sputums") OR ("bronchial" OR "bronchiale" OR "bronchials")).

A *query* utilizada para a busca no Europe Pubmed Central® foi: (PUB_TYPE:"Meta-Analysis") High-Frequency Chest Wall Oscillation (TI (meta?analys* or "systematic review*")) or (AB (meta?analys* or "systematic review*")).

A abordagem de busca empregada para a base de dados CINAHL® (EBSCOhost®) foi a seguinte*:* Search Terms: High-Frequency Chest Wall Oscillation; Search Options: Expanders - Apply related words; Also search within the full text of the articles; Apply equivalent subjects, Search modes - Boolean/Phrase; Source Types: Reviews.

Revisões Cochrane® correspondentes à High-Frequency Chest Wall Oscillation na palavra-chave abstrata do título - em Revisões Cochrane®, Respostas Clínicas, Editoriais, Coleções Especiais (variações de palavras foram pesquisadas) foram pesquisadas na Base de Dados Cochrane® de Revisões Sistemáticas.

A plataforma Nested Knowledge® foi usada para gerenciar as revisões sistemáticas relevantes e remover quaisquer revisões duplicadas.

Foram estabelecidos critérios de inclusão, considerando o intervalo da data de publicação, o idioma e a relevância para a questão de pesquisa. Revisões sistemáticas que atenderam aos critérios de inclusão foram selecionadas para inclusão na meta-revisão.

2.2.3 Avaliação, Síntese e Análise da Qualidade Bibliográfica

Dois autores de revisão (AM e VCC) analisaram a inclusão dos artigos na íntegra. As discordâncias foram resolvidas por consenso facilitado por autores seniores. Os

artigos completos selecionados para inclusão e os excluídos, juntamente com os motivos de exclusão, estão listados no Apêndice A.

A qualidade metodológica das revisões sistemáticas incluídas foi avaliada por meio da ferramenta AMSTAR-2® (SHEA et al., 2017).

O instrumento é composto por 16 itens que avaliam os seguintes domínios (BENZ et al., 2023; KILPATRICK et al., 2023). (ANEXO 1)

Cada domínio é classificado com um "sim", "sim parcial" ou "não". Sete desses domínios (2, 4, 7, 9, 11, 13, 15) são considerados essenciais.

A ferramenta categoriza a confiança geral nos resultados da revisão em alta - nenhuma ou apenas uma fraqueza não crítica, moderada - mais de uma fraqueza não crítica, baixa - uma falha crítica com ou sem fraquezas não crítica e criticamente baixa - mais de uma falha crítica com ou sem fraquezas não críticas.

A qualidade das revisões incluídas foi avaliada por AM e VCC e quaisquer preocupações foram discutidas e resolvidas com os outros pesquisadores.

Aplicamos a estrutura PICO para estruturar e refinar as questões de pesquisa para a revisão guarda-chuva, permitindo uma análise sistemática e focada das revisões sistemáticas e metanálises incluídas:

- População: Pacientes com qualquer doença pulmonar;
- Intervenção: Dispositivos de HFCWO;
- Comparação: Placebo, tratamento padrão ou técnicas alternativas de desobstrução das vias aéreas - conforme identificado em revisões sistemáticas;
- Desfecho: Resultados de eficácia e segurança de revisões sistemáticas.

Dados relevantes para a questão de pesquisa, incluindo condições de saúde direcionadas, intervenções avaliadas e resultados medidos, foram extraídos das revisões sistemáticas selecionadas.

Os principais achados e conclusões das revisões sistemáticas incluídas foram sintetizados e analisados.

Temas comuns, discrepâncias ou tendências nos resultados foram identificados, fornecendo insights sobre o estado do conhecimento dos dispositivos de HFCWO e suas aplicações terapêuticas.

Os artigos identificados nas fontes bibliográficas investigadas foram investigados por dois pesquisadores AM e VCC e suas avaliações bibliográficas foram verificadas pelos pesquisadores seniores do grupo.

As plataformas de IA SciSpace® e Elicit® foram usadas para automatizar fluxos de trabalho para revisões de literatura, construir consultas, examinar artigos e para ajudar a resumir os pontos-chave de cada publicação. Elas usam uma técnica de extração de informações para recuperar informações de cada documento.

Uma combinação de estratégias de prompts combinadas com modelos de linguagem de grande escala (LLM) foi recentemente proposta para produzir respostas mais informativas (SINGHAL et al., 2023).

Usamos Cadeias de Pensamento (CoT) (OTT et al., 2023) e Árvore de Pensamento (ToT) (YAO et al., 2023), que são técnicas de engenharia de prompts baseadas em pensamento, como uma combinação de estratégias de estímulo para obter respostas mais abrangentes e informativas com SciSpace® e Elicit®.

Esses tipos de instruções exigem que o LLM gere uma sucessão de ideias interconectadas. Instruções de cadeia de pensamentos e árvore de pensamentos foram adaptados a perguntas científicas específicas para SciSpace® e Elicit® gerarem uma resposta mais lógica e estruturada.

2.2.4 Pesquisa Bibliométrica

O estudo bibliométrico empregou o uso do Dimensions®, uma plataforma de pesquisa multidisciplinar abrangente que engloba artigos acadêmicos*, grants*, ensaios clínicos e patentes (HOOK; CARREGADOR; HERZOG, 2018).

Os dados foram obtidos em 30 de setembro de 2023, na plataforma Dimensions® da Digital Science & Research Solutions Inc®, disponível em https://app.dimensions.ai.

O acesso foi concedido a fontes de dados somente de assinatura sob um contrato de licença. A busca restringiu-se ao período de 2003 a 2023.

Os termos de busca booleanas utilizados na Plataforma Dimensions®, para patentes de 2003 até hoje foram: '(""chest wall oscillation"" OR (""chest"" AND ""wall"" AND ""oscillation"") OR ""chest wall oscillation"" OR (""high"" AND ""frequency"" AND ""chest"" AND ""wall"" AND ""oscillation"") OR ""high frequency chest wall oscillation"" OR (""chest wall oscillation"" OR (""chest"" AND ""wall"" AND ""oscillation"") OR ""chest wall oscillation"" OR (""high"" AND ""frequency"" AND ""chest"" AND ""wall"" AND ""compression"") OR ""high frequency chest wall compression"") OR ((""chested"" OR ""thorax"" OR ""thorax"" OR ""chest"" OR ""chests"") AND (""vibrate"" OR ""vibrated"" OR ""vibrates"" OR ""vibrating"" OR ""vibration"" OR ""vibration"" OR ""vibrations"" OR ""vibrational"" OR ""vibrator"" OR ""vibrators"")) OR ""Vibrotherapy"") AND ((((""airway"" OR ""airway s"" OR ""airways"") AND (""clearance"" OR ""clearances"")) OR (""sputum"" OR ""sputum"" OR ""sputums"") OR (""bronchial"" OR ""bronchiale"" OR ""bronchials"")))' no título e no resumo.

2.2.5 Pesquisa sobre Regulamentos de Dispositivos de HFCWO em Diferentes Regiões Geográficas

Para realizar uma análise comparativa do cenário regulatório para dispositivos de HFCWO, pesquisamos dispositivos de HFCWO na literatura médica e cinza para obter uma lista abrangente de dispositivos em desenvolvimento ou comercializados.

Pesquisas na literatura cinzenta e no Perplexity.ai® do Google® foram usadas para identificar nomes de dispositivos de HFCWO e/ou aprovação regulatória e/ou acesso ao mercado.

A Perplexity.ia® é uma ferramenta de chat com IA que atua como um mecanismo de busca. Ela é projetada para auxiliar os usuários na busca por informações na web.

Agências Reguladoras responsáveis por aprovar e regulamentar dispositivos de HFCWO foram identificadas em países e regiões representativos: Europa, América do Norte, América do Sul, Ásia, África e Austrália.

Em seguida, coletamos informações sobre os requisitos regulatórios para dispositivos de HFCWO em cada jurisdição, pesquisando os sites das agências reguladoras ou entrando em contato diretamente.

Comparamos os requisitos regulatórios em cada jurisdição para identificar semelhanças e diferenças. Também analisamos o cenário regulatório para identificar tendências e padrões e identificar eventuais lacunas ou inconsistências na regulamentação.

2.2.6 Ferramentas de pesquisa bibliográfica e bibliométrica baseadas em IA

Plataformas alimentadas por IA, como Nested Knowledge®, SciSpace®, Elicit® e Dimensions®, para realizar pesquisas bibliográficas.

Todas essas plataformas são capazes de diferentes tarefas, como gerar texto, traduzir idiomas, escrever diferentes tipos de conteúdo criativo e responder às suas perguntas de forma informativa.

O Nested Knowledge® é uma plataforma de software abrangente para revisão sistemática da literatura e metanálises (COWIE et al., 2022). Ele fornece uma variedade de ferramentas e recursos para ajudá-lo a identificar, avaliar e sintetizar evidências de pesquisa.

O SciSpace® é uma plataforma online de gestão de bases de dados bibliográficas. Ao analisar o PDF do artigo, o SciSpace Copilot® pode servir como um assistente de pesquisa de IA resumindo publicações de pesquisa, resumindo introdução e conclusão, identificando limitações e respondendo a perguntas de pesquisa específicas.

Elicit® é uma plataforma para realizar pesquisas bibliográficas e receber respostas de uma variedade de fontes, incluindo os PDFs de vários artigos.

Essas plataformas de pesquisa de IA podem ajudar a encontrar informações relevantes e estruturar argumentos.

Elas usam LLMs avançados que podem automatizar fluxos de trabalho para revisões de literatura.

A plataforma Dimensions® fornece dados sobre resultados de pesquisa, como artigos, patentes e conjuntos de dados.

2.2.7 Engenharia prompts baseada em pensamento

A engenharia de prompts baseada em pensamento foi usada para aprimorar as capacidades dos modelos de linguagem.

Envolve a estruturação de prompts para guiar o modelo através de uma sequência de pensamentos ou etapas de raciocínio para chegar a uma resposta final. Essa técnica é particularmente útil para tarefas complexas que exigem raciocínio de várias etapas.

Foram utilizados dois métodos de engenharia de prompts baseados em pensamentos CoT e ToT (Figura 1).

As instruções em CoT, introduzido por Wei et al (2022), permite capacidades complexas de raciocínio por meio de etapas intermediárias de raciocínio (WEI et al., 2022).

Quando combinado com instruções de poucas amostras, isso aprimora a eficácia no enfrentamento de tarefas mais intrincadas que exigem uma fase preliminar de raciocínio antes de gerar uma resposta.

Por exemplo, para uma tarefa como "Os números ímpares neste grupo somam um número par: 4, 8, 9, 15, 12, 2, 1", o CoT envolveria a adição de todos os números ímpares (9, 15, 1), resultando em 25. A resposta é Falsa.

Este método é particularmente útil quando não há muitos exemplos disponíveis para usar no prompt.

A ToT foi criada por Yao et al. (2023) e Long (2023) como uma maneira de promover correntes de pensamento e apoiar a exploração de pensamentos que podem ser utilizados como blocos de construção para a resolução geral de problemas com modelos de linguagem. Por exemplo, a ToT mantém o rastreamento de uma árvore de pensamentos.

Pensamentos são sequências lógicas de palavras que auxiliam na resolução de problemas. Com este método, um modelo de linguagem pode avaliar seu progresso na resolução de um problema por meio de raciocínio consciente.

A combinação da capacidade do modelo de linguagem em conceber e avaliar ideias com métodos de busca (como busca em largura e busca em profundidade) permite percorrer ideias de maneira planejada, avançando e retrocedendo no tempo.

Por meio de uma conversa em várias rodadas, ambos esses métodos aprimoram a capacidade dos modelos de linguagem em resolver problemas difíceis.

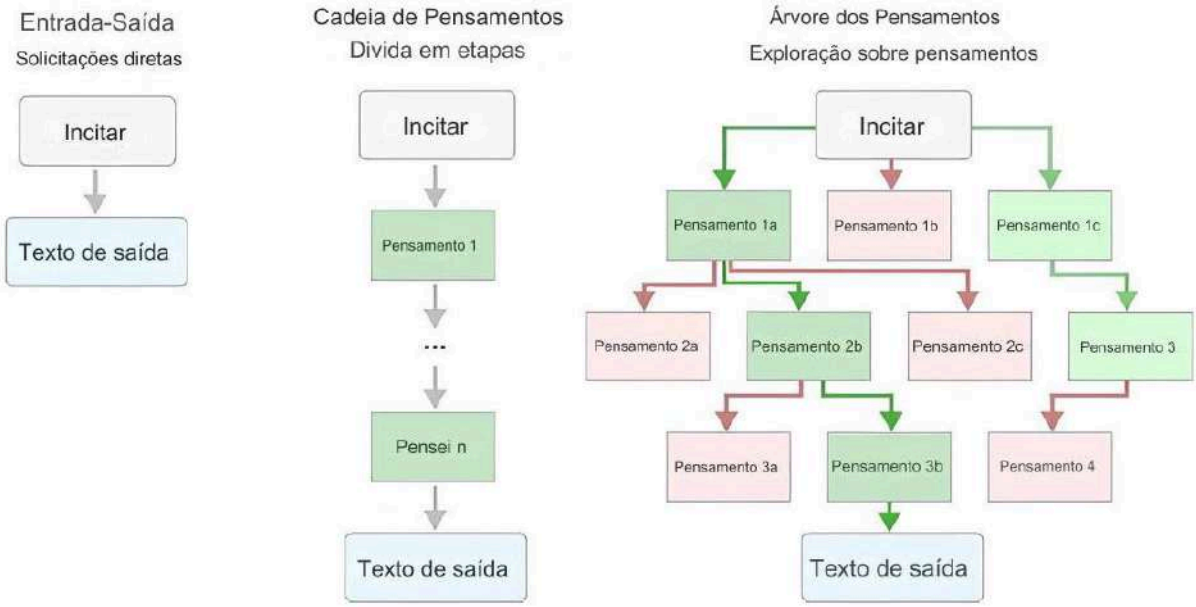

Figura 1. Métodos de Engenharia de Prompts Baseados em Pensamentos: Cadeia de Pensamentos (CoT) e Árvores de Pensamentos (ToT).
Fonte: ("3 métodos fáceis para melhorar seu modelo de linguagem grande | Rumo à Ciência de Dados,")

Os prompts primários de engenharia empregados abrangeram indagações sobre as condições de saúde alvo sob investigação, as intervenções específicas incluídas na revisão, os resultados relacionados à HFCWO - Oscilação da Parede Torácica de Alta Frequência, a duração das intervenções dos dispositivos e o nível de certeza nas evidências:

Quais condições de saúde foram investigadas ?;

Que intervenções específicas estão incluídas na revisão ?;

Qual a duração das intervenções dos dispositivos de HFCWO - Oscilação da Parede Torácica de Alta Frequência ?;

Quais são os resultados dos dispositivos de HFCWO - Oscilação da Parede Torácica de Alta Frequência ?;

Qual a certeza das provas ?

2.3 RESULTADOS

2.3.1 Síntese das Evidências Científicas sobre Dispositivos de HFCWO - Uma Meta-revisão Bibliográfica

A meta-revisão identificou 12 revisões sistemáticas de 35 revisões sistemáticas e metanálises triadas (Figura 2).

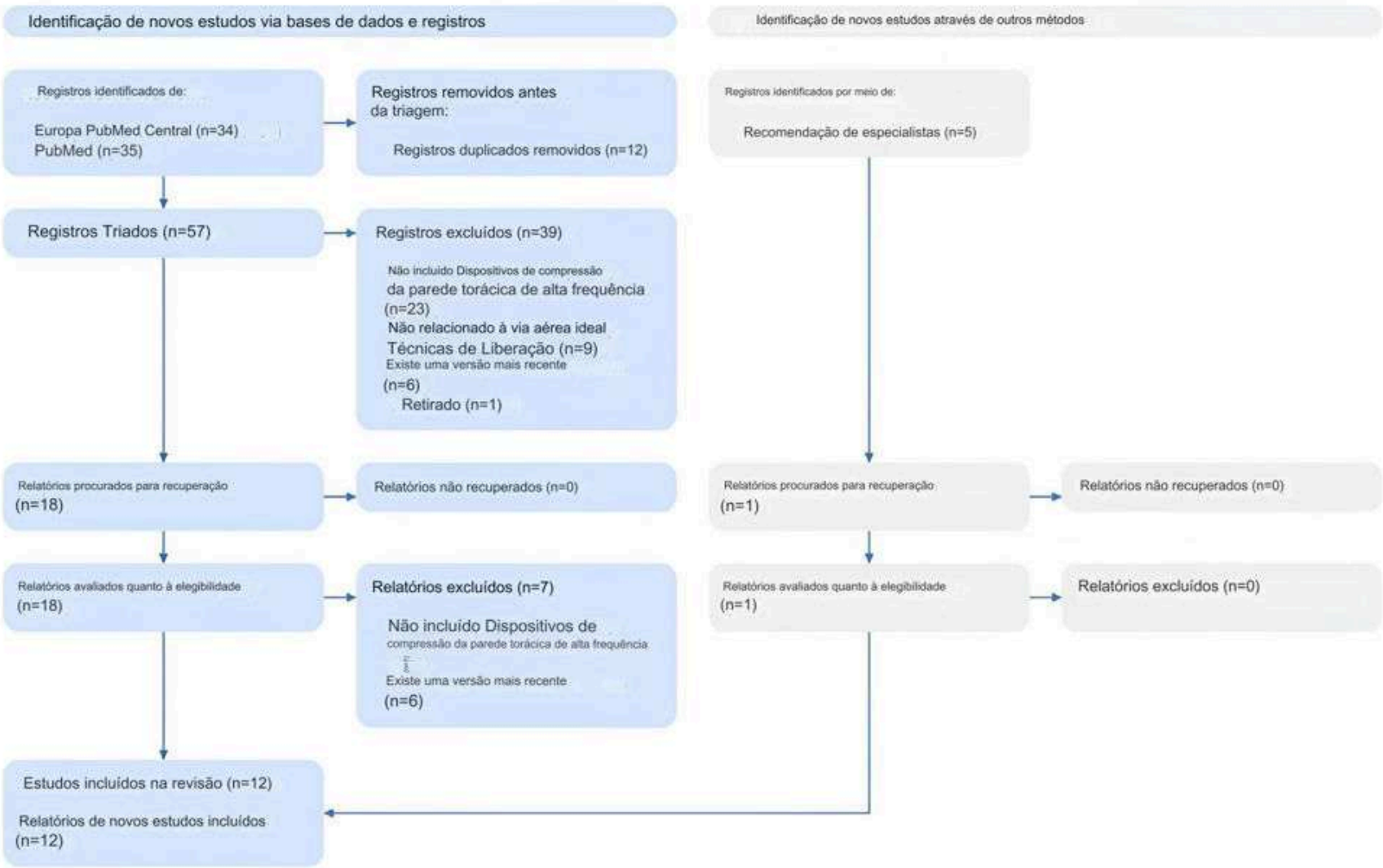

Figura 2. Diagrama PRISMA®: Dispositivos de HFCWO.

Fonte: Nested Knowledge®

As análises PICO mostraram os seguintes desfechos como os principais desfechos para os dispositivos de HFCWO – Oscilação de Alta Frequência da Parede Torácica: expectoração de escarro, volume expiratório forçado, função pulmonar, preferência, qualidade de vida e mortalidade (Figura 3).

Figura 3. Inspetor de Estudo: Extração RoboPICO® de 12 registros correspondentes.
Fonte: Nested Knowledge®

A análise das metarevisões bibliográficas compreendeu doze revisões sistemáticas, sendo uma delas uma revisão sistemática da Cochrane®. Os dados das 12 revisões sistemáticas selecionadas foram extraídos e categorizados, conforme apresentado no Apêndice A.

Os ensaios individuais incluídos nas avaliações frequentemente careciam de dados suficientes para avaliar o risco de viés. Vários estudos não tinham descrições suficientes de métodos, esquemas de tratamento, medidas de desfecho e efeitos adversos e tinham níveis baixos a muito baixos de certeza de evidência. Oito das doze revisões sistemáticas apresentaram nível de confiança AMSTAR-2® moderado a alto (Quadro 2).

As 12 revisões sistemáticas identificadas investigaram a eficácia comparativa dos dispositivos de HFCWO com outras técnicas de fisioterapia para uma variedade de condições.

O objetivo primário dos dispositivos de HFCWO foi auxiliar indivíduos com comprometimento da desobstrução das vias aéreas na eliminação efetiva do muco de suas vias aéreas no contexto de doenças respiratórias e condições neuromusculares, englobando:

- Fibrose Cística
- Bronquiectasia
- DPOC ou
- Doença Pulmonar Crônica Decorrente de Doença Neuromuscular.

2.3.2 Achados de revisões sistemáticas sobre HFCWO: Avaliação de eficácia e segurança em diferentes condições de saúde

Um resumo das revisões sistemáticas que examinam a eficácia e a segurança das intervenções dos dispositivos de HFCWO para várias condições de saúde, incluindo

condições do paciente, adesão, função pulmonar e produção de escarro é apresentado no Quadro 1.

Fibrose cística, pneumonia, DPOC e bronquiectasias estão entre os temas investigados nesses estudos.

As durações, os resultados de eficácia, as avaliações de segurança e a certeza das evidências referentes a cada intervenção são detalhados para cada estudo.

Várias revisões relataram a ausência de eventos adversos associados aos tratamentos com dispositivos de HFCWO, o que ressalta o perfil de segurança dessas intervenções.

Restrições de pesquisa, tamanho da amostra, cegamento e taxas de atrito contribuem para a ampla gama de qualidade geral da evidência entre os estudos, avaliada por essas revisões sistemáticas como baixa a muito baixa.

A revisão sistemática de Warnock e Gates teve como objetivo comparar a eficácia e a aceitabilidade das técnicas de desobstrução das vias aéreas em pessoas com fibrose cística com aquelas sem técnicas de desobstrução das vias aéreas ou tosse isolada (WARNOCK; GATES, 2023). Foram incluídos estudos randomizados e quase-randomizados. Foram incluídos dois artigos completos com estudos que avaliaram a HFCWO para desobstrução de vias aéreas (BRAGGION et al., 1995; GROSSE-ONNEBRINK et al., 2017). Os achados desta revisão sistemática sugerem que a HFCWO pode ter efeitos em curto prazo no aumento do peso do escarro em pacientes com FC. Um estudo encontrou uma resposta variável ao tratamento com dispositivos de HFCWO (GROSSE-ONNEBRINK et al., 2017). A certeza das evidências para esses achados é baixa. No entanto, a revisão observa que todos os estudos incluídos tiveram acompanhamento de curto prazo e, portanto, nenhuma conclusão pôde ser tirada sobre os efeitos de longo prazo da terapia com dispositivos de HFCWO em pessoas com fibrose cística.

A revisão sistemática de Wilson et al., com o objetivo de comparar a eficácia clínica da técnica do ciclo ativo respiratório (ACBT) com outras terapias de desobstrução das vias aéreas na FC (WILSON; SALDANHA; ROBINSON, 2023). Foram incluídos estudos randomizados, quase-randomizados e cruzados. Foram incluídos dois artigos completos com estudos que avaliaram a HFCWO (OSMAN et al., 2010; PHILLIPS et al., 2004). Os achados desta revisão sistemática sugerem que a HFCWO teve efeitos sobre os testes de função pulmonar (TFP), secreção expectorada e saturação de oxigênio comparáveis aos da ACBT. No entanto, Phillips et al. (PHILLIPS et al., 2004) verificaram que a HFCWO teve pior desempenho que a ACBT em termos de aumento do peso do escarro e TFP. Nenhum evento adverso ou piora dos sintomas pulmonares foi observado nos estudos. A certeza das evidências era muito baixa.

A revisão sistemática de Chen et al., teve como objetivo avaliar a eficácia e a segurança da fisioterapia respiratória para pneumonia em adultos (CHEN et al., 2022). Foram incluídos estudos randomizados e quase-randomizados. Um artigo completo com um estudo que avaliou HFCWO foi incluído (SHI et al., 2017). Os achados desta revisão sistemática sugerem que a HFCWO tem um impacto limitado na mortalidade e pode reduzir ligeiramente o tempo de internação na UTI em 3,8 dias, ao mesmo tempo em que reduz o tempo de ventilação mecânica em três dias. Não foram relatados dados de eventos adversos nos estudos. A certeza geral da evidência é muito baixa devido às limitações como amostras pequenas, resultados imprecisos, falta de cegamento, métodos fisioterapêuticos não padronizados e desafios na definição de desfechos significativos. A análise por intenção de tratar foi insuficiente, e as altas taxas de abandono contribuíram ainda mais para a baixa certeza das evidências.

A revisão sistemática de Khan et al., com o objetivo de avaliar o impacto de vários regimes de exercícios na obstrução, dispneia e qualidade de vida de indivíduos com diagnóstico de DPOC (KHAN; SOUZA; AHMED, 2022). Foram incluídos estudos randomizados e quase-randomizados. Quatro artigos completos com estudos que avaliaram a HFCWO em pacientes com DPOC (NICOLINI et al., 2018), DPOC e asma (MAHAJAN et al., 2011), exacerbação aguda da DPOC (S. FARAG; EL-SYED, 2017) e bronquiectasias (NICOLINI et al., 2013) foram incluídas. Os achados desta revisão

sistemática sugerem que a HFCWO, utilizada isoladamente ou em conjunto com a fisioterapia respiratória tradicional e dispositivos como o Flutter®, auxilia na remoção de muco e secreções, resultando em melhor dispneia e qualidade de vida em pacientes com doenças obstrutivas. A evidência foi avaliada como alta a moderada.

A revisão sistemática de Huang et al., com o objetivo de sintetizar as evidências disponíveis sobre a eficácia da HFCWO em melhorar a expectoração de escarro e encurtar o tempo de internação hospitalar em pacientes com DPOC hospitalizados por exacerbações agudas (HUANG et al., 2022). Foram incluídos ensaios clínicos randomizados. Treze artigos completos com estudos que avaliaram HFCWO foram incluídos, três dos quais eram artigos escritos em inglês (CHAKRAVORTY; CHAHAL; AUSTIN, 2011; GOKTALAY et al., 2013; MAHAJAN et al., 2011). A metanálise descobriu que a HFCWO aumentou significativamente o volume expectorado do escarro e encurtou o tempo de internação hospitalar. Os níveis de VEF1 (%), PaO2 e PaCO2, por outro lado, não melhoraram consideravelmente. Os treze estudos foram classificados como tendo alguma preocupação ou alto risco de viés de relato, principalmente devido à falta de disponibilidade do protocolo.

A revisão sistemática de Morrison e Milroy teve como objetivo identificar se os dispositivos HFCWO ou oral são úteis para a depuração mucociliar e se são melhores do que outros métodos de desobstrução das vias aéreas para secreções da FC (MORRISON; MILROY, 2020). Trinta e nove estudos clínicos randomizados e controlados foram incluídos, dos quais 20 foram cruzados em delineamento. Cinco artigos completos compararam a HFCWO com a TCP (ARENS et al., 1994; BRAGGION et al., 1995; HANSEN; WARWICK, 1990; KLUFT et al., 1996; WARWICK; WIELINSKI; HANSEN, 2004), quatro estudos compararam a HFCWO com o dispositivo Flutter® (MODI et al., 2010; OERMANN et al., 2001; OSMAN et al., 2010; SONTAG et al., 2010), um estudo comparou a HFCWO com a ventilação percussiva intrapulmonar (VPI) (VAREKOJIS et al., 2003), dois estudos compararam a HFCWO com a pressão expiratória positiva (PEP) (DARBEE; KANGA; OHTAKE, 2005; MCILWAINE et al., 2013) e um estudo comparou HFCWO com o VibraLung® (WHEATLEY et al., 2018). Dois estudos compararam a HFCWO com o ciclo ativo das técnicas respiratórias (MODI et al.,

2010; PHILLIPS et al., 2004). Dois estudos compararam a HFCWO com as técnicas usuais de desobstrução das vias aéreas (KHAN; LIAN; MIKITCHENKO, 2014; OSMAN et al., 2010). A análise de estudos comparando a HFCWO com outras técnicas de desobstrução das vias aéreas não mostrou impacto significativo na função pulmonar (VEF1, CVF, FEF25-75%). A HFCWO resultou em maior peso do escarro, mas não volume, em comparação com a PEP ou a técnica de desobstrução das vias aéreas. Um estudo favoreceu a HFCWO para eliminação de muco em relação à TCP. Os níveis de SaO2 variaram entre os estudos. No geral, a revisão sistemática de Morrison e Milroy (2020) considerou evidências de dezessete estudos e concluiu que a qualidade da evidência para essas comparações era geralmente baixa a muito baixa. Os autores enfatizaram a necessidade de estudos maiores e mais longos para investigar desfechos como infecções pulmonares, preferência do paciente, adesão à terapia e satisfação geral. A revisão não encontrou evidências convincentes que sustentassem a superioridade dos aparelhos vibratórios sobre outros métodos fisioterapêuticos ou de um tipo de dispositivo sobre outro, ressaltando a importância de mais pesquisas nessa área.

A revisão sistemática de McIlwaine et al. (2019), com o objetivo de investigar a eficácia e aceitabilidade dos dispositivos de PEP em relação a outras formas de fisioterapia para aumentar a depuração de muco e outros desfechos em pacientes com fibrose cística (MCILWAINE; BOTÃO; NEVITT, 2019). A revisão sistemática incluiu um total de 28 estudos randomizados controlados, 18 dos quais foram cruzados em delineamento. Foram incluídos quatro artigos completos com estudos que compararam a HFCWO com a PEP (BRAGGION et al., 1995; DARBEE; KANGA; OHTAKE, 2005; FAINARDI et al., 2011; MCILWAINE et al., 2013). Nas comparações entre HFCWO e PEP, não foram encontradas diferenças significativas em termos de eventos adversos e efeitos na função pulmonar (VEF1, CVF, FEF25-75%). Ao longo de um ano de estudo, ambos os tratamentos tiveram impactos semelhantes no VEF1 e na CVF. No entanto, a PEP levou a menos exacerbações respiratórias (evidências de alta qualidade). Os níveis de SpO2 diminuíram com a HFCWO e aumentaram com a PEP durante o tratamento. Ambos os métodos melhoraram a depuração pulmonar, sem diferença significativa. O custo dos dispositivos de HFCWO foi notavelmente mais alto. A adesão foi alta para

ambos os tratamentos (96%). Em um cenário de tratamento único, mais participantes preferiram PEP em vez de HFCWO. Embora o número total de eventos adversos não tenha diferido, a HFCWO foi associada a mais eventos adversos relacionados às vias aéreas inferiores (tosse, infecção torácica, hemoptise, diminuição da função pulmonar, dor torácica) do que a PEP (evidência de alta qualidade).

A revisão sistemática de De Alvarenga et al., objetivou identificar as principais estratégias de intervenção fisioterapêutica utilizadas para o tratamento hospitalar de pacientes com doença pulmonar obstrutiva crônica (DPOC) e sua efetividade (DE ALVARENGA et al., 2016). A revisão sistemática incluiu seis artigos que avaliaram diferentes estratégias de intervenção fisioterapêutica sem o uso de ventilação artificial. Um artigo completo com um estudo que avaliou HFCWO foi incluído (MAHAJAN et al., 2011). O grupo HFCWO apresentou redução da dispneia em relação ao grupo controle, enquanto os demais fatores avaliados não apresentaram resultados significativos. Várias intervenções fisioterapêuticas foram empregadas em pacientes hospitalizados com DPOC, incluindo exercício físico, exercícios respiratórios, expiração total lenta, glote aberta em decúbito lateral (ELTGOL), HFCWO, espirômetros de incentivo e eletro acupuntura. Diferenças metodológicas entre os estudos limitaram a geração de alto nível de evidência.

A revisão sistemática de Winfield et al., com o objetivo de avaliar a eficácia de opções terapêuticas não farmacêuticas para o manejo da morbidade respiratória em crianças com atraso global grave do desenvolvimento (WINFIELD et al., 2014). Quinze artigos completos foram incluídos na revisão, compreendendo ensaios clínicos randomizados, ensaios controlados e estudos de coorte avaliando técnicas de desobstrução de vias aéreas, sucção, tosse assistida, ventilação não invasiva, traqueostomia e manejo postural envolvendo crianças de até 18 anos com diagnóstico de comprometimento neurológico grave e morbidade respiratória. Foram incluídos dois artigos completos com estudos que avaliaram a HFCWO (FITZGERALD et al., 2014; YUAN et al., 2010). A revisão de Yuan (2010) não relatou diferença estatisticamente significativa nas admissões hospitalares entre HFCWO e técnicas de fisioterapia convencional padrão para crianças com condições médicas complexas (YUAN et al.,

2010). O estudo não randomizado de Fitzgerald (2013) mostrou uma redução nas internações por exacerbação respiratória e nos dias de internação com a HFCWO (FITZGERALD et al., 2014). A adesão foi maior para HFCWO no estudo de Yuan e as tendências de uso de antibióticos variaram entre os estudos. Em geral, a HFCWO demonstrou potenciais benefícios na redução de internações e dias hospitalares, com melhor adesão em alguns casos. No entanto, a qualidade geral da evidência foi avaliada como ruim.

A meta-revisão de Wilson, Morrison e Robinson teve como objetivo sintetizar evidências das Revisões Cochrane® sobre a eficácia e segurança de vários procedimentos de desobstrução de vias aéreas em pacientes com fibrose cística (WILSON; MORRISON; ROBINSON, 2019). Seis revisões Cochrane® foram incluídas, uma das quais comparou qualquer fisioterapia respiratória sem fisioterapia torácica ou tosse isolada, e as cinco revisões restantes compararam diferentes técnicas de desobstrução das vias aéreas entre si. A versão de 2017 da revisão sistemática de Morrison et al., (MORRISON; MILROY, 2020), que revisou três artigos completos com estudos que analisaram HFCWO (MODI et al., 2010; OERMANN et al., 2001; SONTAG et al., 2010). As evidências foram de baixíssima qualidade e focaram na preferência dos participantes. Nenhum estudo de curta duração foi incluído, e nenhum relatou qualidade de vida. Os resultados variaram, tornando inconclusivo determinar uma clara preferência por qualquer um dos dispositivos devido à metodologia pouco clara e resultados imprecisos em ambos os ensaios.

A revisão sistemática de Lee, Burge e Holland (2015) teve como objetivo avaliar o impacto das ACTs em indivíduos com bronquiectasias. Eles se concentraram em objetivos primários: os efeitos dos ACTs nas taxas de exacerbação aguda, incidência de hospitalização e qualidade de vida relacionada à saúde em pacientes com bronquiectasias, considerando também a segurança e os potenciais benefícios para a fisiologia e os sintomas (LEE; BURGE; HOLANDA, 2015). Um artigo completo com um estudo que avaliou a HFCWO foi incluído (NICOLINI et al., 2013). A HFCWO prescrita por 15 dias melhorou significativamente a qualidade de vida relacionada à saúde, as características do escarro, o volume expiratório forçado no primeiro segundo (VEF1) e a

CVF quando comparado a nenhum tratamento, embora a qualidade da evidência tenha sido baixa.

A revisão sistemática de McCool e Rosen (2006) teve como objetivo avaliar a efetividade comparativa da fisioterapia respiratória padrão na eliminação de muco em comparação com "sem tratamento" ou "tosse espontânea" em indivíduos com diagnóstico de fibrose cística (MCCOOL; ROSEN, 2006). Foram incluídos quatro artigos completos com estudos que avaliaram a HFCWO (ARENS et al., 1994; BRAGGION et al., 1995; KLUFT et al., 1996; PHILLIPS et al., 2004) e um artigo descrevendo o desenvolvimento de um dispositivo de HFCWO (HANSEN; WARWICK, 1990). O tratamento da HFCWO em pacientes com fibrose cística aumentou significativamente o peso úmido do escarro e o VEF1, igualando os benefícios da fisioterapia respiratória convencional. Também levou a um maior volume e peso do escarro em comparação com a fisioterapia respiratória convencional. No entanto, quando comparado a outros métodos de desobstrução das vias aéreas, não houve diferenças significativas no volume de escarro ou no VEF1. Notavelmente, a HFCWO reduziu a produção de escarro em comparação com a técnica de respiração de ciclo ativo, tornando-se uma opção de tratamento eficaz para a fibrose cística.

Artigo	Condições de saúde	Duração das intervenções	Desfechos de eficácia	Segurança	Certeza das Provas
(WARNOCK; PORTÕES, 2023)	Fibrose cística	• 1 – 2 dias	• Os pesos de escarro úmido e seco coletados durante as sessões foram significativamente maiores do que o controle. Sem efeitos sobre TFP (VEF1 e FEF25-75, FRC). • LCI significativamente melhorado (ou seja, diminuído)	Esta revisão estudou eventos adversos e concluiu que nenhum estudo relatou dados sobre eventos adversos.	Baixo ou muito baixo
(WILSON; SALDANHA; ROBINSON, 2023)	Fibrose cística	• 2 dias	• TFP (VEF1, CVF%), saturação de oxigênio – HFCWO teve efeitos comparáveis com ACBT + CCPT • Não forneceu resultados relevantes sobre o peso do escarro úmido para metanálise • Peso do escarro, TFP mostrou que a HFCWO foi inferior à ACBT. • 60% acharam Hayek Cuirass HFCWO desconfortável, enquanto 100% acharam o tratamento por ACBT confortável.	Esta revisão estudou eventos adversos e concluiu que nenhum estudo relatou dados sobre eventos adversos.	Muito baixo
(CHEN et al., 2022)	Pneumonia	Dias	• Mortalidade: HFCWO (versus nenhuma fisioterapia) pode ter	Esta revisão estudou eventos adversos e concluiu que	Muito baixo

			pouco ou nenhum efeito na melhoria da mortalidade. • Duração da permanência na UTI deve ser reduzida em 3,8 dias em pessoas com pneumonia grave por HFCWO mais ventilação mecânica vs. sem fisioterapia • Duração da ventilação mecânica reduzida em três dias em pessoas com pneumonia grave que receberam ventilação mecânica versus nenhuma fisioterapia	nenhum estudo relatou dados sobre eventos adversos.	• A certeza das evidências da eficácia da fisioterapia respiratória para pneumonia em adultos é avaliada como muito baixa. • A baixa certeza das evidências deve-se às limitações da pesquisa, ao pequeno tamanho das amostras, à imprecisão dos resultados e à falta de cegamento dos estudos. • Os estudos não relataram o momento para medir os desfechos, e houve desafios na padronização do método de fisioterapia respiratória e na definição de desfechos clinicamente significativos. • A falta de cegamento nos estudos pode ter causado superestimação dos efeitos. • A ausência de análise por intenção de tratar e as altas taxas de abandono em alguns estudos também contribuem para a baixa certeza das evidências.
(KHAN; SOUZA; AHMED, 2022)	• DPOC •Bronquiectasia	• 4 dias a 4 semanas	• A adesão dos pacientes à HFCWO ativa e simulada foi igualmente alta	Esta revisão não estudou eventos adversos.	• Alto a moderado • As fontes fornecidas não mencionam explicitamente a certeza das evidências dos efeitos de diferentes terapias

			• dispneia significativamente melhorada por HFCWO ativo do que HFCWO falso • A função pulmonar (CVF, VEF1) melhorou significativamente pela HFCWO na DPOC e bronquiectasias. • Falta de ar, tosse e escala de escarro significativamente melhorada pela HFCWO na DPOC e bronquiectasias. • A dispneia e a qualidade de vida melhoraram significativamente com HFCWO por HFCWO na DPOC e bronquiectasias. • A contagem total de células do escarro e as contagens de neutrófilos, linfócitos e macrófagos melhoraram significativamente pela HFCWO na DPOC. • Os parâmetros de oxigenação (PaO2, SaO2%) e o escore CAT melhoraram significativamente pela HFCWO na DPOC.		de exercícios ou da HFCWO sobre a obstrução, dispneia e qualidade de vida em pacientes com DPOC.

			• O volume do escarro, neutrófilos, macrófagos, mas não a contagem total de células melhorou significativamente pela HFCWO em bronquiectasias.		
(HUANG et al., 2022)	Exacerbações agudas da DPOC	2 dias a 4 semanas	• Volume de escarro significativamente aumentado pela HFCWO. • Tempo de internação hospitalar significativamente encurtado pela HFCWO. • O VEF1 (%), a PaO2 e a PaCO2 não melhoraram significativamente com a HFCWO.	Esta revisão não estudou eventos adversos.	A certeza das provas não foi avaliada. O risco de viés foi avaliado como sendo com algumas preocupações a alto. Exclusão de estudos ambulatoriais, variação nos componentes de intervenção HFCWO entre os estudos, potencial heterogeneidade do estudo e inclusão de literatura chinesa desconhecida que pode limitar a generalizabilidade.
(MORRISON; MILROY, 2020)	Fibrose cística	2 dias a 2,8 anos	• A função pulmonar (VEF1, CVF, FEF25-75%) pela HFCWO não difere da PEP ou da técnica de desobstrução das vias aéreas ou controle. • Peso do escarro maior ou não gerado pela HFCWO em relação à fisioterapia convencional. • O volume de escarro pela HFCWO não difere da PEP ou da técnica de desobstrução das vias aéreas.	Esta revisão estudou eventos adversos e concluiu que nenhum estudo relatou dados sobre eventos adversos.	Baixo a muito baixo, avaliado pelo GRADE.

(MCILWAINE; BOTÃO; NEVITT, 2019)	Fibrose cística	Variou de tratamentos únicos a um ano	• VEF1 – nenhuma diferença significativa na mudança da linha de base entre os grupos HFCWO e PEP. • Melhoria do LCI, distribuição da ventilação e mistura de gases pelos tratamentos HFCWO e PEP sem diferenças entre os tratamentos. • Função pulmonar (CVF, FEF25-75%) – efeitos comparáveis entre HFCWO e PEP. • O peso úmido do escarro não foi significativamente diferente após HFCWO e PEP (tratamentos únicos ou <7 dias). • Níveis de oxigênio no sangue – diminuídos por HFCWO, mas aumentados por PEP • Adesão ao tratamento em 1 ano semelhante para HFCWO e PEP	O grupo HFCWO apresentou mais eventos nas vias aéreas inferiores (aumento da tosse, infecção torácica, hemoptise, redução da função pulmonar e dor torácica) do que o grupo PEP.	Evidência de baixa a moderada qualidade avaliada pelo GRADE®
(DE ALVARENGA et al., 2016)	DPOC	4 sessões, 3 vezes por dia durante 15 minutos cada	• Adesão e satisfação do paciente • Escore de dispneia de Borg – melhora significativa em	20% tiveram um evento de cuidados agudos relacionados à respiração em 30 dias e foram semelhantes em	Baixo nível de evidência

			comparação com o grupo placebo • Volume de escarro • VEF1	frequência com o grupo placebo	
(WINFIELD et al., 2014)	Crianças com atraso grave do desenvolvimento global	2 a 3 vezes por dia durante 10 a 20 minutos a 10 a 15 Hz, durante um período de estudo de 5 a 24 meses	• Adesão à terapia • Internações respiratórias • Antibioticoterapia • Radiografias de tórax • Polissonografia • Número de internações no seguimento • Dias de internação	Esta revisão estudou eventos adversos e concluiu que nenhum estudo relatou dados sobre eventos adversos.	Baixa qualidade geral da evidência, pequeno tamanho amostral, desenho não randomizado, falta de consistência entre os estudos na aplicação das intervenções e medidas de desfecho utilizadas e alto risco de viés em vários estudos
(WILSON; MORRISON; ROBINSON, 2019)	Fibrose cística	4 semanas a 3 anos	• VEF1 • Satisfação e preferência do paciente	Esta revisão estudou eventos adversos e concluiu que nenhum estudo relatou dados sobre eventos adversos.	Baixa ou muito baixa. Sérias limitações na forma como a preferência dos participantes foi avaliada, detalhes insuficientes para avaliar a precisão e resultados sujeitos a viés de relato.

(LEE; BURGE; HOLANDA, 2015)	Bronquiectasias estáveis não fibrocísticas	15 dias	• QVRS significativamente melhorada pela HFCWO mais do que a fisioterapia respiratória tradicional • VEF1, CVF e CPT melhoraram significativamente pela HFCWO mais do que a fisioterapia respiratória tradicional • O volume de escarro melhorou significativamente pela HFCWO mais do que a fisioterapia respiratória tradicional • As porcentagens de neutrófilos e macrófagos no escarro foram significativamente reduzidas e aumentadas pela HFCWO, respectivamente • Proteína C-reativa significativamente reduzida pela HFCWO mais do que a fisioterapia respiratória tradicional • dispneia, tosse e escarro não significantes • A contagem total de células no escarro não é significativa	Esta revisão estudou eventos adversos e concluiu que nenhum estudo relatou dados sobre eventos adversos.	Baixa avaliada pelo GRADE®. Ausência de ocultação de alocação; participantes e terapeutas não cegos. Pequeno número de participantes.

(MCCOOL; ROSEN, 2006)	•Fibrose cística	• 1 a 14 dias	• Aumento do peso do escarro comparável ao CPT sem alterar os TFP ou a saturação de oxigênio • Sem efeitos sobre TFP • Os pesos úmido e seco do escarro coletado durante as sessões foram significativamente maiores que o controle. Sem efeitos sobre TFP. • Os pesos úmido e seco do escarro coletado foram significativamente maiores que o CPT. • Produção de escarro úmido durante a primeira hora após o tratamento significativamente maior que a CPT. CV, VEF1 e FEF25-75% - aumentos significativos, e VR, VR/CPT - diminui após 7 e 14 dias	Esta revisão não avaliou eventos adversos.	Baixo nível de evidência; benefício, conflitante; grau de recomendação, I.

Quadro 1. Achados para HFCWO.

Fonte: Autores

Artigo	***1ª.***	***2ª.***	***3ª.***	***4ª.***	***5ª.***	***6ª.***	***7ª.***	***8ª.***	***9ª.***	***10ª.***	***11ª.***	***12ª.***	***13ª.***	***14ª.***	***15ª.***	***16ª.***	***Confiança Geral***
(WARNOCK; PORTÕES, 2023)	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	P Sim	N/A	N/A	Sim	Sim	N/A	Sim	Alto
(WILSON; SALDANHA; ROBINSON, 2023)	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Alto
(CHEN et al., 2022)	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Alto
(KHAN; SOUZA; AHMED, 2022)	Não	Não	Sim	P Sim	Sim	Sim	Não	Sim	Sim	Não	P Sim	P Sim	Sim	Não	Não	Sim	Criticamente baixo
(HUANG et al., 2022)	Sim	Não	Sim	Sim	Sim	Sim	Não	Sim	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Baixo
(MORRISON; MILROY, 2020)	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Alto
(MCILWAINE; BOTÃO; NEVITT, 2019)	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Alto
(DE ALVARENGA et al., 2016)	Não	Não	Não	P Sim	Não	Não	Não	Não	Não	Não	Não	N/A	Não	N/A	Não	Sim	Criticamente baixo
(WINFIELD et al., 2014)	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Moderado
(WILSON; MORRISON; ROBINSON, 2019)	N/A	Não	Sim	N/A	Sim	Sim	Sim	Sim	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Moderado
(LEE; BURGE;	Sim	Não	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Sim	Alto

HOLANDA, 2015)																	
(MCCOOL; ROSEN, 2006)	Não	Não	P Sim	Não	Não	Não	Não	Não	Não	Não	Não	Não	Não	Não	Não	Não	Criticamente baixo

Quadro 2. Avaliação da qualidade AMSTAR-2® para as revisões sistemáticas incluídas.

Fonte: Autor. O Quadro 2 foi construído de acordo com Kilpatrick et al. (KILPATRICK et al., 2023) e Benz et al. (BENZ et al., 2023).

Nota. P Sim = parcial sim, N/D = não aplicável. Confiança geral: criticamente baixa (mais de uma falha crítica), baixa (uma falha crítica), moderada (mais de uma falha não crítica) e alta (nenhuma ou uma falha não crítica).

Recuperamos artigos completos escritos em inglês de revisões sistemáticas para obter uma visão abrangente dos protocolos de tratamento e modelos de dispositivos específicos usados em ensaios clínicos investigando HFCWO.

O Quadro 3 resume os autores, os dispositivos de HFCWO utilizados, as configurações dos dispositivos, os esquemas de tratamento e as indicações de cada estudo, cobrindo uma variedade de condições respiratórias, como fibrose cística, pneumonia, bronquiectasias e DPOC.

Esses dispositivos são usados para tratar doenças como fibrose cística, bronquiectasias, DPOC grave e pneumonia.

As configurações desses dispositivos incluem várias frequências oscilantes e pressões de pulso personalizadas para o conforto específico do paciente.

Os regimes de tratamento diferem em termos de duração da sessão, frequência e intervalos de descanso.

Autores/Referência	Dispositivos HFCWO	Configurações do dispositivo de HFCWO			Regime de Tratamento	Indicação
(BRAGGION et al., 1995)	ThAIRapy Bronchial Drainage System (American Biosystems)	Frequências oscilantes de 6, 8, 14, 15, 18 e 19 Hz para intervalos de cinco minutos			2 dias consecutivos 2 vezes por dia de sessões de 50 minutos	Fibrose cística
(GROSSE-ONNEBRINK et al., 2017)	The Vest® Model 104 (Hill-Rom)	Frequência oscilante de13 Hz. Pressão de pulso de 3 mbar			1 sessão de 30 minutos	Fibrose cística
(OSMAN et al., 2010)	The Vest Airway Clearance System Model 4 (Hill-Rom)	Frequências oscilantes de 10, 13 e 15 Hz aos 8 minutos cada, seguidas de intervalo de			2 dias não consecutivos 2 vezes por dia de sessões de 30 minutos	Fibrose cística

		descanso de 2 minutos pressão de pulso ajustada com base no conforto individual				
(Phillips et al., 2004)	Hayek Oscillator 1000 Cuirass TM (Flexico Medical Instruments)	Modo de secreção: o ciclo bifásico consistiu de quatro ciclos bifásicos, 600 oscilações por minuto durante 3 min, seguidas de 60 oscilações por minuto durante 2 min			2 dias consecutivos 2 vezes por dia de sessões de 20 minutos	Fibrose cística
(SHI et al., 2017)	Não consta	Não consta			Não consta	Pneumonia
(NICOLINI et al., 2013)	The Vest Airway Clearance System (Hill-Rom)	Frequência oscilante de 13–15 Hz, baseada na tolerância do paciente pressão de pulso 2–5 cm H2O para um ajuste confortável			15 dias 2 vezes por dia de sessões de 30 minutos	Bronquiectasia
(NICOLINI et al., 2018)	The Vest Airway Clearance System Model 205 (Hill-Rom)	Frequência oscilante de 13–15 Hz, baseada na tolerância do paciente pressão de pulso 2–5 cm H2O para um ajuste apertado, mas confortável			14 dias 2 vezes por dia de sessões de 20 minutos	DPOC grave
(MAHAJAN et al., 2011)	The Vest Airway Clearance System (Hill-Rom)	Frequência oscilante de 10-12 Hz pressão de pulso de 4-6 unidades			2 dias 3 vezes por dia de sessões de 15 minutos	Exacerbação aguda da DPOC e asma

(CHAKRAVORTY; SHAHAL; AUSTIN, 2011)	SmartVest® Airway Clearance System (Electromed)	Frequência oscilante de 13–15 Hz, baseada na tolerância do paciente pressão de pulso para um ajuste confortável			4 semanas (5 dias por semana) 3 vezes por dia de sessões de 20 minutos	Exacerbação aguda da DPOC
(GOKTALAY et al., 2013)	The Vest Airway Clearance System (Hill-Rom)	Frequência oscilante de 10 e 20 Hz pressão de pulso de 12 cm H2O			Tratamento de 5 dias 3 vezes por dia de sessões de 20 minutos	Exacerbação aguda da DPOC
(ARENS et al., 1994),	Bronchial Drainage System (American Biosystems)	Frequências oscilantes de 6, 8, 14, 15, 18 e 19 Hz por cinco minutos cada			14 dias 3 vezes por dia sessões de 30 minutos	Fibrose cística
(KLUFT et al., 1996)	ThAIRapy Bronchial Drainage System (American Biosystems)	Frequências oscilantes de 6, 8, 14, 15, 18 e 19 Hz por cinco minutos cada			2 dias não consecutivos 3 vezes por dia de sessões de 30 minutos	Fibrose cística
(Oermann et al., 2001)	ThAIRapy Vest system, American Biosystems	Frequências oscilantes de 5, 10, 15 e 25 Hz, por cinco minutos cada, separadas por respiração profunda e tosse			4 semanas 2-3 vezes por dia de sessões de 20 minutos	Fibrose cística
(DARBEE; KANGA; OHTAKE, 2005)	The Vest Model 103 (Hill-Rom)	Frequências oscilantes de 10 Hz nos 15 minutos iniciais e de 15 Hz nos últimos 15 minutos de tratamento pressão de pulso de 5			2 dias não consecutivos 1 vez por dia de sessão de 30 minutos	Fibrose cística

		unidades arbitrárias				
(MCILWAINE et al., 2013)	InCourage System (RespirTech)	Frequências oscilantes variando de 6 a 15 Hz, seis séries de ciclos de 5 minutos, alternando com bufos e tosse			12 meses 1-2 vezes por dia de sessões de 30 minutos	Fibrose cística
(MODI et al., 2010) (SONTAG et al., 2010)	The Vest (Hill-Rom)	Frequências oscilantes seis séries de ciclos de 5 minutos, alternando com bufos e tosse			1,3 a 2,8 anos 2 vezes por dia de sessões de 20-40 minutos	Fibrose cística
(VAREKOJIS et al., 2003)	The Vest, Model 103 (Advanced Respiratory)	Frequências oscilantes de 6 e 8, 14 e 16, 18 e 20 Hz por 8 minutos cada, alternando com tosse de 2 minutos			2 dias consecutivos 3 vezes por dia de sessões de 30 minutos	Fibrose cística
(WARWICK; WIELINSKI; HANSEN, 2004)	ThAIRapy Bronchial Drainage System (American Biosystems)	Frequências oscilantes de seis séries de 5 minutos variando entre 6 e 25 Hz			2 dias consecutivos ou não consecutivos Sessões de 36 a 40 min	Fibrose cística
(FAINARDI et al., 2011)	The Vest Airway Clearance System Model 4 (Hill-Rom)	Frequências oscilantes de 15-20 Hz pressão de pulso variando de 6-10 na escala do colete 1-10, de acordo com o conforto individual			uma sessão de 30 minutos	Fibrose cística
(YUAN et al., 2010)	The Vest (?) (Hill-Rom)	Frequência oscilante de 12 Hz			5 meses 3 vezes por dia de sessões de 12 minutos	crianças com TDSG e distúrbios neuromusculares

		Ajuste de pressão de pulso de 4				
(FITZGERALD et al., 2014)	The Vest model 105 (Hill-Rom)	Frequência oscilante de • 10 Hz para 18–36 meses de idade e • 12 Hz para pacientes de 36 meses Pressão de pulso de 3 unidades arbitrárias			12 meses 2 vezes por dia de sessões de 20 minutos e aumentadas até 4 vezes ao dia para infecção do trato respiratório inferior associada ao aumento da necessidade de oxigênio	crianças com TDSG e distúrbios neuromusculares
(SCHERER et al., 1998)	Hayek Oscillator (Breasy Medical)	"Modo de depuração de secreção" que consiste em frequências oscilantes alternadas (16 Hz, relação I:E 1:1, por 2 min, e 1,5 Hz, relação I:E 6:1, tempo de pressão - 15/+10 mm Hg por 3 min)			1 sessão, 20 minutos por hora durante 4 horas	Fibrose cística

Quadro 3. Dispositivos de HFCWO – Oscilação de Alta Frequência da Parede Torácica e Regimes de Tratamento.
Fonte: Autor

2.3.3 Resultados da pesquisa bibliométrica em dispositivos de HFCWO

A busca por publicações científicas e patentes de dispositivos de vibração mecânica torácica para desobstrução de vias aéreas nas últimas duas décadas resultou em 230 publicações de pesquisa, 137 patentes e 56 ensaios clínicos na plataforma Dimensions®. Foi utilizada a mesma busca booleana do PubMed®.

As citações das publicações e os escores altimétricos indicaram um crescente interesse científico e geral nos dispositivos de desobstrução de vias aéreas (Figuras 4, 5, 6 e 7).

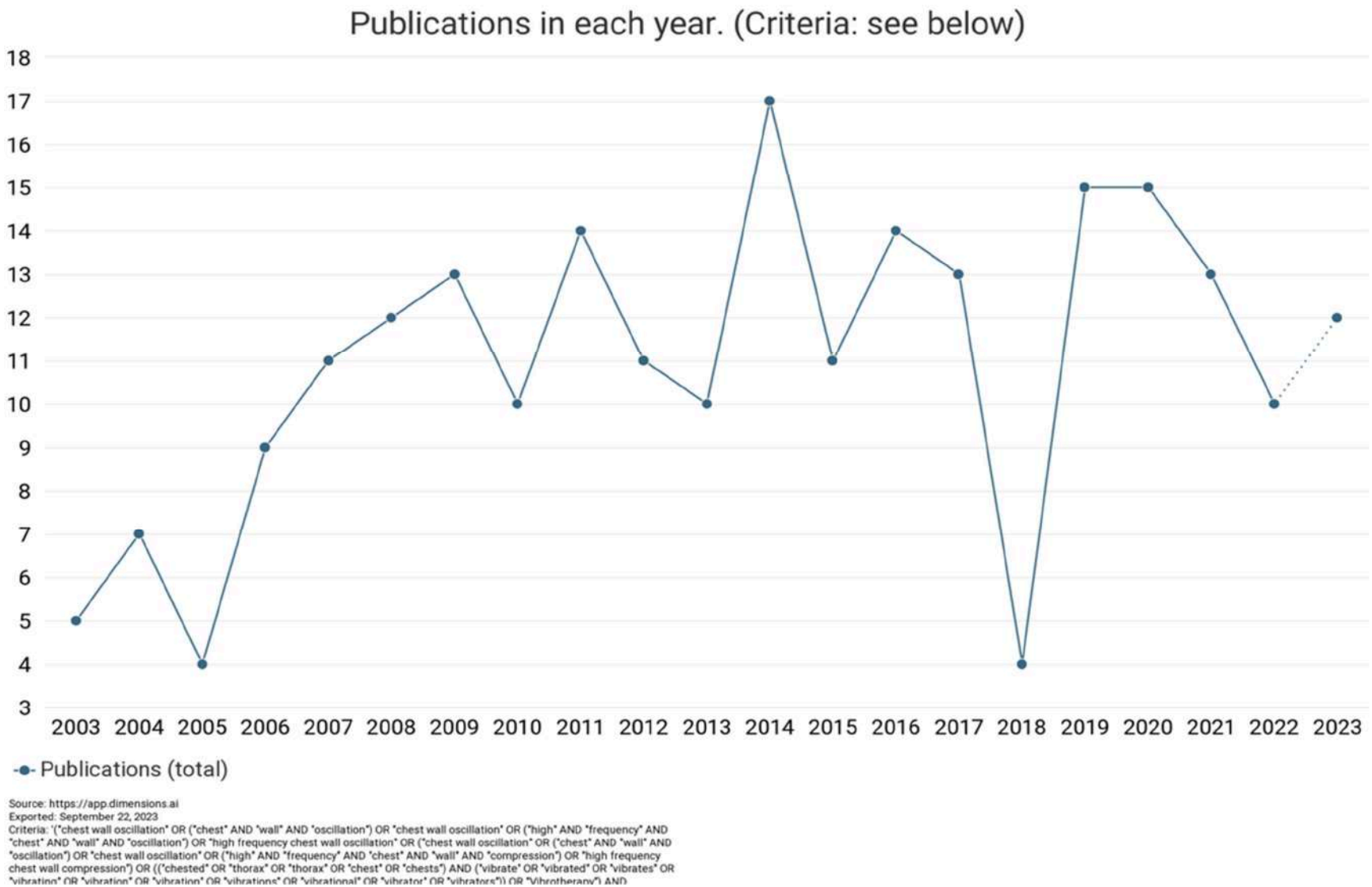

Figura 4. Taxa Anual de Publicações.

Fonte: Autor, Plataforma Dimensions® - A visualização mostra o número de publicações publicadas em cada ano.

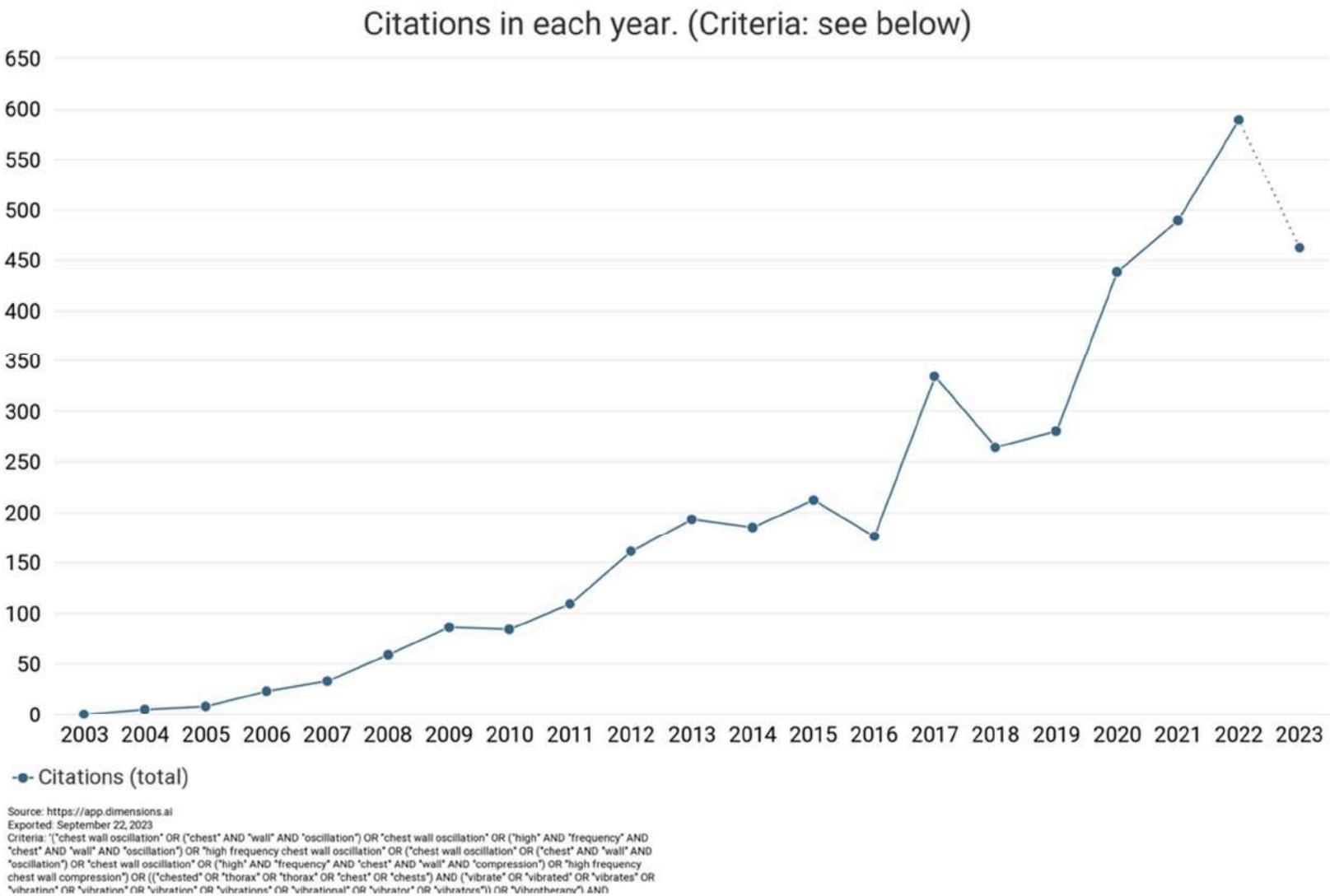

Figura 5. Citações de Publicações.

Fonte: Autor, Plataforma Dimensions®. Citações de publicações é o número de vezes que publicações foram citadas por outras publicações na base de dados. A visualização mostra o número de citações recebidas em cada ano.

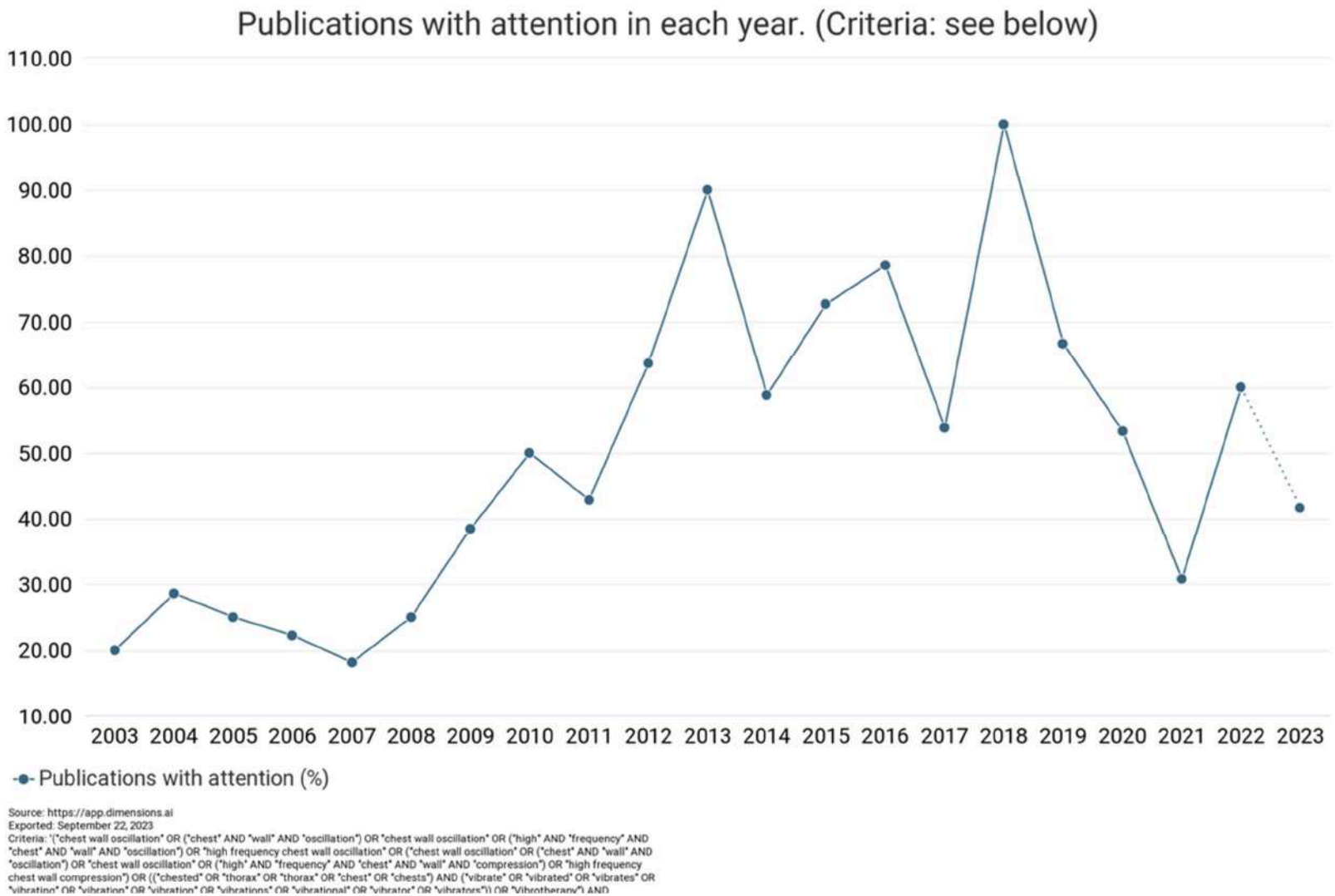

Figura 6. Escore de Atenção Altimétrica das Publicações.

Fonte: Autor, Plataforma Dimensions®. O Altmetric Attention Score® é uma contagem ponderada da altimétrica de atenção on-line encontrada para uma saída de pesquisa individual. A visualização mostra o percentual de publicações com atenção altimétrica publicadas em cada ano.

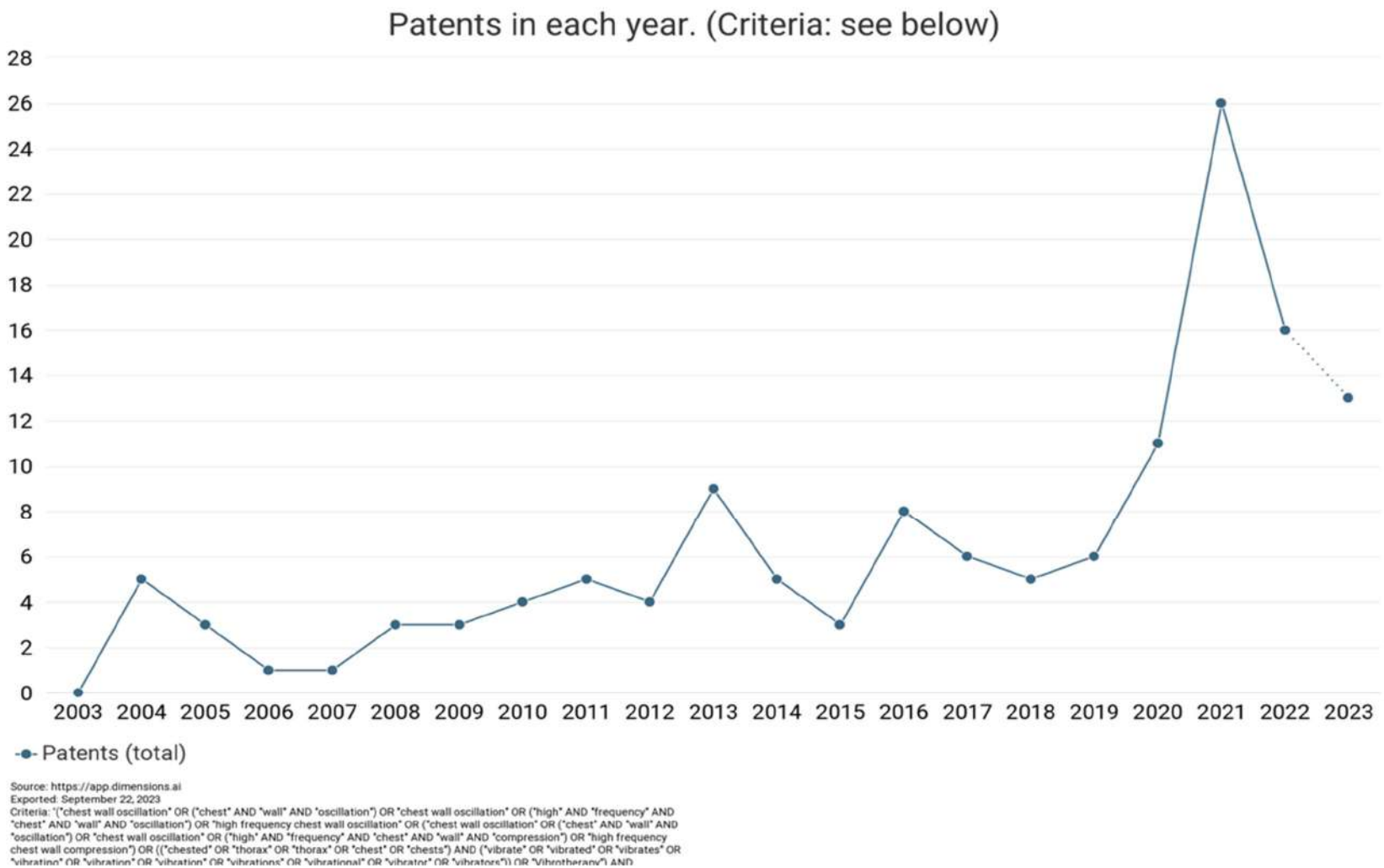

Figura 7. Escore de Atenção Altimétrica das Patentes.

Fonte: Autor, Plataforma Dimensions®. O Altmetric Attention Score® é uma contagem ponderada da altimétrica de atenção on-line encontrada para uma saída de pesquisa individual. A visualização mostra o percentual de publicações com atenção altimétrica publicadas em cada ano.

Dispositivos de HFCWO foram estudados em doenças e condições como fibrose cística, DPOC, bronquiectasias, pacientes de UTI com complicações pulmonares cirúrgicas, distúrbios neurológicos ou neuromusculares, pneumonia, cirurgia torácica (incluindo lobectomia pulmonar e transplante), esclerose lateral amiotrófica (ELA), atelectasia, COVID-19, trauma contuso da parede torácica, prematuros, crianças com deficiência complexa, pacientes pediátricos com traqueostomia, mucoviscidose/FC, discinesia ciliar primária, participantes saudáveis, montanhistas escalando a altitudes extremas.

De acordo com o geomapeamento das publicações, os dez principais países em número de publicações são: EUA, Reino Unido, Austrália, Brasil, Canadá, Itália, Bélgica e França (Figura 8, Apêndice D).

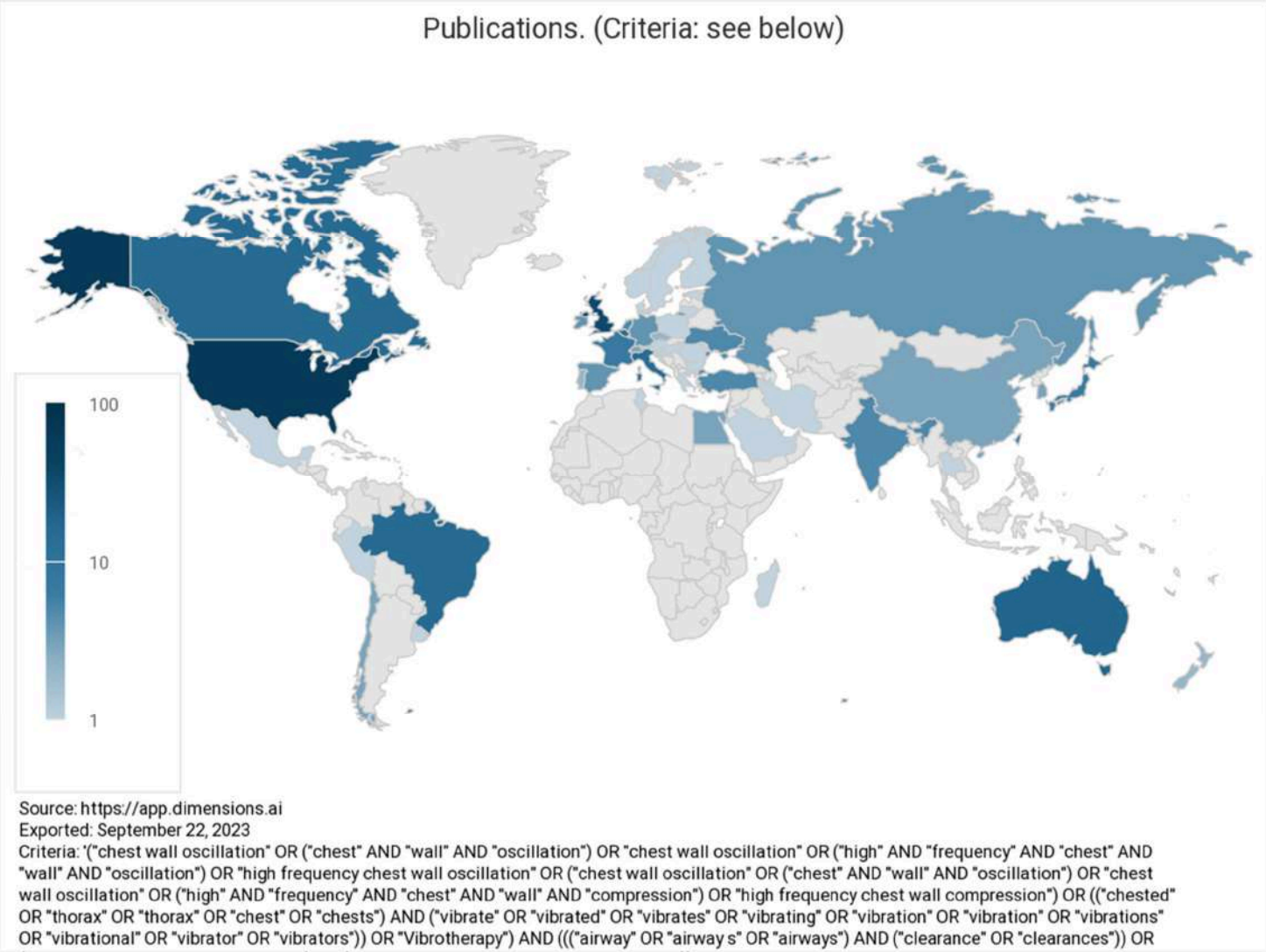

Figura 8. Geomapa de Publicações para o período de 2003 – até a presente data.
Fonte: Autor, Plataforma Dimensions®

Entre as 137 patentes, 55 estavam ativas, 20 concedidas e 19 pendentes (Figura 9, Apêndice B).

Notavelmente, os principais países em termos de patentes diferem daqueles em termos de publicações: China, EUA, Cingapura, Coreia do Sul, Rússia, Brasil, Turquia, Índia e Ucrânia (Figura 9, Apêndice C).

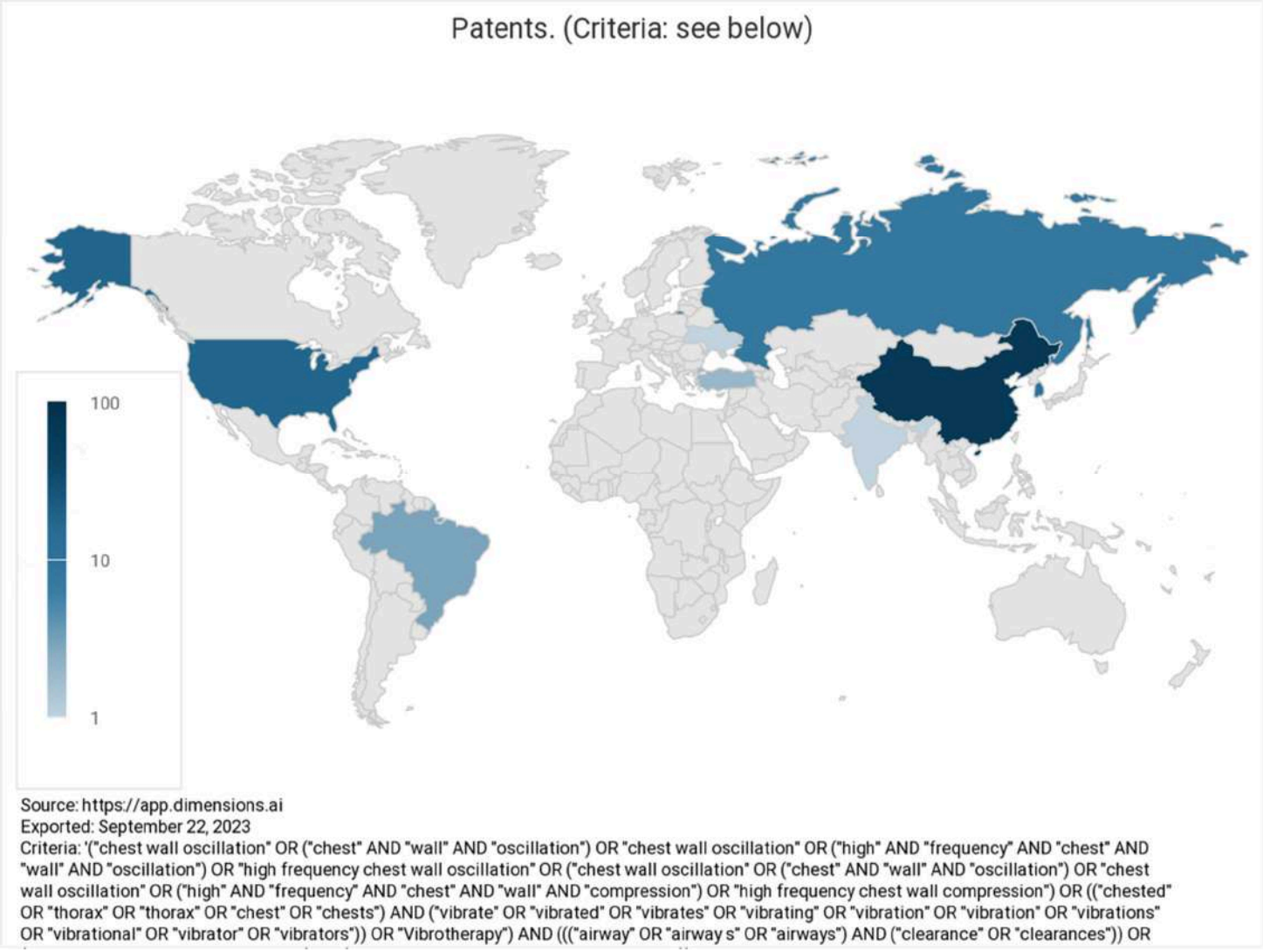

Figura 9. Geomapa de Patentes para o período de 2003 – até a presente data.
Fonte: Autor, Plataforma Dimensions®

Dentro do sistema de Classificação Internacional de Patentes (IPC), 57 patentes pertencem ao código A61H23. A61H23/02 é o código IPC para Aparelhos para respiração artificial, que inclui a subclasse A61H23/02/08 que abrange aparelhos para respiração artificial usando oscilações de alta frequência.

Havia 56 ensaios clínicos, dos quais 47 ensaios estavam concluídos, 6 estavam em andamento e 3 tinham status desconhecido. Os ensaios clínicos HFCWO incluíram três na Fase 4, três na Fase 3, um na Fase 2 e um na Fase 1. (Figura 10)

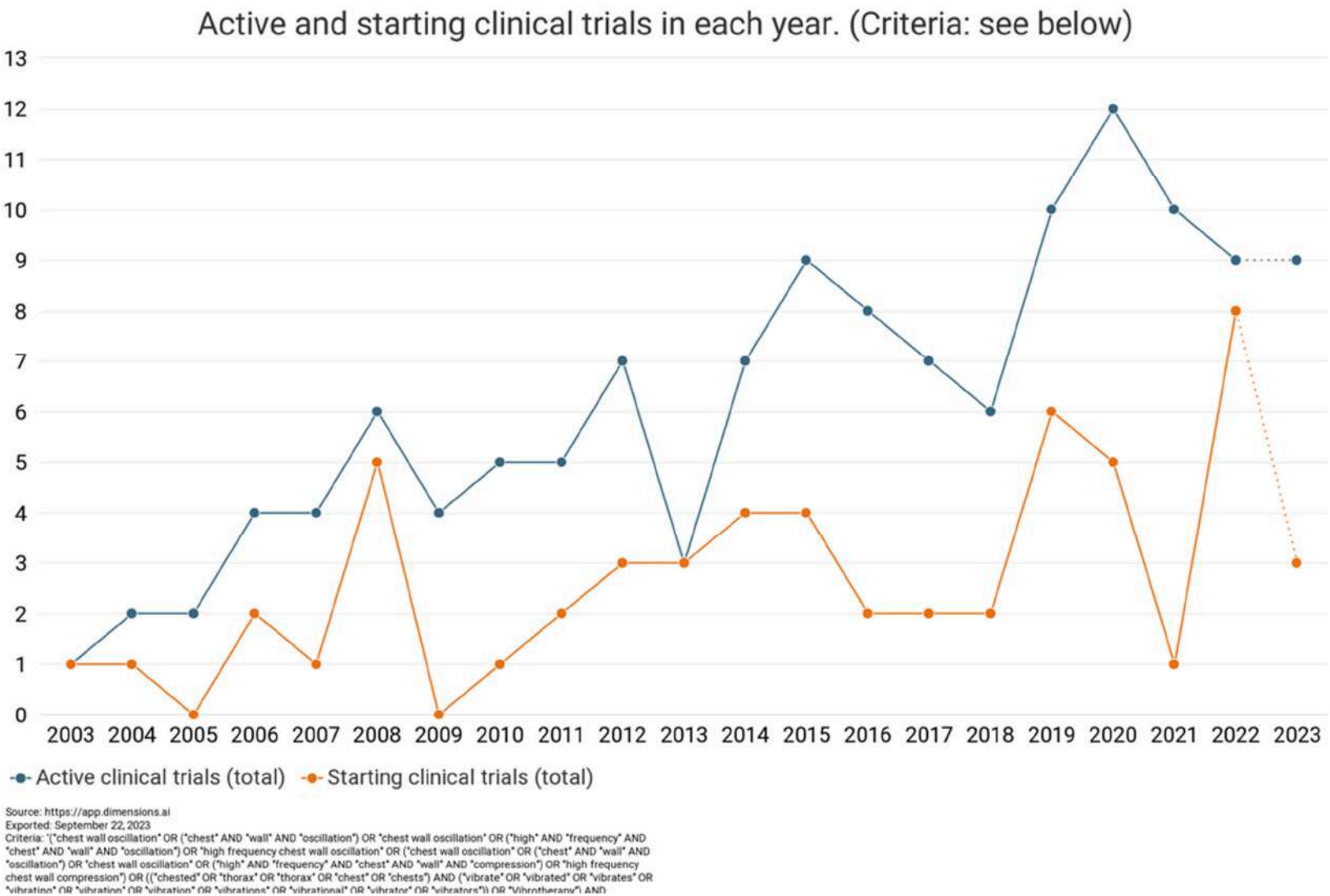

Figura 10. Pesquisas Clínicas Ativas ou Iniciadas Anualmente
Fonte: Autor, Plataforma Dimensions®

Foram identificados ensaios clínicos nos seguintes países: EUA 16, Reino Unido 8, Egito 5, Brasil 3, Canadá 3, Alemanha 3, Austrália 2, Itália 2, Paquistão 2, Taiwan 2, China 1, Espanha 1, Israel 1, Irã 1, Tailândia 1, Turquia 1 (Figura 11).

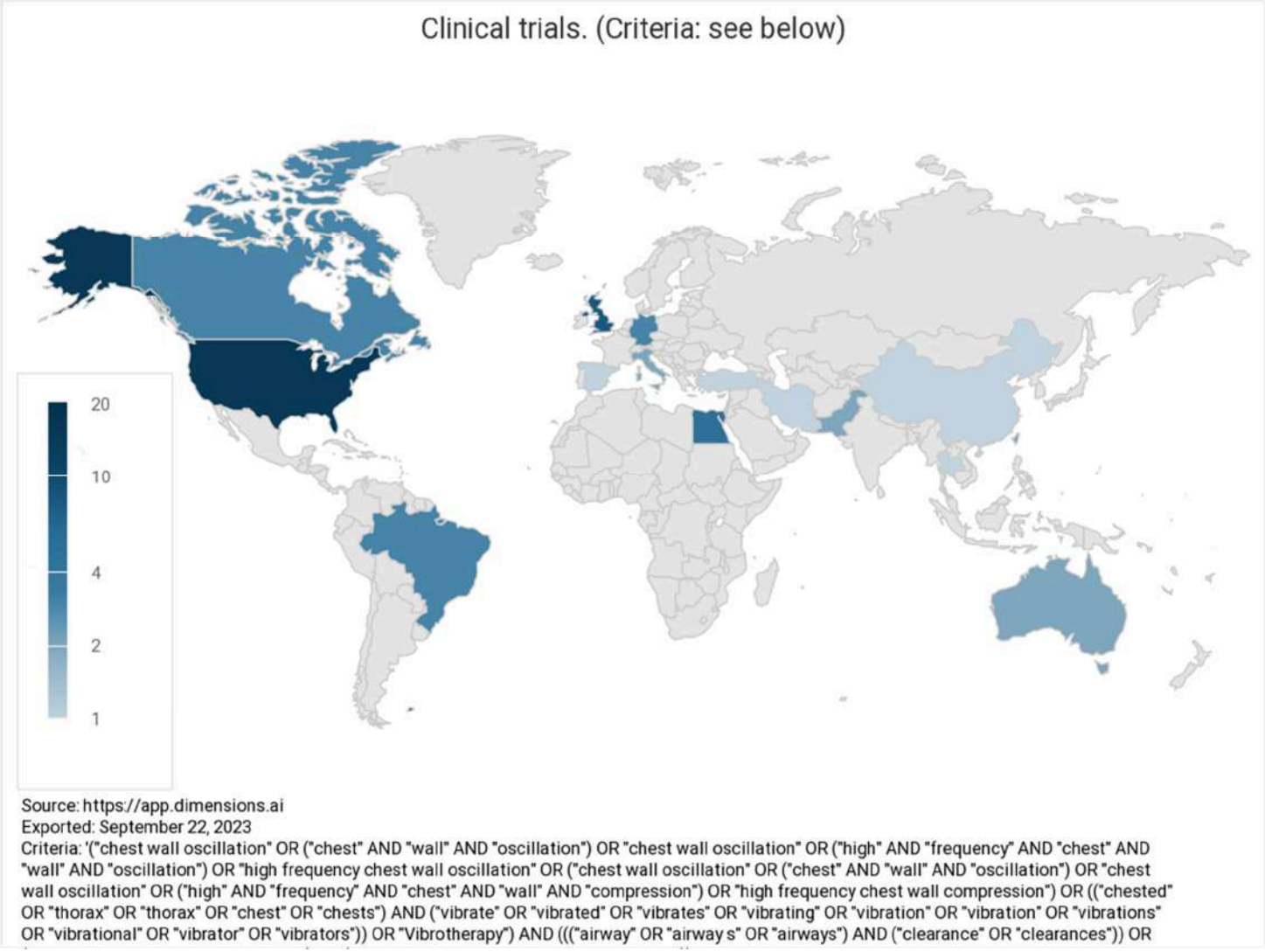

Figura 11. Geomapa das Pesquisas Clínicas Ativas ou Iniciadas Anualmente.
Fonte: Autor, Plataforma Dimensions®

2.3.4 Tecnologia HFCWO e descrições de dispositivos

O Quadro 4 fornece uma visão geral concisa dos dispositivos de HFCWO usados em ambientes clínicos.

Ela inclui informações sobre o nome do dispositivo, modelo, faixa de frequência, tecnologia empregada, compatibilidade com “Internet das Coisas” (IoT), operação da bateria e status de aprovação da FDA.

Nome	Modelos	Faixa de Frequência	Tecnologia	IoT	Bateria	Aprovado pela FDA
The Vest System 105 – 205 (“The Vest System, Model 105 | Hillrom,” [s.d.])	**Colete/Banda**	**1-20Hz**	**Pneumático**	**App & Portal**	**Não**	**Sim**
InCourage system (“InCourage | RespirTech,” [s.d.])	**Colete/Banda**	**5-30Hz**	**Pneumático**	**App & Portal**	**Não**	**Sim**
AffloVest (“Mobile Airway Clearance Therapy HFCWO Vest | AffloVest,” [s.d.])	**Colete**	**N/D**	**Mecânico**	**Não**	**Sim**	**Sim**
RespIn (“RespInnovation SAS,” [s.d.])	**Envelopamento/Almofada**	**N/D**	**Pneumático**	**Não**	**Não**	**Sim**
Biphasic Cuirass Ventilation (BCV™) / Hayek BCV (“What is BCV - Hayek Medical,” [s.d.])	**Couraça**	**N/D**	**Ventilação Bifásica**	**Não**	**Não**	**Sim**
SmartVest Airway Clearance System (“Homepage - SmartVest Airway Clearance System,” [s.d.])	**Colete**	**5-20Hz**	**Pneumático**	**Não**	**Não**	**Sim**
The Monarch System (“The Monarch Airway Clearance System | Hillrom,” [s.d.])	**Colete**	**1-20Hz**	**Mecânico**	**App & Portal**	**Sim**	**Sim**

Expector (“expector.com.br/en/,” [s.d.])	**Colete/Banda**	**1-30Hz**	**Mecânico**	**App & Portal**	**Sim**	**Não**
PneuVest Series (“HFCWO - Clarity Medtech,” [s.d.])	**Colete**	**1-20Hz**	**Pneumático**	**Não**	**Não**	**Não**
VibraCicle (“VibraCircle,” [s.d.]) **& AirCicle** (“AirCircle,” [s.d.])	**Colete**	**N/D**	**Pneumático**	**App & Portal**	**Sim**	**Não**

Quadro 4. Dispositivos de HFCWO.

Fonte: Autor - Período de pesquisa: jul a out/2023. As informações do Dispositivo foram extraídas dos sites de seus Fabricantes/Distribuidores, respectivos catálogos e/ou manuais e podem não representar todas as especificações técnicas, indicações e contraindicações. A pesquisa de aprovação da FDA foi realizada em 22/09/2023 e não considera aplicações em andamento.

2.3.5 Cenário regulatório

As regulamentações para dispositivos de HFCWO variam entre as regiões geográficas.

Para serem comercializados nos EUA, os dispositivos de HFCWO são necessários para obter a aprovação da Food and Drug Administration (FDA).

Os dispositivos de HFCWO são categorizados como dispositivos médicos de Classe II pela FDA, necessitando de adesão aos procedimentos de notificação pré-comercialização (510(k)) antes de sua introdução no mercado dos EUA.

Outras grandes regiões, como Europa, Canadá, Austrália e Ásia, possuem regulamentação específicas, similares à dos EUA, para dispositivos de HFCWO.

Na União Europeia, os dispositivos de HFCWO, como todos os dispositivos médicos, precisam atender aos requisitos do Regulamento de Dispositivos Médicos da UE (MDR) para acesso ao mercado.

O MDR tornou-se aplicável a todos os dispositivos médicos vendidos na UE a partir de 26 de maio de 2021. No entanto, a implementação de certas disposições MDR será prorrogada até dezembro de 2028 para dispositivos médicos que foram previamente

aprovados sob a Diretiva de Dispositivos Médicos 93/42/CEE (MDD) e a Diretiva 90/385/CEE de Dispositivos Médicos Implantáveis Ativos (AIMDD).

2.4 DISCUSSÃO

2.4.1 Contexto

Esta síntese de evidências fornece uma compreensão abrangente da HFCWO por meio de sua meta-revisão, análise bibliométrica, patentes e cenários regulatórios.

A HFCWO melhora as medidas de função respiratória, as características do escarro, a dispneia, os escores de saúde e a qualidade de vida. No entanto, a evidência foi baixa a muito baixa.

A pesquisa clínica concentra-se em fibrose cística, bronquiectasias, DPOC e doenças neuromusculares.

O panorama bibliométrico mostra um aumento global no interesse, abrangendo publicações, patentes e ensaios clínicos, com contribuições notáveis de diversos países.

A HFCWO atua por diversos mecanismos, enfatizando seu impacto na depuração de secreção e na função pulmonar.

Considerações de segurança reforçam a necessidade de avaliação cuidadosa, particularmente em pacientes com trauma da parede torácica.

A análise de patentes e do cenário regulatório acentua a tendência de inovação liderada pela China, EUA e outros, com a HFCWO ganhando reconhecimento como um tratamento convencional nos EUA e se expandindo para o mercado europeu.

Esses insights contribuem coletivamente para uma compreensão matizada da HFCWO, incentivando mais pesquisas e enfatizando sua relevância global e estrutura regulatória em evolução.

2.4.2 Sinopse de Evidência – Meta-revisão de revisões sobre HFCWO (A)

Esta meta-revisão de revisões sistemáticas determinou que há evidências, embora baixas a muito escassas, de que a HFCWO é eficaz em melhorar os parâmetros funcionais respiratórios (CVF e VEF1), melhorar o escarro úmido ou aumentar a expectoração do escarro, reduzir a dispneia, melhorar os escores saudáveis e a qualidade de vida.

A maioria das pesquisas clínicas se concentra no uso de dispositivos de HFCWO no tratamento de fibrose cística, bronquiectasias, DPOC ou doenças neuromusculares.

A partir das doze revisões sistemáticas avaliadas, compilamos uma visão abrangente de múltiplos estudos que descrevem a aplicação da HFCWO como uma intervenção para distintas condições de saúde.

A visão geral abrange dados sobre condições de saúde, intervenções de tratamento, duração, resultados de eficácia, avaliações de segurança e a certeza das evidências para dispositivos de HFCWO:

1. Warnock & Gates, 2023 (Fibrose Cística): O estudo mostra que a HFCWO levou ao aumento do peso do escarro em comparação com o grupo controle, mas não teve efeito nos TFP. A revisão concluiu que havia uma falta de dados sobre eventos adversos e tinha uma certeza de evidência baixa ou muito baixa (WARNOCK; GATES, 2023).

2. Wilson, Saldanha, Robinson, 2023 (Fibrose Cística): Este estudo descobriu que a HFCWO teve efeitos comparáveis em TFP como técnicas de desobstrução das vias aéreas e fisioterapia de compressão torácica. No entanto, mostrou inferioridade em relação ao ACBT em relação ao peso do escarro. A revisão destacou uma certeza muito baixa das evidências e a necessidade de avaliações de segurança adicionais (WILSON; SALDANHA; ROBINSON, 2023).

3. Chen et al., 2022 (Pneumonia): Neste estudo, a HFCWO pareceu ter pouco impacto na diminuição da mortalidade por pneumonia. Reduziu o tempo de permanência na UTI e a ventilação mecânica em casos graves de pneumonia. A certeza da evidência foi muito baixa devido às limitações da pesquisa (CHEN et al., 2022).

4. Khan, Shaikh, Ahmed, 2022 (DPOC, Bronquiectasias): A HFCWO melhorou significativamente a dispneia, função pulmonar, qualidade de vida e outros parâmetros em pacientes com DPOC e bronquiectasias. No entanto, a revisão não avaliou eventos adversos. A certeza da evidência foi alta a moderada, mas mais pesquisas sobre segurança são necessárias (KHAN; SOUZA; AHMED, 2022).

5. Huang et al., 2022 (Exacerbações Aguda da DPOC): Este estudo descobriu que a HFCWO aumentou o volume de escarro e reduziu o tempo de internação hospitalar em pacientes com exacerbações agudas da DPOC. No entanto, não melhorou significativamente os TFP. A certeza da evidência não foi avaliada devido a preocupações com o desenho do estudo e potencial viés (HUANG et al., 2022).

6. Morrison & Milroy, 2020 (Fibrose Cística): A HFCWO não mostrou diferenças significativas na função pulmonar ou no peso do escarro em comparação com outras técnicas de desobstrução das vias aéreas. As avaliações de segurança não foram relatadas, e a certeza das evidências foi baixa a muito baixa (MORRISON; MILROY, 2020).

7. McIlwaine, Button, Nevitt, 2019 (Fibrose Cística): O estudo encontrou efeitos comparáveis da HFCWO e PEP na função pulmonar. No entanto, a HFCWO levou a mais eventos nas vias aéreas inferiores. A certeza da evidência foi avaliada como baixa a moderada (MCILWAINE; BOTÃO; NEVITT, 2019).

8. De Alvarenga et al., 2016 (DPOC): A HFCWO melhorou significativamente a adesão do paciente e reduziu os escores de dispneia de Borg. Nenhum efeito adverso foi relatado, mas o nível de evidência foi baixo (DE ALVARENGA et al., 2016).

9. Winfield et al., 2014 (Atraso Global do Desenvolvimento): Os efeitos positivos da HFCWO em hospitalizações relacionadas à respiração, antibioticoterapia e dias de hospitalização foram significativos. Nenhum efeito adverso foi relatado, mas a qualidade geral da evidência foi pobre devido ao pequeno tamanho da amostra e a um alto risco de viés (WINFIELD et al., 2014).

10. Wilson, Morrison, Robinson, 2019 (Fibrose Cística): A HFCWO não mostrou efeitos adversos, mas teve sérias limitações na avaliação da preferência dos participantes. A certeza da evidência foi baixa a muito baixa (WILSON; MORRISON; ROBINSON, 2019).

11. Lee, Burge, Holanda, 2015 (Bronquiectasia não fibrocística): A HFCWO melhorou significativamente a qualidade de vida relacionada à saúde e a função pulmonar. Nenhum efeito adverso foi relatado, mas o nível de evidência foi avaliado como baixo (LEE; BURGE; HOLANDA, 2015).

12. McCool & Rosen, 2006 (Fibrose Cística): A HFCWO levou ao aumento do peso do escarro, mas sem alterações significativas nos TFP. Nenhum efeito adverso foi relatado e as evidências foram de baixa qualidade com benefícios conflitantes (MCCOOL; ROSEN, 2006).

Em resumo, os resultados variados das intervenções com dispositivos de HFCWO em diferentes condições de saúde indicam a necessidade de mais pesquisas e padronização das avaliações de segurança.

Embora a utilização de dispositivos de HFCWO se mostre promissora na melhoria de certos desfechos, a certeza das evidências é frequentemente baixa, sugerindo que estudos mais abrangentes são necessários para avaliar sua eficácia e segurança.

2.4.3 Sinopse de Evidências – Visão Bibliométrica da Pesquisa HFCWO (B)

Os achados desta ampla pesquisa em dispositivos de vibração mecânica torácica para desobstrução das vias aéreas nas últimas duas décadas fornecem um retrato notável do crescente interesse científico e geral neste campo.

I.- Interesse científico e relevância geral: As 230 publicações de pesquisa, 137 patentes e 56 ensaios clínicos identificados através das plataformas Dimensions® e PubMed® indicam interesse substancial em HFCWO. Citações e escores altimétricos revelam que esses dispositivos vêm ganhando reconhecimento científico e atenção pública, refletindo sua relevância no campo da saúde.

II.- Diversas aplicações em condições de saúde: A HFCWO tem sido estudada em uma ampla gama de doenças e condições, destacando sua versatilidade e potencial. Estes incluem fibrose cística, DPOC, bronquiectasias e até COVID-19, destacando a adaptabilidade desses dispositivos para várias necessidades médicas. Além disso, sua aplicação em cenários como cirurgia torácica, pneumonia e trauma fechado da parede torácica mostra sua importância nos cuidados cirúrgicos e pós-operatórios.

III.- Distribuição Geográfica: O geomapeamento das publicações revela que os principais países com mais publicações nesse campo são EUA, Reino Unido, Austrália, Brasil, Canadá, Itália, Bélgica e França. Essa distribuição geográfica ressalta a natureza global da pesquisa e desenvolvimento de dispositivos de desobstrução das vias aéreas.

IV.- Patentes e Propriedade Intelectual: A presença de 137 patentes, sendo 55 ativas, demonstra o significativo interesse da propriedade intelectual neste campo. Notavelmente, os países com mais patentes diferem daqueles com mais publicações, com a China, os EUA e outras nações fazendo contribuições substanciais para a inovação nessa área. Nos EUA, as patentes são classificadas sob o código IPC A61H23, significando o foco em aparelhos para respiração artificial, particularmente oscilações de alta frequência, destacando uma área de interesse e avanço tecnológico.

V.- Ensaios Clínicos: A existência de 56 ensaios clínicos, com 47 concluídos, indica a tradução da pesquisa em aplicações práticas. Os ensaios em várias fases, da Fase 1 à Fase 4, refletem os esforços contínuos para avaliar a segurança e eficácia dos dispositivos de HFCWO em ambientes clínicos. A ampla distribuição desses estudos em diferentes países enfatiza o escopo global e o potencial dessas investigações para beneficiar pacientes em todo o mundo.

Em conclusão, os resultados mostram o crescente interesse em dispositivos de desobstrução de vias aéreas, a diversificação de suas aplicações e a colaboração global entre pesquisadores e inovadores neste campo.

A presença de patentes e ensaios clínicos em andamento reflete um forte compromisso com o avanço da compreensão e utilização desses dispositivos, com o potencial de melhorar o atendimento ao paciente e o bem-estar em um amplo espectro de condições de saúde.

2.4.4 Mecanismos de ação da HFCWO

Brunengo et al. (2021) construíram um modelo matemático do pulmão e descobriram que os dispositivos de HFCWO criam tensões que mobilizam o muco ao contribuir para o seu limite de escoamento. A faixa de frequência ótima da HFCWO prevista coincide com aquela utilizada na prática (BRUNENGO et. al., 2021)

Calverley (1986) demonstrou que a HFCWO pode diminuir a ventilação minuto em sujeitos que respiram espontaneamente em 35-40% a 3-5Hz, por meio de mecanismos que não envolvem alterações nos gases sanguíneos (CALVERLEY et al., 1986). Isso sugere que a HFCWO pode auxiliar na ventilação sem a necessidade de intubação. A rápida inflação e deflação do colete durante a HFCWO comprimem e liberam a parede torácica até 20 vezes por segundo, gerando mudanças de pressão positivas ou negativas que se acredita mobilizarem secreções (SAROJINI; DASH, 2021).

Sarojini (2021) e Mantellini (2012) revisaram como a HFCWO pode auxiliar na eliminação de secreções vibrando a parede torácica, tornando o muco menos viscoso e mais fácil de ser expectorado (SAROJINI; DASH, 2021) (MANTELLINI et al., 2012).

As vibrações ajudam a soltar secreções espessas, facilitando a eliminação (QUISSESA; JUHDELIENA; GULTOM, 2021). A terapia também reduz a viscosidade do muco e melhora os parâmetros inflamatórios sanguíneos (SAROJINI; DASH, 2021; ZUCKER; SKJODT; JONES, 2008).

A HFCWO também altera os padrões respiratórios ao diminuir a frequência respiratória, mas aumentar o volume corrente, o que pode melhorar a oxigenação e reduzir os níveis de dióxido de carbono (PIQUET et al., 1987).

Em pacientes com secreções excessivas, a HFCWO melhora a aeração pulmonar e a distribuição da ventilação (LONGHINI et al., 2016).

Em pacientes sem secreções excessivas, a HFCWO não melhora significativamente a aeração pulmonar ou a distribuição da ventilação (LONGHINI et al., 2016).

Jolley (2013) descobriu que a HFCWO a 30Hz reduziu a falta de ar em sujeitos saudáveis durante a hipercapnia, um estado de excesso de dióxido de carbono no sangue. A falta de alteração no impulso ou esforço respiratório sugere que a HFCWO melhora a correspondência entre o esforço respiratório e a necessidade (JOLLEY et al., 2013).

Em resumo, a HFCWO emprega uma variedade de mecanismos, incluindo oscilação de pressões pleurais, modulação de padrões respiratórios, aprimoramento da aeração pulmonar e ventilação, afrouxamento de secreções, redução de viscosidade e ciclos rápidos de compressão-liberação da parede torácica.

A eficácia da HFCWO está intrinsecamente relacionada ao nível de fluxo oscilado e à pressão de pulso gerada.

Importante destacar que, embora o HFCWO proporcione benefícios substanciais em pacientes com secreções excessivas, seu impacto na função pulmonar é menos pronunciado em indivíduos sem desafios desse tipo de secreção.

Essas descobertas contribuem coletivamente para uma compreensão abrangente dos mecanismos que fundamentam a ação terapêutica da HFCWO.

2.4.5 Segurança, riscos e contraindicações para dispositivos de HFCWO

Dispositivos de HFCWO são geralmente considerados seguros para desobstruir as vias aéreas em uma variedade de distúrbios respiratórios.

No entanto, existem riscos e considerações que vêm com o seu uso. Pacientes com trauma da parede torácica são mais propensos a apresentar problemas pulmonares ligados à desobstrução das vias aéreas (ANDERSON et al., 2008). A terapia com a HFCWO nesses pacientes deve ser cuidadosamente avaliada e seguida para garantir sua segurança e eficácia.

O Bronchiectasis ToolboxT®, da Thoracic Society of Australia and New Zealand e o MassHealth®, da Medicaid Children's Health Insurance Program publicaram uma lista abrangente de contraindicações e precauções.

As contraindicações incluem lesão cervical instável, acesso ao portal sob o dispositivo HFCWO, embolia pulmonar, contusão pulmonar, hemoptise atual, instabilidade hemodinâmica, fraturas de costelas e presença de grande derrame pleural ou empiema.

Precauções devem ser tomadas em casos de doença em estágio terminal, em que o volume expiratório final pode cair abaixo da capacidade de fechamento, quando o portal está localizado sob o dispositivo, mas não acessado atualmente, após cirurgia esofágica recente, na presença de abdome distendido, broncoespasmo, osteoporose ou coagulopatia.

2.4.6 Patentes de Dispositivos de HFCWO e Cenário Regulatório

A análise das patentes selecionadas revela uma clara tendência de inovação no campo dos dispositivos de vibração de alta frequência.

As patentes cobrem uma ampla gama de áreas, desde métodos e sistemas até dispositivos que utilizam vibrações eletromecânicas e eletropneumáticas.

Essa diversidade demonstra o crescente interesse da indústria e dos pesquisadores em encontrar soluções inovadoras para os problemas respiratórios.

A proteção de patentes desempenha um papel fundamental no fomento à pesquisa e desenvolvimento nesse campo, incentivando investimentos e permitindo que inovadores compartilhem seus avanços com a comunidade científica, promovendo assim o progresso tecnológico.

A China surge como líder com 90 depósitos de patentes, seguida pelos EUA com 57, Brasil e Canadá com 6 cada. Nota-se que pedidos de patentes internacionais (WO/EP) ou em outros países não foram considerados nesta análise.

Vários dispositivos de HFCWO liberados pela FDA estão disponíveis nos EUA, incluindo o VestTM Airway Clearance System®, SmartVest Airway Clearance System®, inCourageTM System® e Medpulse Respiratory Vest System®.

Existem diferenças regionais nas regulamentações de dispositivos de HFCWO.

Nos EUA, os dispositivos de HFCWO devem receber a aprovação da FDA para serem comercializados, são classificados como equipamentos médicos duráveis (DME) ("High Frequency Chest Wall Oscillation Devices - Policy Article (A52494)," [s.d.]) e são cobertos pelo Medicare Parte B (GUIDANCE, [s.d.]).

Um fabricante de dispositivos médicos deve solicitar um código do Healthcare Common Procedure Coding System® (HCPCS) do Centers for Medicare & Medicaid Services® (CMS) após a aprovação do FDA.

Em 2022, o CMS atribuiu aos dispositivos de HFCWO o código E0483 ("E0483 - HCPCS Code for Hi freq chest wall oscil sys," [s.d.]).

A HFCWO, considerada um tratamento convencional para desobstrução de vias aéreas nos EUA, foi introduzida na Europa (OSMAN et al., 2010).

Em outras regiões geográficas e países, não há regulamentos específicos para dispositivos de HFCWO, mas eles devem cumprir o processo de aprovação como todos os dispositivos médicos.

Na União Europeia (UE), os dispositivos de HFCWO, como todos os dispositivos médicos, precisam atender aos requisitos do Regulamento de Dispositivos Médicos da UE (MDR) para acesso ao mercado. MDR tornou-se aplicável a todos os dispositivos médicos vendidos na UE a partir de 26 de maio de 2021.

No entanto, a implementação de certas disposições MDR será prorrogada até dezembro de 2028 para dispositivos médicos que foram previamente aprovados sob a Diretiva de Dispositivos Médicos 93/42/CEE (MDD) e a Diretiva 90/385/CEE de Dispositivos Médicos Implantáveis Ativos (AIMDD).

2.4.7 Ferramentas de Inteligência Artificial (IA) para Aquisição de Evidências Científicas

Nosso projeto de pesquisa utilizou plataformas avançadas como Nested Knowledge®, SciSpace®, Elicit®, Altmetric Explorer® e Dimensions® para pesquisa bibliográfica e bibliométrica.

Essas ferramentas nos ajudaram a analisar dados, acompanhar tendências e coletar opiniões de especialistas, empregando tecnologias de ponta, como processamento de linguagem natural (PLN), aprendizado de máquina, análise de dados e *crowdsourcing.*

O Nested Knowledge® aproveita a PLN para descobrir relações intrincadas entre conceitos científicos.

O SciSpace® usa algoritmos de aprendizado de máquina para reconhecimento de padrões em dados acadêmicos.

Elicit® facilita opiniões de especialistas de *crowdsourcing*.

O Altmetric Explorer® rastreia o engajamento on-line com publicações acadêmicas, oferecendo insights sobre o impacto social.

Dimensions® baseia-se em dados bibliométricos para análise e visualização de citações.

Essas tecnologias aprimoram as capacidades de processamento e análise de dados, ajudando os pesquisadores a extrair insights valiosos de grandes volumes de informações.

No entanto, é importante notar que essas plataformas nem sempre fornecem resultados claros devido à complexidade dos dados que manipulam (MCGOWAN et al., 2023; WALTERS; WILDER, 2023).

Isso destaca a necessidade contínua de julgamento humano e pensamento crítico na interpretação de seus achados. Embora o uso de plataformas de IA tenha facilitado muito a síntese da literatura científica, a verificação humana e o refinamento das observações e interpretações permaneceram necessários (JAVID; REDDIBOINA; BHANDARI, 2023; SALLAM, 2023).

A engenharia de prompts baseada em pensamento é um método para orientar modelos de linguagem de grande escala (LLM) para fornecer respostas mais completas e informativas.

Ele funciona instruindo o LLM a dividir seu processo de pensamento em etapas ou conceitos menores.

Metodologias de engenharia de pensamento foram empregadas neste projeto, incluindo prompts de cadeia de pensamento e árvore de pensamento.

Esses tipos de prompts exigem que o LLM gere uma série de conceitos que se baseiam uns nos outros. Isso permite que o LLM raciocine sobre o problema em questão e produza uma resposta mais lógica e estruturada.

Em nosso estudo, empregamos vários mecanismos de IA para pesquisar e sintetizar evidências científicas, onde o raciocínio dos pesquisadores por meio de debates colaborativos permaneceu central para concluir as evidências.

Um estudo recente mostra promessa em aumentar o raciocínio de IA e a precisão factual, introduzindo a colaboração e o debate entre modelos de linguagem múltipla (DU et al., 2023).

Este é um passo encorajador para o desenvolvimento de modelos de linguagem mais confiáveis e confiáveis que podem ser usados para uma gama mais ampla de empregos.

Ao usar essas técnicas, os pesquisadores podem criar sistemas mais eficientes e eficazes para a análise da literatura científica que podem ajudá-los a acelerar suas pesquisas e descobertas.

Embora essas plataformas sejam inestimáveis, elas funcionam melhor quando combinadas com a percepção humana, garantindo que nossa pesquisa leve a conclusões significativas em nosso cenário tecnológico em constante evolução.

O impacto da IA na pesquisa científica revoluciona as práticas tradicionais e aumenta a eficiência da pesquisa.

Ferramentas alimentadas por IA podem digitalizar e analisar rapidamente grandes quantidades de literatura, extrair insights valiosos e acelerar o processo de escrita, liberando os pesquisadores para se concentrarem em aspectos mais inovadores de seu trabalho.

Em nosso estudo, as ferramentas de IA forneceram suporte por meio de:

- Revisões de literatura orientadas por IA: A IA pode ajudar os pesquisadores a identificar literatura relevante para suas revisões de pesquisa, economizando tempo e esforço e permitindo-lhes produzir revisões mais abrangentes e atualizadas. Por exemplo, ferramentas alimentadas por IA como CiteSpace® e VOSviewer® podem gerar automaticamente redes e mapas de citação, revelando padrões e relacionamentos ocultos na literatura.
- Análise e visualização de dados: A IA pode processar conjuntos de dados complexos com mais rapidez e precisão do que os seres humanos, oferecendo o potencial de descobrir padrões ou correlações ocultas. Além disso, a IA pode ajudar na criação de visualizações de dados atraentes que melhoram a clareza e o impacto dos artigos de pesquisa. Por exemplo, ferramentas alimentadas por IA, como Tableau® e Power BI®, podem ajudar os pesquisadores a gerar painéis, gráficos e mapas interativos que comunicam suas descobertas de forma clara e envolvente.
- Recomendação de conteúdo: os sistemas de recomendação orientados por IA ajudam os pesquisadores a descobrir artigos relevantes e a manter-se atualizados com as pesquisas mais recentes em seu campo. Esses sistemas analisam os interesses de um usuário e sugerem artigos, promovendo a aprendizagem interdisciplinar e a colaboração. Por exemplo, ferramentas alimentadas por IA, como o Google Acadêmico® e o PubMed Central®, recomendam artigos relevantes com base no histórico de pesquisa de um usuário e artigos salvos. Ferramentas de IA como Grammarly® e QuillBot® podem ajudar os pesquisadores a identificar e corrigir erros gramaticais, melhorar a estrutura da frase e melhorar a legibilidade.

No geral, a IA é uma ferramenta poderosa que tem o potencial de revolucionar a pesquisa científica. Ao considerar cuidadosamente os desafios e as considerações éticas, os pesquisadores podem aproveitar o poder da IA para aprimorar seu trabalho e avançar o conhecimento científico.

3 CONCLUSÃO

Em conclusão, nossa investigação destaca o papel promissor dos dispositivos de HFCWO no cuidado respiratório, embora a demanda por evidências mais robustas persista.

A análise bibliométrica revela um interesse global em dispositivos de desobstrução das vias aéreas e enfatiza a necessidade de pesquisas contínuas para melhorar nossa compreensão dos dispositivos de HFCWO, abordando as considerações de segurança.

A relevância clínica da HFCWO ressalta sua importância no avanço da medicina respiratória.

Além disso, nossa pesquisa demonstra a relação simbiótica entre pesquisa interdisciplinar, engenharia de prompts e ferramentas de IA e mostra o papel transformador da IA em diversos domínios de pesquisa, além das revisões da literatura.

Isso destaca o cenário em evolução das práticas científicas, com o julgamento humano permanecendo parte integrante da interpretação de descobertas complexas.

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APÊNDICE A – META-REVISÃO – ANÁLISE DO TEXTO COMPLETO

Title	Author	Publication Year	Screening Status
Airway clearance techniques compared to no airway clearance techniques for cystic fibrosis.	Warnock, Louise	2023	Included
Active cycle of breathing technique for cystic fibrosis.	Wilson, Lisa M	2023	Included
Effects of High-Frequency Chest Wall Oscillation on Acute Exacerbation of Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis of Randomized Controlled Trials.	Huang, Hsiao-Ping	2022	Included
Chest physiotherapy for pneumonia in adults.	Chen, Xiaomei	2022	Included
Technical Aspects of Devices and Equipment for Positive Expiratory Pressure With and Without Oscillation.	Fagevik OlsV©n, Monika	2021	Excluded: Not included High-Frequency Chest Wall Compression Devices
Oscillating devices for airway clearance in people with cystic fibrosis.	Morrison, Lisa	2020	Included
Positive expiratory pressure physiotherapy for airway clearance in people with cystic fibrosis.	McIlwaine, Maggie	2019	Included
Airway clearance techniques for cystic fibrosis: an overview of Cochrane systematic reviews.	Wilson, Lisa M	2019	Included
Oscillating devices for airway clearance in people with cystic fibrosis.	Morrison, Lisa	2017	Excluded: There is a more recent version
Active cycle of breathing technique for cystic fibrosis.	Mckoy, Naomi A	2016	Excluded: There is a more recent version
Physiotherapy Intervention During Level I of Pulmonary Rehabilitation on Chronic Obstructive Pulmonary Disease: A Systematic Review.	de Alvarenga, Guilherme Medeiros	2016	Included
Airway clearance techniques for bronchiectasis.	Lee, Annemarie L	2015	Included
Positive expiratory pressure physiotherapy for airway clearance in people with cystic fibrosis.	McIlwaine, Maggie	2015	Excluded: There is a more recent version
Principal findings of systematic reviews for the management of acute bronchiolitis in children.	Castro-Rodriguez, Jose A	2015	Excluded: Not included High-Frequency Chest Wall Compression Devices
The effects of oscillating positive expiratory pressure therapy in adults with stable non-cystic fibrosis bronchiectasis: A systematic review.	Lee, Annemarie L	2015	Excluded: Not included High-Frequency Chest Wall Compression Devices
Non-pharmaceutical management of respiratory morbidity in children with severe global developmental delay.	Winfield, Naomi R	2014	Included
Oscillating devices for airway clearance in people with cystic fibrosis.	Morrison, Lisa	2014	Excluded: There is a more recent version
Airway clearance techniques for bronchiectasis.	Lee, Annemarie L	2013	Excluded: There is a more recent version
Active cycle of breathing technique for cystic fibrosis.	McKoy, Naomi A	2012	Excluded: There is a more recent version
Active cycle of breathing technique for cystic fibrosis.	Robinson, Karen A	2010	Excluded: There is a more recent version
Oscillating devices for airway clearance in people with cystic fibrosis.	Morrison, Lisa	2009	Excluded: There is a more recent version
Effectiveness of positive expiratory pressure on patients over 16 years of age with cystic fibrosis: systematic review and meta-analysis.	Rocamora-PV©rez, Patricia	2022	Excluded: Not included High-Frequency Chest Wall Compression Devices
Exercise versus airway clearance techniques for people with cystic fibrosis.	Heinz, Katie D	2022	Excluded: Not included High-Frequency Chest Wall Compression Devices
Cough augmentation techniques for people with chronic neuromuscular disorders.	Morrow, Brenda	2021	Excluded: Not included High-Frequency Chest Wall Compression Devices
High versus low positive end-expiratory pressure (PEEP) levels for mechanically ventilated adult patients with acute lung injury and acute respiratory distress syndrome.	Santa Cruz, Roberto	2021	Excluded: Not included High-Frequency Chest Wall Compression Devices

Postnatal corticosteroids for transient tachypnoea of the newborn.	Bruschettini, Matteo	2020	Excluded: Not included High-Frequency Chest Wall Compression Devices
Sustained versus standard inflations during neonatal resuscitation to prevent mortality and improve respiratory outcomes.	Bruschettini, Matteo	2020	Excluded: Not included High-Frequency Chest Wall Compression Devices
High-frequency oscillatory ventilation versus conventional ventilation for acute respiratory distress syndrome.	Sud, Sachin	2016	Excluded: Not included High-Frequency Chest Wall Compression Devices
Autogenic drainage for airway clearance in cystic fibrosis.	McCormack, Pamela	2017	Excluded: Not included High-Frequency Chest Wall Compression Devices
Positive expiratory pressure therapy versus other airway clearance techniques for bronchiectasis.	Lee, Annemarie L	2017	Excluded: Not included High-Frequency Chest Wall Compression Devices
Timing of hypertonic saline inhalation for cystic fibrosis.	Elkins, Mark	2020	Excluded: Not included High-Frequency Chest Wall Compression Devices
Sustained versus standard inflations during neonatal resuscitation to prevent mortality and improve respiratory outcomes.	Bruschettini, Matteo	2017	Excluded: Not included High-Frequency Chest Wall Compression Devices
Chest physiotherapy for acute bronchiolitis in paediatric patients between 0 and 24 months old.	RoquV© i Figuls, Marta	2016	Excluded: Not included High-Frequency Chest Wall Compression Devices
Invasive ventilation modes in children: a systematic review and meta-analysis.	Duyndam, Anita	2011	Excluded: Not included High-Frequency Chest Wall Compression Devices
Acupuncture for depression.	Smith, Caroline A	2018	Excluded: Not related to Optimal Airway Clearance Techniques
Non-invasive ventilation for the management of acute hypercapnic respiratory failure due to exacerbation of chronic obstructive pulmonary disease.	Osadnik, Christian R	2017	Excluded: Not related to Optimal Airway Clearance Techniques
Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis.	Main, E	2005	Excluded: There is a more recent version
Effect of mechanical ventilation in the prone position on clinical outcomes in patients with acute hypoxemic respiratory failure: a systematic review and meta-analysis.	Sud, Sachin	2008	Excluded: Not related to Optimal Airway Clearance Techniques
Pressure and volume limited ventilation for the ventilatory management of patients with acute lung injury: a systematic review and meta-analysis.	Burns, Karen E A	2011	Excluded: Not related to Optimal Airway Clearance Techniques
Lateral positioning for critically ill adult patients.	Hewitt, Nicky	2016	Excluded: Not related to Optimal Airway Clearance Techniques
Interventions for promoting physical activity in people with cystic fibrosis.	Cox, Narelle S	2013	Excluded: Not related to Optimal Airway Clearance Techniques
Psychological interventions for individuals with cystic fibrosis and their families.	Goldbeck, Lutz	2014	Excluded: Not related to Optimal Airway Clearance Techniques
Inhaled beclomethasone versus placebo for chronic asthma.	Adams, N P	2005	Excluded: Not related to Optimal Airway Clearance Techniques
Improving mucociliary clearance in chronic obstructive pulmonary disease.	Bhowmik, Angshu	2009	Excluded: Not a Systematic Review
EFFECTS OF DIFFERENT EXERCISE THERAPIES ON OBSTRUCTION, DYSPNEA, AND QUALITY OF LIFE IN COPD PATIENTS: A SYSTEMATIC REVIEW	Khan, Fouzia Hussain	2022	Included
Airway clearance devices in cystic fibrosis.	Marks, John H	2007	Excluded: Not a Systematic Review
High-frequency oscillation of the airway and chest wall.	Fink, James B	2002	Excluded: Not a Systematic Review

[High-frequency chest wall oscillation].	Ji, S G	1992	Excluded: No abstract available
Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis.	Main, Eleanor	2023	Excluded: There is a more recent version
Pulmonary physical therapy techniques for the management of COVID-19 patients: A systematic review.	Khan, Savera	2022	Excluded: Not related to Optimal Airway Clearance Techniques
Use of oscillatory positive expiratory pressure (OPEP) devices to augment sputum clearance in COPD: a systematic review and meta-analysis.	Alghamdi, Saeed M	2020	Excluded: Not included High-Frequency Chest Wall Compression Devices
Effect of airway clearance techniques in patients experiencing an acute exacerbation of bronchiectasis: a systematic review.	Phillips, Jennifer	2020	Excluded: Not included High-Frequency Chest Wall Compression Devices
Chest physiotherapy compared to no chest physiotherapy for cystic fibrosis.	Warnock, Louise	2015	Excluded: There is a more recent version
Chest physiotherapy compared to no chest physiotherapy for cystic fibrosis.	Warnock, Louise	2013	Excluded: There is a more recent version
Nebuliser systems for drug delivery in cystic fibrosis.	Daniels, Tracey	2013	Excluded: Not included High-Frequency Chest Wall Compression Devices
WITHDRAWN: Bronchopulmonary hygiene physical therapy for chronic obstructive pulmonary disease and bronchiectasis.	Jones, Arthur P	2011	Excluded: Withdrawn
Effect of airway clearance techniques in patients experiencing an acute exacerbation of chronic obstructive pulmonary disease: a systematic review.	Hill, Kylie	2010	Excluded: Not included High-Frequency Chest Wall Compression Devices
Chest physiotherapy for reducing respiratory morbidity in infants requiring ventilatory support.	Hough, Judith L	2008	Excluded: Not included High-Frequency Chest Wall Compression Devices
Nonpharmacologic airway clearance therapies: ACCP evidence-based clinical practice guidelines.	McCool, F Dennis	2006	Included
Bronchopulmonary hygiene physical therapy for chronic obstructive pulmonary disease and bronchiectasis.	Jones, A P	2000	Excluded: Not included High-Frequency Chest Wall Compression Devices
Bronchopulmonary hygiene physical therapy in bronchiectasis and chronic obstructive pulmonary disease: a systematic review.	Jones, A	2000	Excluded: Not included High-Frequency Chest Wall Compression Devices
Chest physical therapy management of patients with cystic fibrosis. A meta-analysis.	Thomas, J	1995	Excluded: Not included High-Frequency Chest Wall Compression Devices

APÊNDICE B – PATENTES – PLATAFORMA DIMENSIONS®

"About the data: Exported on Sep 22, 2023. Criteria: '("chest wall oscillation" OR ("chest" AND "wall" AND "oscillation") OR "chest wall oscillation" OR ("high" AND "frequency" AND "chest" AND "wall" AND "oscillation") OR "high frequency chest wall oscillation" OR ("chest wall oscillation" OR ("chest" AND "wall" AND "oscillation") OR "chest wall oscillation" OR ("high" AND "frequency" AND "chest" AND "wall" AND "compression") OR "high frequency chest wall compression") OR (("chested" OR "thorax" OR "thorax" OR "chest" OR "chests") AND ("vibrate" OR "vibrated" OR "vibrates" OR "vibrating" OR "vibration" OR "vibration" OR "vibrations" OR "vibrational" OR "vibrator" OR "vibrators")) OR "Vibrotherapy") AND ((("airway" OR "airway s" OR "airways") AND ("clearance" OR "clearances")) OR ("sputum" OR "sputum" OR "sputums") OR ("bronchial" OR "bronchiale" OR "bronchials"))' in title and abstract; Publication Year is 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 or 2015 or 2014 or 2013 or 2012 or 2011 or 2010 or 2009 or 2008 or 2007 or 2006 or 2005 or 2004 or 2003.

Rank	Publication number	Application number	Family ID	Patent title	Abstract
318	WO-2013 1517 00-A1	US2013030869W	49292874	HIGH FREQUENCY CHEST WALL OSCILLATION APPARATUS	A high frequency chest wall oscillation (HFCWO) apparatus for the purpose of lung airway clearance of people includes an inflated vest type garment worn around the chest of a person. An oscillating pressure generator with reduced power requirements and a power source is integrated with the garment so that the complete apparatus is wearable by the person. Improvements in pressure waveforms, safety and compliance to prescribed use are disclosed.
318	US-9237982-B2	US13798955	49292874	High frequency chest wall oscillation apparatus	A high frequency chest wall oscillation (HFCWO) apparatus for the purpose of lung airway clearance of people includes an inflated vest type garment worn around the chest of a person. An oscillating pressure generator with reduced power requirements and a power source is integrated with the garment so that the complete apparatus is wearable by the person. Improvements in pressure waveforms, safety and compliance to prescribed use are disclosed.
318	US-2013026787 7-A1	US13798955	49292874	HIGH FREQUENCY CHEST WALL OSCILLATION APPARATUS	A high frequency chest wall oscillation (HFCWO) apparatus for the purpose of lung airway clearance of people includes an inflated vest type garment worn around the chest of a person. An oscillating pressure generator with reduced power requirements and a power source is integrated with the garment so that the complete apparatus is wearable by the person. Improvements in pressure waveforms, safety and compliance to prescribed use are disclosed.

318	EP-283385-4-A1	EP1377195 3A	4929287 4	HIGH FREQUENCY CHEST WALL OSCILLATION APPARATUS	A high frequency chest wall oscillation (HFCWO) apparatus for the purpose of lung airway clearance of people includes an inflated vest type garment worn around the chest of a person. An oscillating pressure generator with reduced power requirements and a power source is integrated with the garment so that the complete apparatus is wearable by the person. Improvements in pressure waveforms, safety and compliance to prescribed use are disclosed.
3075	CN-1148287 99-A	CN2020800783 35.9	7584621 1	Self-adaptive high-frequency chest wall oscillation system	The present disclosure relates to devices, systems and methods for High Frequency Chest Wall Oscillation (HFCWO) therapy that can enhance sputum ejection by facilitating mucus ejection by preferential impact to the user, including by continuously applying pressure to a chest engaging device to provide HFCWO. The chest wall concussion treatment system of the present disclosure may include a chest engaging device for delivering an impact force to a patient's chest and a force generator arranged to generate a continuous impact force as a patient treatment plan. The chest wall oscillation therapy system additionally comprises a therapy control system comprising at least one sensor arranged to detect an indication of a breathing pattern of the patient.
2769	US-9968511-B2	US15397789	3978942 7	High frequency chest wall oscillation system	A therapy system is operable to deliver at least one respiratory therapy to a patient. For example, therapy system may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The therapy system is contained in a housing supported by a mobile stand.

2769	US-2018022868 7-A1	US15952500	39789427	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system is operable to deliver at least one respiratory therapy to a patient. For example, therapy system may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The therapy system is contained in a housing supported by a mobile stand.
2769	US-2017011270 7-A1	US15397789	39789427	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system is operable to deliver at least one respiratory therapy to a patient. For example, therapy system may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The therapy system is contained in a housing supported by a mobile stand.
2769	US-2014017184 3-A1	US14185348	39789427	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system is operable to deliver at least one respiratory therapy to a patient. For example, therapy system may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The therapy system is contained in a housing supported by a mobile stand.
2769	US-2009019242 1-A1	US12420872	39789427	MOBILE HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system is operable to deliver at least one respiratory therapy to a patient. For example, therapy system may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The therapy system is contained in a housing supported by a mobile stand.

269	US-111100 28-B2	US1595250 0	39789427	High frequency chest wall oscillation system	A therapy system is operable to deliver at least one respiratory therapy to a patient. For example, therapy system may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The therapy system is contained in a housing supported by a mobile stand.
261	CN-217938661-U	CN202123158705.0	84208738	Novel high-frequency chest wall oscillation sputum excretion instrument	The utility model belongs to the technical field of nursing device, especially, relate to a novel high frequency chest wall oscillation sputum discharging appearance, the pressurized gas that the air pump produced aerifys to inflatable undershirt with the pulse form under the effect of inflation valve switching, the gas of storing in the inflatable undershirt unloads through the bleed valve, the utility model provides a prior art have traditional manual back of the body sputum discharging strength inhomogeneous, frequency difficult control etc. not enough, the sputum discharging effect is not very ideal problem, has the problem that makes the patient effectively secrete the excrement, plays positive beneficial technological effect to the motion of respiratory track.
594	US-673678 5-B1	US0975467 2	25035816	Mechanical chest wall oscillator	A portable high frequency chest wall oscillation (HFCWO) apparatus for the purposes of airway lung clearance and ventilation includes a circumferential chest band which is placed around a person's chest and a drive which is connected to the chest band for cyclically varying the circumference of the chest band to apply an oscillating compressive force to the chest of the person. The apparatus maintains the oscillating compressive force applied by the chest band to the chest of the person at a substantially constant level such that the person is able to continue chest expansions and contractions during a breathing cycle.

2594	US-2004017670 9-A1	US10801021	25035816	Mechanical chest wall oscillator	A portable high-frequency chest wall oscillation (HFCWO) apparatus for the purposes of airway lung clearance and ventilation includes a circumferential chest band which is placed around a person's chest and a drive which is connected to the chest band for cyclically varying the circumference of the chest band to apply an oscillating compressive force to the chest of the person. The apparatus maintains the oscillating compressive force applied by the chest band to the chest of the person at a substantially constant level such that the person is able to continue chest expansions and contractions during a breathing cycle.
2500	WO-2002053083-A3	US0200120W	25035816	MECHANICAL CHEST WALL OSCILLATOR	A portable high frequency chest wall oscillation (HFCWO) apparatus (10) for the purposes of airway lung clearance and ventilation includes a circumferential chest band (12) which is placed around a person's chest and a drive (14) which is connected to the chest band (12) for cyclically varying the circumference of the chest band (12) to apply an oscillating compressive force to the chest of the person. The apparatus (10) maintains the oscillating compressive force applied by the chest band (12) to the chest of the person at a substantially constant level such that the person is able to continue chest expansions and contractions during a breathing cycle.
2500	EP-1416898-B1	EP02701890A	25035816	Mechanical chest wall oscillator	A portable high frequency chest wall oscillation (HFCWO) apparatus (10) for the purposes of airway lung clearance and ventilation includes a circumferential chest band (12) which is placed around a person's chest and a drive (14) which is connected to the chest band (12) for cyclically varying the circumference of the chest band (12) to apply an oscillating compressive force to the chest of the person. The apparatus (10) maintains the oscillating compressive force applied by the chest band (12) to the chest of the person at a substantially constant level such that the person is able to continue chest expansions and contractions during a breathing cycle.
2500	EP-1416898-A2	EP02701890A	25035816	MECHANICAL CHEST WALL OSCILLATOR	A portable high frequency chest wall oscillation (HFCWO) apparatus (10) for the purposes of airway lung clearance and ventilation includes a circumferential chest band (12) which is placed around a person's chest and a drive (14) which is connected to the chest band (12) for cyclically varying the circumference of the chest band (12) to apply an oscillating compressive force to the chest of the person. The apparatus (10) maintains the oscillating compressive force applied by the chest band (12) to the chest of the person at a substantially constant level such that the person is able to continue chest expansions and contractions during a breathing cycle.
2370	US-6910479-B1	US09412459	27503604	Airway treatment apparatus with bias line cancellation	An airway clearance system and method produces high frequency chest wall oscillations (HFCWO) and increased airflow velocities through the air passages to clear the lungs of mucus. The system includes a chest wall force applicator to produce the HFCWO by applying an oscillating force component and a steady state (or bias line) force component. An air pressure input mouthpiece system that supplies airflow to a mouthpiece with a steady state, air component which tends to counteract or cancel the bias line force component.

2285	US-2017002781 3-A1	US15206760	578862 38	COORDINATED CONTROL OF HFCWO AND COUGH ASSIST DEVICES	A respiratory therapy apparatus includes components operable to simultaneously provide a High Frequency Chest Wall Oscillation (HFCWO) therapy and a Mechanical Insufflation/Exsufflation (MIE) therapy to a patient. The respiratory therapy apparatus includes a controller that controls a synchronization of the HFCWO therapy and the MIE therapy to provide respiratory therapy to the patient to effectively clear mucous or induce deep sputum from the lungs of patient.
2285	US-1051804 8-B2	US15206760	578862 38	Coordinated control of HFCWO and cough assist devices	A respiratory therapy apparatus includes components operable to simultaneously provide a High Frequency Chest Wall Oscillation (HFCWO) therapy and a Mechanical Insufflation/Exsufflation (MIE) therapy to a patient. The respiratory therapy apparatus includes a controller that controls a synchronization of the HFCWO therapy and the MIE therapy to provide respiratory therapy to the patient to effectively clear mucous or induce deep sputum from the lungs of patient.
2107	WO-2007106804-A3	US2007063864W	385102 27	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system (200, 300, 610, 900) is operable to deliver a plurality of respiratory therapies to a patient and has an assessment system (318, 366, 372, 378, 379, 480, 482) operable to assess the efficacy of at least one of the respiratory therapies. The therapy system (200, 300, 610, 900) may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The assessment system (318, 366, 372, 378, 379, 480, 482) may comprise any one or more of the following devices: a flow meter, a spirometer, an electronic stethoscope, a tympanic thermometer, a pulse oximeter, a respiration rate monitor, and the like.

2107	WO-2007106804-A2	US2007063864W	3851027	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system (200, 300, 610, 900) is operable to deliver a plurality of respiratory therapies to a patient and has an assessment system (318, 366, 372, 378, 379, 480, 482) operable to assess the efficacy of at least one of the respiratory therapies. The therapy system (200, 300, 610, 900) may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The assessment system (318, 366, 372, 378, 379, 480, 482) may comprise any one or more of the following devices: a flow meter, a spirometer, an electronic stethoscope, a tympanic thermometer, a pulse oximeter, a respiration rate monitor, and the like.
2107	EP-2007461-A2	EP07758416A	3851027	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	A therapy system (200, 300, 610, 900) is operable to deliver a plurality of respiratory therapies to a patient and has an assessment system (318, 366, 372, 378, 379, 480, 482) operable to assess the efficacy of at least one of the respiratory therapies. The therapy system (200, 300, 610, 900) may be operable to deliver any one or more of the following therapies: a high frequency chest wall oscillation (HFCWO) therapy, a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The assessment system (318, 366, 372, 378, 379, 480, 482) may comprise any one or more of the following devices: a flow meter, a spirometer, an electronic stethoscope, a tympanic thermometer, a pulse oximeter, a respiration rate monitor, and the like.

1908	CN-1103275 22-A	CN201910661470.5	681470888	A kind of tracheal catheter and automatic eliminating the phlegm device with automatic eliminating the phlegm function	The invention discloses a kind of tracheal catheters with automatic eliminating the phlegm function, tracheal catheter is placed in endotracheal shared snorkel when including ventilation, positioned at extratracheal air intake duct and exhaust tube, exhaust tube is provided with intercommunicating pore, intercommunicating pore is for being connected to long-pending phlegm container, in addition the invention also discloses automatic eliminating the phlegm devices, including tracheal catheter and expiratory phase phlegm expelling instrument with automatic eliminating the phlegm function, expiratory phase phlegm expelling instrument includes chest wall oscillations device, chest wall oscillations device is equipped with respiratory state and monitors sensor, respiratory state monitors sensor by monitoring patient respiratory state to judge whether chest wall oscillations device works.The present invention, to extend the wear time of tracheal catheter, gives the enough rehabilitation durations of patient so that tracheal catheter is overstock without sputum by real-time suction sputum, avoids carrying out bronchotomu and causing unnecessary infection.
1732	US-8460223-B2	US11685285	39789427	High frequency chest wall oscillation system	An therapy system is operable to deliver a plurality of respiratory therapies to the patient and has an assessment system operable to assess the efficacy of at least one of the respiratory therapies. The therapy system may be operable to deliver any one or more of the following therapies: a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The assessment system may comprise any one or more of the following devices: a flow meter, a spirometer, an electronic stethoscope, a tympanic thermometer, a pulse oximeter, a respiration rate monitor, and the like.

1732	US-2008000477-A1	US11685285	39789427	HIGH FREQUENCY CHEST WALL OSCILLATION SYSTEM	An therapy system is operable to deliver a plurality of respiratory therapies to the patient and has an assessment system operable to assess the efficacy of at least one of the respiratory therapies. The therapy system may be operable to deliver any one or more of the following therapies: a positive expiratory pressure (PEP) therapy, a nebulizer therapy, an intermittent positive pressure breathing (IPPB) therapy, a cough assist therapy, a suction therapy, a bronchial dilator therapy, and the like. The assessment system may comprise any one or more of the following devices: a flow meter, a spirometer, an electronic stethoscope, a tympanic thermometer, a pulse oximeter, a respiration rate monitor, and the like.
1643	JP-2005512604-A	JP2002554034A	25035816	Mechanical chest wall oscillator	A portable high frequency chest wall vibration (HFCWO) device (10) for airway lung clearance and ventilation is connected to a peripheral chest band (12) and this chest band (12), which is placed around a human chest And a drive device (14) for periodically changing the periphery of the chest band (12) to apply a vibration compression force to the human chest. The device (10) maintains the vibrational compression force applied from the chest band (12) to the human chest at a substantially constant level so that the human can expand the chest during the respiratory cycle. And can continue to shrink.
1389	KR-2020010336-A	KR1020190021738	72469400	PORTABLE PEDIATRIC CHEST WALL VIBRATOR	The present invention relates to a portable pediatric chest wall vibrator. More specifically, the present invention relates to a portable pediatric chest wall vibrator which is put in the chest of an infant or worn with a dedicated belt, so that the vibration generated by a vibrator stimulates the chest, the chest wall, and the respiratory tract including the bronchi of a wearer, thereby allowing sputum to be discharged.

1354	KR-1022561119-B1	KR1020190021738	724694000	PORTABLE PEDIATRIC CHEST WALL VIBRATOR	The present invention relates to a portable pediatric chest wall vibrator, and in particular, by putting it in the chest of a child or wearing it with a dedicated belt, the vibration generated by the vibrator stimulates the chest, the chest wall, and the respiratory tract including the bronchi of the wearer, so that sputum is It relates to a portable pediatric chest wall vibrator that allows it to be excreted.
1300	KR-2022001066 9-A	KR1020200088926	795543444	Automatic chest wall vibration system through patient lung sound monitor	The present invention relates to an automatic chest wall vibration system through monitoring the patient's lung sound, and more particularly, by receiving a sound from the lungs during breathing of a patient and comparing it with the patient's previous lung sound or a normal patient's lung sound, an abnormal sound (atelectasis) or pneumonia), it automatically vibrates the chest wall and stimulates the respiratory tract including the chest, chest wall, and bronchi to induce sputum (sputum) to be discharged. It relates to an automatic vibration system.
1300	KR-1024517466-B1	KR1020200088926	795543444	Automatic chest wall vibration system through patient lung sound monitor	The present invention relates to an automatic chest wall vibration system through monitoring the patient's lung sound, and more particularly, by receiving the sound from the lungs during the patient's breathing and comparing it with the patient's previous lung sound or the normal patient's lung sound, an abnormal sound (atelectasis) or pneumonia), it automatically vibrates the chest wall to stimulate the patient's chest, chest wall, and respiratory tract, including bronchi, to induce sputum (sputum) to be discharged. It relates to an automatic vibration system.

1251	CN-1150894 73-B	CN202210899371.2	83301681	Rehabilitation equipment for postoperative full chest sputum excretion	The invention relates to the technical field of medical equipment, in particular to postoperative full chest sputum excretion rehabilitation equipment. The full chest vibration sputum excretion machine aims at solving the technical problems that the prior full chest vibration sputum excretion machine can vibrate a patient due to the whole expansion of an inflatable vest, cannot simulate the beating method from outside to inside and from bottom to top during manual sputum excretion, and reduces the treatment effect. The technical scheme is as follows: a postoperative full chest sputum excretion rehabilitation device, which comprises a therapeutic instrument; the left and right parts of the back side of the vest are respectively provided with a back vibration mechanism, and the therapeutic instrument is communicated with the back vibration mechanisms through a pipeline. According to the invention, the back vibration mechanism enables the plurality of air bags in the first shell to sequentially expand from outside to inside and impact the back of a patient, so that sputum in bronchus of the patient is loosened, the patient is helped to enter the loosened sputum in bronchus branches into main bronchus, the patient can conveniently expectorate the sputum, and the sputum in bronchus branches is prevented from being reattached in bronchus branches after the sputum is loosened under the impact of the air bags.

119	CN-2108442182-U	CN201921608246.1	71295037	External vibration sputum excretion machine for neurology	The utility model discloses an external vibration sputum excretion machine for neurology, which comprises a sputum excretion machine main body, a chest wall and a sputum excretion machine, wherein the other side of the sputum excretion machine main body is linearly connected with the chest wall, the periphery of the chest wall is connected with a fixing sleeve in an embedded way, the two sides of the top end of the fixing sleeve are closely sewed with shoulder straps, the sputum excretion machine is fixedly connected in the middle of the front side of the chest wall, one side of the inner part of the sputum excretion machine is fixedly connected with a vibration motor, the top end of the vibration motor is fixedly connected with a vibration table, the top end of the vibration table is fixedly connected with a knocking plate, the knocking plate can effectively press and knock multiple parts of the thoracic cavity of a patient, thereby achieving the comprehensive knocking and sputum excretion effect, improving the sputum excretion working quality, embodying the high efficiency of the utility model, improving the article storage tank of the sputum excretion machine main body per se, embodying the carrying handle, embodying the portability of the utility model, the chest, has wide application prospect in the future.

164	CN-203425218-U	CN201320469226.7	500542 83	Vibration-type sputum ejection machine	The utility model discloses a vibration-type sputum ejection machine. The vibration-type sputum ejection machine comprises a host machine, a transmission device, a power output device and an auxiliary waistcoat, wherein the host machine, the transmission device and the power output device are connected in sequence; the power output device comprises a vibrator which is connected with the transmission device and a tapping head which is detachably connected with the vibrator; the auxiliary waistcoat is used for fixing the tapping head and is suitable for a human body to wear; a loading structure used for installing the tapping head is arranged on the auxiliary waistcoat. Compared with the prior art, different chest areas of a patient at different body positions can be tapped in a hospital or at home without the assistance of medical personnel by the vibration-type sputum ejection machine provided by the utility model; the vibration-type sputum ejection machine is easy to operate.
158	BR-2020140206 55-U2	BR2020140206 55	560129 26	chest vibration vest for bronchial hygiene	summary "bronchial hygiene chest vibration vest." utility model patent for a bronchial hygiene chest vibration vest, for performing percussion and compression techniques comprised of a vest with a set of vibration devices, insufflation device, Inflatable chambers, heating plate, integrated circuit, electric-electronic cables, function control and adapter for connection to the mains. adjusted to the user's body by rigid straps, elastic straps and velcro.
157	BR-1020140210 82-A2	BR1020140210 82A	558510 72	chest vibration glove for bronchial hygiene	abstract chest vibration glove for bronchial hygiene. flexible material sleeve, in traditional or fingertip versions, with centrally-allocated niche vibrating device, with inner and outer openings, connected to electrical-electronic cables for power supply via adapter and control Functions for performing percussion techniques to aid traditional physiotherapy techniques for bronchial hygiene in newborns, infants, and children.

114	CN-115089473-A	CN202210899371.2	83301681	Postoperative full-chest sputum excretion rehabilitation device	The invention relates to the technical field of medical instruments, in particular to postoperative full-chest sputum excretion rehabilitation equipment. The utility model aims at solving the technical problem that the whole inflatable vest of the existing full-chest vibrating sputum excretion machine vibrates during the exhaust process, so that the patient cannot imitate the beating method from outside to inside and from bottom to top during artificial sputum excretion, thereby reducing the treatment effect. The technical scheme is as follows: a postoperative rehabilitation device for full chest sputum excretion comprises a therapeutic apparatus; the left and right parts of the back side surface of the vest are provided with back vibration mechanisms, and the therapeutic apparatus is communicated with the back vibration mechanisms through a pipeline. According to the invention, through the back vibration mechanism, the plurality of air bags in the first shell sequentially expand from outside to inside and impact the back of a patient, so that sputum in the bronchus of the patient is loosened, the patient is helped to enter the loosened sputum in the bronchus branch into the main bronchus, the patient can conveniently cough up the sputum, and the sputum in the bronchus branch is prevented from being reattached in the bronchus branch after being loosened under the impact of the air bags.
115	TR-2018206648-A2	TR201820648A	67911204	AIRWAY CLEANING DEVICE WITH PORTABLE CHEST WALL VIBRATION	The present invention relates to a vibrating device and a vest containing it, which helps cleanse the sputum of persons with sputum in the lungs. With the invention, the risk of lung infection caused by excessive sputum accumulation in the lungs is reduced. The invention relates to the development of a vibratory device that enables the breakdown of sputum in the lung and the vest containing it.

114	CN-2150826862-U	CN202120332141.9	793344 12	Department of respiration is with supplementary sputum discharging device of intelligent	The utility model relates to a department of respiration nurses technical field, discloses a department of respiration is with intelligent supplementary sputum discharging device, including sputum discharging auxiliary tank, sputum discharging auxiliary tank's preceding side surface is close to center department and installs the collecting box, there is the controller preceding side surface of sputum discharging auxiliary tank is located the top fixed mounting of collecting box. When clearing away the lung-heat sputum excretion to the patient, first magic subsides and the subsides of second magic through first pressure band and second pressure band surface mounting, can fix the chest at the patient with sputum excretion auxiliary tank, then assign the instruction to air vibration machine and pulse vibration machine through the controller, can produce the vibration and the pulse wave of certain degree, auxiliary patient carries out sputum excretion work, can be higher than manual sputum excretion work efficiency through installation air vibration machine and pulse vibration machine, sputum excretion speed is faster, reduce medical staff's the work degree of difficulty, and install a set of vibration dish at sputum excretion auxiliary tank rear side, then can improve patient's comfort level than negative pressure sputum aspirator.

116	KR-1018271-B1	KR1020160004947	592209	Vibrating Vest for Mucus Clearing	The present invention is based on the finding that when a physical therapist applies the sputum discharge method to patients requiring sputum emission such as a patient with chronic obstructive pulmonary disease, the intensity and number of tapping of each lobes are selectively varied by minimizing physical contact with the patient The present invention relates to a functional vest for discharging sputum, which can be adapted to individual patients according to the sputum emission method and can also be used for various patients with one device. The present invention relates to a vibration vest for sputum emission wherein a vibration part is inserted into a chest of a front of a vest and a back part of a vest, and the vest is made to vibrate when a sputum emission method is performed, wherein the front of the vest is a right- And the front right chest pocket portion has a horizontal heat seaming line which is a line corresponding to the horizontal row of the lungs and a front seesaw heat seizing line which is a line corresponding to right lung heat of the lungs, In the pockets of the thorax, the upper part of the horizontal heat seam is the front right upper pocket, the front right chest pocket is the pocket between the horizontal heat seam and the front heat seam, and the front right chest pocket. The lower right side of the lower right side is a lower right side pockets portion, the front right side pocket portion, the front right middle pockets portion, and the front right and lower left pocket portions are respectively provided with motors or vibrators And a vibration part is incorporated. The front surface of the vest has a front left chest pocket portion located between the collarbone and the diaphragm in the left chest centered on the median side and the front left chest pocket portion is formed by a front left quadriceps sewing line, The front upper left pouch pocket portion of the front left pouch pocket is a front left upper pouch pocket portion in the front left pouch pocket portion, the lower left side pouch pocket portion of the front left pouch pocket is a front left left pocket portion, The lower left pocket has a built-in vibrating part composed of a motor or a vibrator.
1091	CN-2193976-U	CN202225917 54.1	872350 37	Chest fixing strap for patting auxiliary sputum excretion	The utility model discloses a chest fixing belt for beating auxiliary sputum excretion, which comprises a chest belt (1) and a back belt (2), wherein the chest belt (1) is connected with the back belt (2) through shoulder belts, interlayers are arranged on the chest belt (1) and the back belt (2), an air bag (3) is arranged in the interlayer of the chest belt (1), a vibration sputum excretion mechanism (4) is arranged in the interlayer of the back belt (2), and connecting mechanisms for users to wear are arranged on two sides of the chest belt (1) and the back belt (2). The utility model can greatly improve the comfort of patients and reduce the tightness; and the vibration sputum excretion mechanism (4) can replace manual beating, thereby being beneficial to sputum excretion of patients and reducing the labor intensity.

108	KR-2017006054 8-A	KR1020160004947	592220 90	Vibrating Vest for Mucus Clearing	The present invention is based on the finding that when a physical therapist applies the sputum discharge method to patients requiring sputum emission such as a patient with chronic obstructive pulmonary disease, the intensity and number of tapping of each lobes are selectively varied by minimizing physical contact with the patient The present invention relates to a functional vest for discharging sputum, which can be adapted to individual patients according to the sputum emission method and can also be used for various patients with one device. The present invention relates to a vibration vest for sputum emission wherein a vibration part is inserted into a chest of a front of a vest and a back part of a vest, and the vest is made to vibrate when a sputum emission method is performed, wherein the front of the vest is a right- And the front right chest pocket portion has a horizontal heat seaming line which is a line corresponding to the horizontal row of the lungs and a front seesaw heat seizing line which is a line corresponding to right lung heat of the lungs, In the pockets of the thorax, the upper part of the horizontal heat seam is the front right upper pocket, the front right chest pocket is the middle right pouch between the horizontal heat seam and the front heat seam, and the front right chest pocket. The bottom part is the front right and left pockets, the front right pockets, the front right pockets, and the front right and bottom pockets are motors or vibrators, respectively. And is incorporated therein. The front surface of the vest has a front left chest pocket portion located between the collarbone and the diaphragm in the left chest centered on the median side and the front left chest pocket portion is formed by a front left quadriceps sewing line, The front upper left pouch pocket portion of the front left pouch pocket is a front left upper pouch pocket portion in the front left pouch pocket portion, the lower left side pouch pocket portion of the front left pouch pocket is a front left left pocket portion, The lower left pocket has a built-in vibrating part composed of a motor or a vibrator.

108	CN-1027160007-B	CN201210086533.7	469419 71	Electromagnetic-powered sputum excretion system	The invention discloses an electromagnetic-powered sputum excretion system, comprising a coughing sensor, a frequency input end, an air pressure input end, an electric-controlled switch, a timing input end, a pressure vest, an air vibration device and a wind device. The sputum excretion system further comprises an electric-controlled operation unit, wherein a plurality of sputum excretion plans including the start time and stop time of the sputum excretion system, the extrusion dynamics of the sputum excretion system, and intervals of excretion actions are prestored. In the invention, the air is extruded by attracting an iron clapper with an electromagnet to generate a vibrating airflow; the chest of a patient is vibrated by the action on the chest of the patient through the pressure vast, thereby assisting the patient to excrete sputum. The electromagnetic control is characterized by promptness, stability and low energy consumption, and the like, thus the electromagnetic-powered sputum excretion system of the invention utilizing electromagnet to generate the vibrating airflow has above characteristics as well. In addition, the sputum excretion system of the invention further has the advantages of simple operation, low cost, and is suitable for wide popularization in the medical sputum excretion field.

108	CN-1027160007-A	CN201210086533A	469419 71	Electromagnetic-powered sputum excretion system	The invention discloses an electromagnetic-powered sputum excretion system, comprising a coughing sensor, a frequency input end, an air pressure input end, an electric-controlled switch, a timing input end, a pressure vest, an air vibration device and a wind device. The sputum excretion system further comprises an electric-controlled operation unit, wherein a plurality of sputum excretion plans including the start time and stop time of the sputum excretion system, the extrusion dynamics of the sputum excretion system, and intervals of excretion actions are prestored. In the invention, the air is extruded by attracting an iron clapper with an electromagnet to generate a vibrating airflow; the chest of a patient is vibrated by the action on the chest of the patient through the pressure vast, thereby assisting the patient to excrete sputum. The electromagnetic control is characterized by promptness, stability and low energy consumption, and the like, thus the electromagnetic-powered sputum excretion system of the invention utilizing electromagnet to generate the vibrating airflow has above characteristics as well. In addition, the sputum excretion system of the invention further has the advantages of simple operation, low cost, and is suitable for wide popularization in the medical sputum excretion field.

1079	CN-1030770770-A	CN201310043245A	481476211	Electromagnetic adsorption sputum excretion system with power tube	The invention discloses an electromagnetic adsorption sputum excretion system with a power tube. The electromagnetic adsorption sputum excretion system with the power tube comprises a cough sensor, a frequency input end, an air pressure input end, an electronic control switch, a timing input end, a pressure vest, an air oscillation machine, a fan and an electronic control operation unit, wherein the electronic control operation unit is used for storing a plurality of sputum excretion schemes comprising sputum excretion system starting and stopping time, sputum excretion system extrusion strength and extrusion action interval in advance. According to the electromagnetic adsorption sputum excretion system with the power tube, which is disclosed by the invention, air extrusion is carried out as an irony clapper is adsorbed by electromagnet so as to generate vibration airflow; an air bag vest acts on the chest of a patient to enable the chest of the patient to vibrate and assist the patient in excreting sputum; and because the electromagnet control has the characteristics of promptness, stability and small energy consumption, the sputum excretion system taking the electromagnet as the power for generating the vibration airflow also has the characteristics. In addition, the system has the advantages of simpleness in use and low cost and is suitable to be widely applied in the medical sputum excretion field.

1078	US-2015005151 8-A1	US14387846	492581 33	ELECTROMAGNETIC POWERED SPUTUM EXCRETION SYSTEM	An electromagnetic powered sputum excretion system comprises a coughing sensor, a frequency input end, an air pressure input end, an electric-controlled switch, a timing input end, a pressure vest (80), an air vibration device (90), and a fan (70). The air is extruded by attracting iron clappers (904) with an electromagnet (906) to generate a vibrating airflow, and the chest of a patient is vibrated by the action on the chest of the patient through the pressure vest (80), thereby the sputum excretion system assists the patient to excrete sputum. Since the control via the electromagnet (906) is characterized by promptness, stability, low energy consumption and the like, the sputum excretion system, which utilizes the electromagnet (906) as a power to generate the vibrating airflow, has above characteristics as well. The present sputum excretion system further has the advantages of simple operation and low cost.
1069	CN-1034319 82-B	CN201310333426.4	496857 73	A kind of vibration type sputum elimination machine	The invention discloses a kind of vibration type sputum elimination machine, comprise the main frame, actuating device and the PTO that connect successively, described PTO comprises the vibrator be connected with described actuating device, and taps the head with kowtowing of removably connecting of described vibrator; Described sputum elimination machine also comprises taps the head for kowtowing described in fixing and is applicable to the auxiliary vest of human body wearing, described auxiliary vest is provided with described in installing, kowtows the filling structure of tapping the head.Compared with prior art, a kind of vibration type sputum elimination machine provided by the present invention, patient can without the need to medical personnel auxiliary just in hospital or family, different position can be taked and knocking carried out to different chest regions, operate simple and easy.

1069	CN-2029 2060 1-U	CN2012 201231 70U	482105 94	Electromagnetism power sputum excretion system	The utility model discloses an electromagnetism power sputum excretion system which comprises a cough sensor, a frequency input end, an air pressure input end, an electric control switch, a timing input end, a pressure vest, an air oscillating machine and a fan. The electromagnetism power sputum excretion system further comprises a electric control operation unit which stores a plurality of sputum excretion schemes including sputum excretion system starting time and stopping time, sputum excretion system extrusion force and extrusion intervals in advance. According to the electromagnetism power sputum excretion system, air extrusion is carried out by the fact that an electromagnet an absorbs iron clap plate, so that vibration air flow is generated, the vibration air flow has an effect on the chest of a patient through an air bag vest to enable the chest of the patient to generate vibration, so that the electromagnetism power sputum excretion system helps the patient to carry out sputum excretion. Due to the fact that electromagnet control has the advantages of being timely, stable and little in energy consumption, the electromagnetism power sputum excretion system which can generate the vibration air flow through the electromagnet also has the advantages. In addition, the system is easy to use, low in cost and suitable for being widely popularized in medical sputum excretion field.

1064	WO-2013143214-A1	CN2012075799W	4925813 3	ELECTROMAGNETIC POWER SYSTEM OF SPUTUM EXCRETION	An electromagnetic power system of sputum excretion comprises a coughing sensor, a frequency input end, an air pressure input end, an electric-controlled switch, a timing input end, a pressure vest (80), an air vibration device (90) and a fan (70). The sputum excretion system further comprises an electric-controlled operation unit, wherein a plurality of sputum excretion plans including the start time and stop time of the sputum excretion system, the extrusion dynamics and intervals of excretion actions of the sputum excretion system are prestored. The air is extruded by attracting an iron clapper (904) with an electromagnet (906) to generate a vibrating airflow, the chest of a patient is vibrated by the action on the chest of the patient through the pressure vast (80), thereby the system assists the patient to excrete sputum. Because the electromagnetic (906) control is characterized by promptness, stability and low energy consumption, and the like, thus the power system of sputum excretion, which utilizing electromagnet (906) to generate the vibrating airflow, has above characteristics as well. The system further has the advantages of simple operation and low cost.

105	CN-103431982-A	CN201310333426A	49685773	Vibrating type sputum excretion machine	The invention discloses a vibrating type sputum excretion machine. The vibrating type sputum excretion machine comprises a host, a transmission device and a power output device, which are connected in sequence, wherein the power output device comprises a vibrator connected to the transmission device, and a tapping head detachably connected to the vibrator; the vibrating type sputum excretion machine further comprises an auxiliary waistcoat used for fixing the tapping head and being suitable for a human body to wear, and a loading structure used for mounting the tapping head is arranged on the auxiliary waistcoat. In comparison with the prior art, the vibrating type sputum excretion machine provided by the invention has the advantages that a patient can adopt different positions and tap different chest regions at hospital or at home without assistance of medical personnel, and the vibrating type sputum excretion machine is simple in operation.
104	WO-2022014794-A1	KR2020/016521	79554344	AUTOMATIC CHEST WALL VIBRATION SYSTEM USING MONITORING OF SOUND OF PATIENT'S LUNG	The present invention relates to an automatic chest wall vibration system using monitoring of a sound of the patient's lung and, more particularly, to an automatic chest wall vibration system using monitoring of a sound of the patient's lung, wherein the system receives a sound from the lung as a patient breathes, compares the sound to a previous lung sound of the patient or a lung sound of a normal patient, and in the event of an abnormal sound (such as a sound heard when atelectasis or pneumonia is present), automatically vibrates the chest wall to stimulate the patient's chest, chest wall, and respiratory tract including bronchus, and induces sputum to be discharged.

1042	CN-1030759-A	CN201310041150A	481476 10	Electromagnetic adsorption sputum excretion system with overvoltage protection and filtering integration circuit	The invention discloses an electromagnetic adsorption sputum excretion system with an overvoltage protection and filtering integration circuit. The electromagnetic adsorption sputum excretion system with the overvoltage protection and filtering integration circuit comprises a cough sensor, a frequency input end, an air pressure input end, an electronic control switch, a timing input end, a pressure vest, an air oscillation machine, a fan and an electronic control operation unit, wherein the electronic control operation unit is used for storing a plurality of sputum excretion schemes comprising sputum excretion system starting and stopping time, sputum excretion system extrusion strength and extrusion action interval in advance. According to the electromagnetic adsorption sputum excretion system with the overvoltage protection and filtering integration circuit, which is disclosed by the invention, air extrusion is carried out as an irony clapper is adsorbed by electromagnet so as to generate vibration airflow; an air bag vest acts on the chest of a patient to enable the chest of the patient to vibrate and assist the patient in excreting sputum; and because the electromagnet control has the characteristics of promptness, stability and small energy consumption, the sputum excretion system taking the electromagnet as the power for generating the vibration airflow also has the characteristics. In addition, the system has the advantages of simpleness in use and low cost and is suitable to be widely applied in the medical sputum excretion field.

1036	CN-1015078444-B	CN200910010814A	41004478	Intelligent full-thorax high-frequency oscillation sputum elimination machine and method	The present invention discloses an intelligent total thoracic high-frequency oscillating sputum ejection machine and a sputum ejection method. The sputum ejection machine comprises a hose, a pressure sensor, a conducting wire, a power supply device, a box body and a cover plate, and is characterized by also comprising a pressure jacket, an air oscillator and a cough sensor, wherein the pressure jacket consists of a metal spring ring, a transverse membrane, a longitudinal membrane, skin and an adhesive buckle; and the metal spring ring is arranged at the bottom of the skin, the transverse membrane is arranged above the metal spring ring, the longitudinal membrane is arranged inside the skin, the upper end of the longitudinal membrane is connected with the upper edge of the inner wall of the skin, and the lower end of the longitudinal membrane is vertical to the transverse membrane and is reserved with a gap. Specifically the fixed two-point type anterior chest wall pulse cannot beat the lateral surface and the back of the chest so as to cause poor sputum ejection effect for partial patients, the sputum ejection machine and the sputum ejection method adopt intelligent air supply modes of an electric motor and an air pressure compensator to periodically supply pulse airflow to the pressure jacket, can adjust the pulse airflow according to different press degrees required by patients, and are greatly convenient to treat the patients of different types.

1036	CN-1015078444-A	CN200910010814A	41004478	Intelligent full-thorax high-frequency oscillation sputum elimination machine and method	The invention discloses an intelligent total thoracic high-frequency oscillating sputum ejection machine and a sputum ejection method. The sputum ejection machine comprises a hose, a pressure sensor, a conducting wire, a power supply device, a box body and a cover plate, and is characterized by also comprising a pressure jacket, an air oscillator and a cough sensor, wherein the pressure jacket consists of a metal spring ring, a transverse membrane, a longitudinal membrane, skin and an adhesive buckle; and the metal spring ring is arranged at the bottom of the skin, the transverse membrane is arranged above the metal spring ring, the longitudinal membrane is arranged inside the skin, the upper end of the longitudinal membrane is connected with the upper edge of the inner wall of the skin, and the lower end of the longitudinal membrane is vertical to the transverse membrane and is reserved with a gap. In order to solve a new problem that fixed two-point type anterior chest wall pulse cannot beat the lateral surface and the back of the chest so as to cause poor sputum ejection effect for partial patients, the sputum ejection machine and the sputum ejection method adopt intelligent air supply modes of an electric motor and an air pressure compensator to periodically supply pulse airflow to the pressure jacket, can adjust the pulse airflow according to different press degrees required by patients, and are greatly convenient to treat the patients of different types.

1033	CN-2051267 69-U	CN201520938184.6	556125 96	Sputum discharging undershirt	The utility model discloses a sputum discharging undershirt, including undershirt body, vibrating device, gasbag, the shoulder of undershirt body is equipped with shoulder adjusting device, and the door front of a garment portion of undershirt body is equipped with chest measurement adjusting device, is equipped with installation vibrating device's loading parts on the undershirt body, corresponds human lower rib bone edge in the lower part of undershirt body and is equipped with the gasbag, and airbag ring arranges around undershirt body a week, still is provided with detachable drainage pad at the back of undershirt body. This sputum discharging undershirt can be directly strikes the vibration to patient's chest back, can also pat with the back the full thorax of patient simultaneously, need not that medical personnel are manual to strike or hand always vibrating head and kowtow patient's health position and hit, can also let the patient keep certain drainage position, promotes more effectively that the patient eliminates the sputum.
1003	CN-2147 6215 4-U	CN202120312428.5	78752018	Self-control sputum excretion wearable device based on acupoint sequence vibration stimulation	The application relates to the field of medical equipment, especially a wearable equipment of automatic control sputum elimination based on acupuncture point sequence vibration stimulation, it includes wearable thing to and the vibrating motor group of setting on wearable thing, the vibrating motor group contains 5 vibrating motor, can act on 1 acupuncture point in the shanzhong cave before human chest respectively to and two Feishu acupuncture points and two Pishu acupuncture points on back are 4 acupuncture points altogether. The method utilizes the MCU module and the H-bridge group to enable the vibration motor to vibrate on 1 Tanzhong acupoint and 2 Feishu acupoints and 2 Pishu acupoints on the back of the human body according to a required sequence to effectively discharge phlegm.

991	IN-2020110398 64-A	IN2020110398 64		A NOVEL CHEST VIBRATORY GLOVE FOR AIRWAY CLEARANCE	A novel chest vibratory glove for pulmonary clearance which has plurality of vibrators for continuous and localized pulses. The gloves are rechargeable and come in vibrant colours of silicone rubber to attract patients of all ages. The gloves are specifically designed to remove the secretions from the body especially pulmonary area.
991	BR-2020140300 13-U2	BR2020140300 13U	57223435	chest compression and vibration vest for bronchial hygiene	summary “chest bronchial vibration and compression vest”, vest with set of vibration devices on the right and left front, middle and right and left sides, mini insufflation motor, anatomically shaped inflatable chambers covering the parts right front and side and left front and side, heating plate, integrated circuit, electrical / electronic cable entry / exit hole, function control and mains adapter.

969	CN-2142320 35-U	CN202022721084.1	77733601	Full chest oscillation sputum excretion machine	The utility model discloses a full chest vibration sputum discharging machine, including host computer, connector and protection network, the host computer upper end is connected with the display screen through the draw-in groove, the shaping has on the host computer lateral wall the connector, be connected with through the draw-in groove in the connector the protection network, the connector top is provided with the end cover, the end cover with the host computer rotates to be connected. Has the advantages that: the utility model discloses a set up end cover and protection network, can protect the connector, prevent the dust, impurity etc. enter into the host computer in, guarantee the inside cleanliness factor of host computer, also can avoid simultaneously causing the injury to aerifing the undershirt, improve the result of use, place the box and place the case through the setting, can place the hand controller in placing the box, prevent that the hand controller from placing the shakiness, avoid dropping, when sputum discharging machine does not use in addition, pull down the hose and aerify the undershirt and place placing the incasement, convenient to accomodate and take, the practicality is good.

968	CN-2161687776-U	CN202120117638.9	80857963	Medical multifunctional chest warming physiotherapy vibration sputum excretion equipment	The utility model discloses medical multifunctional chest warming physiotherapy vibration sputum excretion equipment which comprises an oscillating sputum excretion machine, a sputum excretion vest, an air guide hose, a microwave physiotherapy instrument, a microwave physiotherapy head, a physiotherapy wire and a microwave distance adjuster, wherein the microwave distance adjuster comprises a fixed seat and a sliding seat, the fixed seat is connected with the sliding seat in a sliding mode, the fixed seat is fixed on the back of the sputum excretion vest, the microwave physiotherapy head is arranged in the sliding seat and drives the microwave physiotherapy head to slide on the fixed seat to adjust the distance between the microwave physiotherapy head and the back of a patient, the oscillating sputum excretion machine is connected with the sputum excretion vest through the air guide hose, and the microwave physiotherapy instrument is connected with the microwave physiotherapy head through the physiotherapy wire. This device sets up microwave physiotherapy system of heating on the basis of current vibration sputum discharging machine, can effectively help the patient that the lung has phlegm and difficult coughing up to expectorate the sputum, has alleviateed medical personnel's burden, has alleviateed the patient because the break and wear that the ailment brought helps patient's recovery.

949	CN-2169629 87-U	CN202121303734.9	82337727	Portable vibration sputum excretion instrument	The utility model relates to a vibrating sputum excretion instrument, in particular to a portable vibrating sputum excretion instrument. The shock absorber comprises a protection device, a driving device is arranged inside the protection device, a vibration device is arranged at the bottom of the driving device, the driving device comprises a driving disc, the left and right symmetrical of the bottom of the driving disc is fixedly connected with arc-shaped protruding arc blocks, the vibration device comprises a positioning frame, a plurality of point striking devices are arranged inside the positioning frame in an annular mode, and the positioning frame comprises a plurality of composite pipes which are arranged in an annular mode and fixed together. The utility model drives the vibration device to vibrate in a reciprocating manner through the driving device, so that the vibration device can strike and vibrate the chest of a patient, meanwhile, the structure of the device is simple, the use difficulty of the device is reduced, the trouble that other people need to assist the device from the side when the device is used is avoided, and meanwhile, an operator pulls the lifting handle, so that the device is convenient to carry and is convenient for medical personnel to move and use the device for transferring.

937	CN-2149683 3-U	CN202121028003.8	791350 01	Thoracic and cardiac surgery is with vibration sputum discharging appearance	The utility model provides a chest heart surgery is with vibration sputum discharging appearance, including removing the base, remove the wheel, the waste liquid bucket, sealed lid, but the sputum collection cover subassembly of disinfecting, adjustable sputum discharging appearance layer board subassembly, sputum discharging appearance subassembly, combination formula function box, vibration transmission shaft, vibrating head, disposable sheath and waste liquid collecting pipe, removal wheel difference screw connection in the lower part outside position of removing the base. The utility model controls the tapping time length and the tapping frequency of the vibrating head through the vibrating sputum excretion instrument, and the tapping piece taps the patient, thereby being beneficial to sputum excretion of the patient; the height of the supporting tube is adjusted by screwing the adjusting screw, so that the height of the supporting plate is changed, the height of the device is adjusted, the operation is simple, the use is convenient, the use is facilitated, the practicability is realized, the device is moved and fixed under the action of the moving wheel, and the convenience and the flexibility are improved; and the disposable paper towel is taken from the paper towel placing cavity at any time to wipe the mouth.

925	CN-2134659 56-U	CN202020905677.0	763913 06	Novel whole chest external oscillation sputum excretion device	The utility model discloses a novel whole thoracic cavity in vitro oscillation sputum excretion device, which comprises a sputum excretion machine, a hose and an oscillation component; the utility model discloses a sputum excretion machine, including sputum excretion machine, hose connector, hose other end, the vibration subassembly is connected with the connector, sputum excretion machine the place ahead is equipped with the hose connector, hose one end is connected on the hose connector, the hose other end is equipped with the connector, the vibration subassembly is connected with the connector. The utility model is scientific and reasonable, convenience safe in utilization can adopt cushion formula vibration sputum discharging device, can directly connect the pad under patient's body, easy operation, and excessive only can let patient's slippage cushion hard simultaneously can not cause the damage. The cushion type sputum excretion device is also provided with a pillow, so that the comfort of the patient is improved. Secondly, the utility model can also adopt a hand-held oscillating sputum excretion device, which is suitable for children to avoid the damage of the too large oscillating sputum excretion device to the children. When in use, only the sputum excretion device is needed to be replaced at the hose, which is convenient and fast. The elastic belt can prevent a patient from clinging to the cross beam in the first support frame after leaning down and is beneficial to the air flow to impact the surface layer cloth belt to oscillate.
918	CN-2030751 63-U	CN201320005351U	488210 49	Sputum excretion physiotherapy instrument	The utility model discloses a sputum excretion physiotherapy instrument which is characterized by being mainly composed of a motor vibration belt (1) and a parameter controlling instrument (2) which is connected with the motor vibration belt (1). Due to the fact that a motor of the sputum excretion physiotherapy instrument not only has the action of beating the chest and the back, but also is free from being looked after by a specially-assigned person, labor cost and time cost are obviously saved. Meanwhile, the sputum excretion physiotherapy instrument can be suitable for patients with different body forms through the adjustment of the lengths of fixing belts and does not have limitations.

916	CN-1128428662-B	CN202110125989.9	759868 02	Chest physical oscillation sputum excretion machine beneficial to sputum excretion of patients with pneumonia	The invention belongs to the technical field of medical equipment, and particularly relates to a chest physical oscillation sputum excretion machine beneficial to sputum excretion of patients with pneumonia, which comprises a host machine and a vibration vest, wherein the host machine comprises a base, four corners of the bottom of the base are fixedly connected with universal wheels, the top of the base is fixedly connected with a support column, the top of the support column is fixedly connected with a device table, and one side of the support column is fixedly connected with a storage box which is positioned at the bottom of the device table.
916	CN-1128428662-A	CN202110125989.9	759868 02	Chest physical oscillation sputum excretion machine beneficial to sputum excretion of patients with pneumonia	The invention belongs to the technical field of medical equipment, and particularly relates to a chest physical oscillation sputum excretion machine beneficial to sputum excretion of patients with pneumonia, which comprises a host and a vibration vest, wherein the host comprises a base, four corners of the bottom of the base are fixedly connected with universal wheels, the top of the base is fixedly connected with a support column, the top of the support column is fixedly connected with a device platform, one side of the support column is fixedly connected with a storage box, and the storage box is positioned at the bottom of the device platform.

905	CN-2130764 89-U	CN2020206766 66.X	756008 28	Acupuncture point vibration sputum excretion device	The utility model relates to an acupuncture point vibrations sputum discharging device, its characterized in that: comprises a vibration waistcoat, a neck vibration belt and a controller; the vibration waistcoat can be worn on a person and covers the range of the front and rear chest cavities of the person; a plurality of vibration pieces are arranged on the inner side of the back of the waistcoat in a rectangular array mode; the shoulder belts are respectively provided with a vibration sheet, and the positions of the vibration sheets correspond to Yunmen acupoints; the neck vibration belt is a belt capable of winding around the neck of a person, and vibration sheets on the belt are arranged in an inverted triangle and respectively massage the water protrusion acupuncture points and the heaven protrusion acupuncture points; the controller is a square box, and a PLC, a vibrating piece driving circuit board and a storage battery are arranged in the box; the box is provided with a switch key and 5 LED power supply storage indicating lamps; a control wire is extended from the box to control the vibrating sheet. The utility model is used for promote patient's sputum excretion, adopt the controller to signal and make the massage piece carry out the vibrations of law, the simulation is clapped the back of the body and is excreted phlegm and amazing sputum excretion acupuncture point and carry out amazing patient and independently excrete phlegm, reduces medical personnel's intensity of labour.
903	CN-2025685 61-U	CN2012201895 33U	472380 22	Multifunctional physical therapy strap	The utility model discloses a multifunctional physical therapy strap which comprises a fixing strap provided with four areas, namely, a back area, two lateral chest areas, and a front chest area, common type electric vibration devices and a hanging strap. According to the utility model, the electric vibration devices are installed in each area of the fixing strap respectively, the hanging strap is installed on the fixing strap, and a connection device is arranged in the front chest area. The multifunctional physical therapy strap disclosed by the utility model can be used for organically combining fixation for thoracic tissue with back-beating physical therapy sputum excretion, and random splitting also can be realized; and in case of ensuring vibrating sputum excretion physical therapy, the comfort of a user is also considered, and random physical therapy sputum excretion at different positions and for different parts can be realized.

903	CN-2051635 54-U	CN201520945188.7	557276 00	Full thorax high-frequency oscillation sputum discharging machine beater mechanism	The utility model relates to the field of medical equipment, especially, full thorax high -frequency oscillation sputum discharging machine beater mechanism, full thorax high -frequency oscillation sputum discharging machine beater mechanism includes the cylinder, is fixed in rubber circle on the cylinder, install in rubber circles pats set, install in pat set central authorities connecting rod assembly, connect in the last switching wheel of connecting rod assembly makes up, is used for the incorporation of fixed switching wheelset to lie in the wheel of transferring makes up the deflection wheel of below, does the wheel that deflects provides the motor of power, the rubber circle, pat set, connecting rod assembly, the combination of switching wheel, the wheel that deflects, motor, support all set up in in the cylinder, the rotary motion of motor drives pat to coil to do and control reciprocating motion, pat set, the quantity of connecting rod assembly, rubber sleeve is 1, interior bat mode makes full thorax high -frequency oscillation sputum discharging machine beater mechanism's vibration range less than normal, has saved the space.

890	CN-2131910 78-U	CN201922340416.9	75817705	Whole chest vibration sputum excretion machine vest	The utility model discloses a full-chest oscillation sputum excretion machine vest, which comprises an air bag and a lining; the air bag is in a vest shape integrally and comprises a back air bag, a left front side air bag and a right front side air bag; the back airbag, the left front airbag and the right front airbag are connected with each other and integrally arranged; the balloon walls of the balloon include a first balloon wall and a second balloon wall; the first air bag wall is made of non-elastic materials, and the second air bag wall is made of elastic materials; the lining is detachably arranged on the outer side of the second air bag wall; connecting buckles are arranged around the air bag; the utility model adopts an integral air bag structure, has simple structure, is internally provided with a lining which can be directly contacted with a human body, can be made of disposable materials and is detachable and convenient to clean and maintain; the outer side wall of the air bag is made of a non-extensible material, so that the outward expansion amount of the vest when the air bag is inflated can be reduced, and the pressure of the air bag can better act on a human body; the design of the split air bag can reduce the oppression feeling of the rib part when a patient is treated.

890	CN-2122352 50-U	CN201922388673.X	739726 89	Whole chest vibration sputum excretion machine vest	The utility model discloses a full-chest oscillation sputum excretion machine vest, which comprises an air bag and a lining; the air bag is in a vest shape integrally and comprises a back air bag, a left front side air bag and a right front side air bag; the back airbag, the left front airbag and the right front airbag are connected with each other and integrally arranged; the balloon walls of the balloon include a first balloon wall and a second balloon wall; the first air bag wall is made of non-elastic materials, and the second air bag wall is made of elastic materials; the lining is detachably arranged on the outer side of the second air bag wall; connecting buckles are arranged around the air bag; the utility model adopts an integral air bag structure, has simple structure, is internally provided with a lining which can be directly contacted with a human body, can be made of disposable materials and is detachable and convenient to clean and maintain; the outer side wall of the air bag is made of a non-extensible material, so that the outward expansion amount of the vest when the air bag is inflated can be reduced, and the pressure of the air bag can better act on a human body; the design of the split air bag can reduce the oppression feeling of the rib part when a patient is treated.

876	CN-2141810 19-U	CN202022538956.0	776645566	Chest massage sputum excretion device for operation patient	The utility model discloses a chest massage sputum discharging device for operation patient, its characterized in that: the massage bed comprises a massage bed body (1), wherein a body folding supporting layer is arranged on the massage bed body (1), a vibration layer is arranged on the body folding supporting layer, and a comfortable supporting layer (8) is covered on the vibration layer; the body folding supporting layer comprises a leg plate (2), a chest middle plate (3), an abdomen connecting plate (4) and a head end plate (5), the leg plate (2) is fixedly arranged on the massage bed body (1), the chest middle plate (3) is arranged between the abdomen connecting plate (4) and the head end plate (5), and two ends of the chest middle plate are respectively pivoted with the ends of the abdomen connecting plate (4) and the head end plate (5); one end of the head end plate (5) far away from the chest middle plate (3) slides on the massage bed body (1). The beneficial effects are as follows: the problem of difficult sputum excretion of the patient after the operation is solved, and the sputum excretion efficiency is improved.

865	CN-2074929943-U	CN201720485646.2	624969 06	A kind of expectoration vest	The utility model discloses a kind of expectoration vests, including vest body, the palm shape vibrator that several are set on the vest body back side and array arranges（1）And with the palm shape vibrator（1）The main controller of electrical connection（2）；The vest body includes front cut pieces（3）And rear garment piece（4）, the front cut pieces（3）And rear garment piece（4）Top is connected using pullover type, the rear garment piece（4）Including passing through slide fastener（43）The internal layer rear garment piece of detachable connection（41）With outer layer rear garment piece（42）, while the palm shape vibrator（1）It is fixed on the outer layer rear garment piece（42）On；The utility model has the advantage of, patient directly can need patient's chest and back the position of knocking to carry out percussion vibration after putting on expectoration vest, can also simultaneously to patient, full thorax and back are patted, can be effectively facilitated patient exclude sputum, it is easier to the discharge of phlegm.

840	CN-2142090037-U	CN202022141496.8	7767383 1	Breathe internal medicine sputum discharging device that cleans breath	The utility model discloses a breathe internal medicine sputum discharging device that cleans breath, including the undershirt cover, the top fixed connection suspender of undershirt cover, the equal fixed bandage of sewing up in both sides of undershirt cover, the fixed magic power of sewing up on the bandage is glued, is a plurality of vibrators of undershirt cover inner wall department fixed mounting, and the outer wall fixed mounting fixed box of undershirt cover is opened in the fixed box has the installation cavity, and the installation pushes away crowded mechanism in the installation cavity, and phlegm mechanism is inhaled in one side outer wall installation of fixed box. Vest cover laminating chest and back, the suspender is pressed on the shoulder, the bandage is through magic bonding connection in the health both sides, thereby make vest cover closely laminate chest and back, chest and back vibrate before the vibrator laminating, thereby tremble the lung, and simultaneously, push away and extrude the mechanism and applys ascending extrusion thrust in succession to chest and back, the simulation manual work is pushed and is pushed, promote the phlegm of lung to flow to throat's extrusion, then aspirate throat through inhaling phlegm mechanism, thereby take the sputum out, it is convenient, thoroughly to arrange the phlegm.

840	CN-114271848-A	CN202111561404.4	80873149	Self-moving type vibration sputum excretion vest capable of performing auscultation in induction mode	The invention relates to the technical field of medical instruments and discloses a self-moving type vibratory sputum excretion vest capable of performing induction auscultation, which comprises an auscultation device capable of monitoring the movement of sputum at the chest of the front side of a patient and induction devices fixedly arranged on the outer surfaces of the two sides of the auscultation device and used for receiving and transmitting the monitored sounds, wherein the front combined vest and the rear combined vest can be firstly worn and fixed on the patient, the auscultation device is close to the chest of the patient and is tightly attached to the chest of the patient to monitor the sputum movement path in the chest of the patient, a monitoring and expanding mechanism in the auscultation device can receive the absorbed sounds through the monitoring and expanding mechanism, expand the sounds to be transmitted to the induction device through a plurality of groups of expanding grooves to be contacted with a built-in induction mechanism, and the built-in induction mechanism transmits signals to the vibratory sputum excretion mechanism through a signal transmission line and an extension line, thereby achieving the effects of improving the sputum excretion efficiency and ensuring the personal safety of patients.
837	JP-2004500905-A	JP2001527700A	27503604	Airflow treatment device	The airway clearance system (10) and method produces high frequency chest wall vibration (HFCWO) and increased airflow velocities through the air passages to flush mucus in the lungs. The system (10) includes a chest wall force applicator (12a) to create an HFCWO and pneumatic input mouthpiece system that enhances airflow to and from the patient's lungs. The system (10) and method can be adjusted to cancel the bias line force component, measure airway resistance, and induce a cough. [Selection diagram] Fig. 1

829	CN-2150 2203 9-U	CN2021 210107 38.8	79216380	Percussion head of vibration sputum excretion instrument	The utility model discloses a percussion head of a vibration sputum excretion instrument, which comprises a percussion part and a hand-held vibration damping part; the tapping part comprises a shell, a driving component and a tapping block, the tapping block is slidably arranged in the shell, the tapping block can extend out of the shell, the driving component is arranged in the shell, and the driving component drives the tapping block to slide; the handheld vibration damping portion comprises a handle and a vibration damping sleeve, the handle is fixedly connected with the shell, the vibration damping sleeve is sleeved on the handle, and the vibration damping sleeve is connected with the handle through a plurality of vibration damping springs. The drive assembly drives the tapping block to tap the chest or the back of the patient in a telescopic way so as to loosen the thick sputum in the lung cavity, and the vibration impact of the handle on the hand of the handheld person is weakened through the damping spring and the damping sleeve. The tapping head is simple in structure, convenient to maintain and repair, small in vibration impact on hands of a handheld person, and capable of reducing fatigue of the handheld person.

820	CN-2109 9170 2-U	CN201921973495.0	71504242	Wearing piece for assisting sputum excretion	The utility model relates to the technical field of medical equipment, in particular to supplementary sputum discharging dresses piece. The auxiliary sputum excretion wearing piece comprises a chest strap, a vibrating device, an adjusting piece and a connecting piece; the adjusting piece is fixed on the chest strap, the connecting piece is fixed on the vibrating device, the connecting piece is detachably connected with the adjusting piece, and the position of the vibrating device on the chest strap is adjusted by changing the connecting position of the connecting piece and the adjusting piece; the adjusting piece comprises a first adjusting piece and a second adjusting piece, and the extending direction of the first adjusting piece and the extending direction of the second adjusting piece are arranged in a crossed mode. The utility model provides an auxiliary sputum excretion wearing piece flexibility is good, and the practicality is strong.

815	CN-2051639 9-U	CN201520941110.8	55727645	Full thorax high-frequency oscillation sputum discharging machine beater mechanism	The utility model relates to the field of medical equipment, especially, full thorax high -frequency oscillation sputum discharging machine beater mechanism, full thorax high -frequency oscillation sputum discharging machine beater mechanism includes the cylinder, is fixed in on the cylinder and relative two rubber circles that set up, two install respectively in two rubber circles pats set, install in pat set central authorities and the relative a pair of connecting rod assembly who sets up, connect in a pair of switching wheel between the connecting rod assembly makes up, is used for the incorporation of fixed switching wheelset to lie in the wheel of transferring makes up the deflection wheel of below, does the wheel that deflects provides the motor of power, the rubber circle, pat set, connecting rod assembly, the combination of switching wheel, the wheel that deflects, motor, support all set up in it is in the cylinder, a pair of connecting rod assembly with correspond the connecting rod assembly cooperation is fixed in respectively pat inside the dish lies in the cylinder on the upper and lower surface of switching wheel combination, and interior bat mode makes full thorax high -frequency oscillation sputum discharging machine beater mechanism's vibration range less than normal, has saved the space.

814	CN-2153076653-U	CN202023201586.8	795704551	Prone position is ventilated and is excreted phlegm vibrations pad	The utility model discloses a prone position ventilation and sputum excretion vibration pad, which comprises: the head pillow assembly comprises a first cushion body, the first cushion body is used for supporting the head, the body pillow assembly comprises a second cushion body and a vibration assembly, the second cushion body is used for supporting the body, the part of the second cushion body, which bears the shoulders, is the front end, the front end of the second cushion body is provided with a first groove, the vibration assembly is arranged in the second cushion body, the vibration assembly comprises an elastic piece and a driving piece, the driving piece drives the elastic piece to vibrate, and make the second fill up the body vibrations, lower limbs pillow subassembly includes the third pad body, and the third pad body is used for supporting lower limb portion, and this prone position is ventilated and is arranged phlegm vibrations pad and can fully expose trachea cannula and trachea open's position, and the help patient is more comfortable carries out the prone position and ventilates and the prone position is arranged phlegm, increases simultaneously and shakes the subassembly, increases the chest and detains and hits, is favorable to the better discharge of sputum.

812	RU-2364341-C1	RU2008116364A	41151049	METHOD OF INDUCED SPUTUM SAMPLING IN CHILDREN TO ESTIMATE SEVERITY AND NATURE OF BRONCHIAL MUCOSA INFLAMMATION	FIELD: medicine; pulmonology and allergology.SUBSTANCE: diagnostics and control of bronchial asthma in children and adults is ensured by measuring the standard initial index characterising state of bronchial patency. In children aged 5 and older, it represents the peak expiratory flow (PEF), while in children aged younger than 5 years, pulmonary auscultation is applied with evaluating the respiratory rate and bronchiospasm signs. Therefor, 5% sterile hypertonic solution is inhaled within accumulated time not more than 30 minutes until productive cough, complaints of anhelation, shortness of breath, thorax discomfort and vertigo are observed. After productive cough comes, a child should stand up, clear the throat and expectorate in a cup. Then a child should bend forward to make vibrating chest massage. If a child has started to expectorate good enough, inhalation procedure is terminated. Within 5 minutes, a child should clear the throat and expectorate periodically. If he does not know how to clear the throat and expectorate, vibrating massage of lateral and posterior chest is applied to stimulate coughing. Then pharynx secretion is sampled with using a medical electric suction machine in a cup of total volume at least 0.5 ml. For analysis, pieces of different sputum portions are taken, and 5 minutes from the beginning of inhalation or observance of complaints, PEF is measured in children aged 5 and older, while in younger children, pulmonary auscultation is applied. If the standard index is decreased by 20% and more and/or respiratory symptoms are observed again, a child should inhale short-acting β2-agonist in age-specific dose 100-200 mkg of Salbutamol. Then specified indices are measured once more. Provided normality is recovered, induction proceeds until productive cough is observed to sample some portions of sputum.EFFECT: possibility to apply the method in childhood and simplified procedure of implementation.2 tbl, 2 ex
811	TR-2018159958-U5	TR2018/15958	67901790	LUNG HEALING AND SECRETARY ACTIVATING THORACIC CLOTHING	This invention is especially developed for use in chronic lung diseases (COPD, chronic bronchitis, emphysema), intensive care units and patients with congenital lung problems (cystic fibrosis, etc.), which vibrates the chest wall and lung tissue, with this vibration, the small It is about a garment that contains a motor that prevents the closure of the air sacs, facilitates the excretion of secretions (sputum), minimizes the possibility of lung infection and respiratory distress, and works with the balancing difference method to affect all areas of both lung areas, front and back.

786	CN-1090913372-B	CN2018110999956.6	648668664	Old person's phlegm device that clears lung	The invention discloses a lung clearing and sputum excretion device for old people, and relates to the technical field of medical instruments in respiratory medicine. It comprises a wearing unit, a vibration unit and a sputum suction unit; the wearing unit comprises a wrapping bag surrounding the chest of the human body; the bag cavities are filled with shear thickening liquid; the vibration unit comprises a positioning plate; a plurality of internal threaded pipes are arranged on the positioning plate in a penetrating way from front to back; one end of the adjusting column close to the positioning plate is fixedly connected with a pressure spring; the other end of the pressure spring is fixedly connected with a knocking box; an electromagnet is fixedly arranged in the knocking box; the sputum suction unit comprises a tool table and a negative pressure pump; the periphery of the head part of the sputum suction tube is uniformly connected with a rubber tube; the rubber tube is filled with magnetic powder. The invention has the beneficial effects that: by utilizing the matching of the quick high-frequency knocking and the shearing thickening liquid, the patient is better protected, the vibration is transmitted, the stimulation of the air passage is enhanced, and the sputum excretion treatment effect is improved.

781	CN-1131712833-B	CN202110477570.X	769255559	Lung-clearing and phlegm-discharging device	The invention discloses a lung-clearing and sputum-discharging device which comprises a wearing mechanism, a vibrating mechanism and a sputum suction mechanism, wherein the wearing mechanism comprises a positioning cylinder and two fixing bands arranged on two sides of one end of the positioning cylinder and used for fixing the positioning cylinder on the chest of a human body, an opening is formed in one side, which is attached to the human body, of the positioning cylinder, and one ends, far away from the positioning cylinder, of the two fixing bands are connected through a magic tape. When the sputum suction device is applied, positive pressure or negative pressure is formed inside the positioning cylinder above the piston plate when the piston plate moves up and down, gas inside the positioning cylinder is discharged from the gas outlet pipe when the positive pressure is generated, gas inside the sputum suction bottle is sucked into the positioning cylinder through the first hose when the negative pressure is generated, suction force is formed inside the sputum suction pipe, sputum is sucked into the sputum suction bottle from the sputum suction pipe, tapping and sputum suction are combined, the negative pressure degree is correspondingly increased when the tapping force is increased, the suction force of the sputum suction pipe is correspondingly increased, and the tapping force and the suction force are automatically controlled by a user.

781	CN-1131 7128 3-A	CN2021 104775 70.X	76925559	Lung-clearing and phlegm-discharging device	The invention discloses a lung-clearing and sputum-discharging device which comprises a wearing mechanism, a vibrating mechanism and a sputum suction mechanism, wherein the wearing mechanism comprises a positioning cylinder and two fixing bands arranged on two sides of one end of the positioning cylinder and used for fixing the positioning cylinder on the chest of a human body, an opening is formed in one side, which is attached to the human body, of the positioning cylinder, and one ends, far away from the positioning cylinder, of the two fixing bands are connected through a magic tape. When the sputum suction device is applied, positive pressure or negative pressure is formed inside the positioning cylinder above the piston plate when the piston plate moves up and down, gas inside the positioning cylinder is discharged from the gas outlet pipe when the positive pressure is generated, gas inside the sputum suction bottle is sucked into the positioning cylinder through the first hose when the negative pressure is generated, suction force is formed inside the sputum suction pipe, sputum is sucked into the sputum suction bottle from the sputum suction pipe, tapping and sputum suction are combined, the negative pressure degree is correspondingly increased when the tapping force is increased, the suction force of the sputum suction pipe is correspondingly increased, and the tapping force and the suction force are automatically controlled by a user.

772	CN-1090913372-A	CN201811099995.6	648668664	A kind of the elderly's clearing lung-heat expectoration device	The invention discloses a kind of the elderly's clearing lung-heat expectoration devices, are related to Respiratory Medicine the field of medical instrument technology.It includes wearable unit, vibration unit and suction sputum unit；The wearable unit includes the parcel bag for surrounding human chest；Bag is intracavitary to be filled with shear thickening liquid；The vibration unit includes positioning plate；Front and back, which is run through, on positioning plate is equipped with multiple riffled tubes；Adjustable column rear end is fixedly connected with pressure spring；The pressure spring other end is fixedly connected with percussion box；It taps in box and is fixedly installed with electromagnet；The suction sputum unit includes tool stand and negative pressure pump；The head periphery of sputum aspirator tube is uniformly connected with rubber tube；Magnetic powder is filled in rubber tube.The beneficial effects of the present invention are: tapping the cooperation with shear thickening liquid using quick high frequency, preferably protecting patient and transmitting vibration, enhancing air flue stimulation improves expectoration effect.

771	KR-2021000109-U	KR2020190004552	761458 97	Manual Chest Wall Vibrator	The present invention relates to a manual chest wall vibrator that vibrates through the chest wall for respiratory rehabilitation of the human body, and a pipe 11 having a certain length through which the inside is penetrated is provided on one side, and the pipe 11 and the pipe 11 are in a hemispherical shape on the other side. A body 10 coupled at an angle and provided with a receiving portion 13 penetrating therein; A support member 20 in which a lower portion is inserted into the receiving portion 13 in a conical shape having an inside formed therethrough, and a flange formed at the upper portion is mounted inside the upper end of the receiving portion 13; A weight body 30 inserted into the support member 20 in a ball shape of a certain weight; A plurality of outlets 41 are formed at the top, and the lower inner periphery includes a stopper 40 coupled to the upper outer periphery of the body 10, the pipe 11, the body 10, the support member 20, and The outlet 41 of the stopper 40 is formed through each of the exhalations introduced through the pipe 11 to apply vibration to the chest wall while the weight body 30 inserted into the support member 20 is ascending and descending. According to the present design, the present design makes it easy to discharge mucus from the airways, such as sputum, by allowing a person with respiratory scaffold disease to bite and blow into the mouth and to transmit vibrations by the middle body to the chest wall, and has a simple structure and is easy to clean, It is easy to carry.

770	CN-2157798 1-U	CN202121888952.3	801308 59	Vibrating percussion head for discharging phlegm	The utility model discloses a sputum excretion vibration percussion head, which comprises a handle, a motor arranged in the front half part of the handle, an upper shell connected with the front end of the handle and a lower shell connected with the lower end of the upper shell, wherein the front side surface of the upper shell is provided with an opening and a shell cover for closing the opening, and the lower end of the lower shell is open; be provided with carousel, connecting rod and slide bar in the upper shell, the pivot end connection of carousel and motor, the top of casing under the slide bar passes perpendicularly, and slide bar and casing down sliding fit, the one end of connecting rod articulates at carousel limit portion, the other end of connecting rod is articulated with the upper end of slide bar, the internal flexible impact head of arranging on the base plate of base plate and array that is provided with of inferior valve, the lower extreme fixed connection of base plate and slide bar. The sputum excretion vibration percussion head replaces manual vibration of the chest or the back of a patient, so that the workload of medical staff can be reduced, the problem of hand fatigue can be avoided, and the sputum excretion efficiency can be improved; the sputum excretion vibration percussion head can also be used as a massager.

767	CN-2114340722-U	CN201921381294.1	722941553	Full chest oscillation sputum excretion machine	The utility model discloses a full chest vibration sputum discharging machine, it includes: a base, a shell, an internal bracket, a compressor and a sputum excretion vest; the shell is arranged on the upper part of the base; the compressor is arranged on the upper part of the inner bracket, and the bracket is arranged on the upper part of the base; the inner bracket comprises three layers of supporting frame plates which are arranged up and down; the compressor is arranged on the support frame plate at the upper part of the inner bracket; the atomization device and the control circuit board are arranged on the support frame plate in the middle; the supporting frame plate at the bottom of the inner bracket is fixedly arranged at the upper part of the base; the atomization device comprises an atomization pump, an atomization pipeline and an atomization mask which are connected with each other, and the atomization pump is arranged on the support frame plate in the middle; the sputum excretion machine of the utility model integrates the casing into a whole, which is convenient for installation and maintenance; the air pump and the base are directly fixed to reduce the vibration of the shell of the machine body, and the two-piece sputum excretion vest is more convenient for a patient to wear; the pipeline is fixedly connected with the back core of the sputum excretion machine, so that the pipeline can be prevented from falling off in the working process.

759	CN-1157215455-A	CN202211446451.9	852967900	Nursing is with sputum discharging device that cleans breath	The invention discloses a lung-clearing sputum excretion device for nursing, which comprises a vest, an air bag, a mounting plate and a control device, wherein the vest is internally provided with the air bag and is used for matching with a main body and being worn on a patient to vibrate sputum excretion; and butt joint piece one, set up on the mounting panel, be used for with vest releasable connection on the mounting panel, this nursing is with phlegm discharging device that cleans the lung, when utilizing phlegm discharging machine to assist clear waste sputum discharging, especially to the old person that the trick is inconvenient right, usable mounting panel, butt joint piece one, action part one and action part two cooperate the use, the convenient depositing of vest has been guaranteed to its one, its two can make wearing of vest more convenient, whole vest can be automatic cladding in user's thorax position, the user only need utilize the vest from taking magic bandage to its location, can utilize the vest to come effective sputum discharging, and directly cancel the location of magic bandage after sputum discharging finishes, can take off the vest and deposit automatically, effectual convenient old person's that the trick is inconvenient phlegm discharging uses.

754	CN-2193986-U	CN202227552 13.8	87240221	External vibration sputum excretion device	The utility model discloses an external vibration sputum excretion machine. Comprising the following steps: the belt is fixedly connected with the main body plate and two side surfaces of the main body plate, two connecting rods are transversely arranged in the main body plate, bearings are respectively arranged at two ends of each connecting rod, the connecting rods are rotatably connected with the inner walls of the two sides of the main body plate through the bearings, two first gears are fixedly arranged in the middle of each connecting rod arranged on one side of the main body plate, and first reset leather strips are wound between the two first gears; according to the utility model, the vibration motor and the electric heating wire start to work through the press switch, the vibration motor drives the pushing extrusion tube to start vibrating, the electric heating wire can enable the temperature of the pushing extrusion tube to rise, and the reset leather strip is pulled to rotate in the vibration process so as to drive the pushing extrusion tube to push up and down, so that the device can extrude the chest of a patient to discharge phlegm in the vibration process or after the vibration is completed, and the phlegm discharging task can be more effectively completed.

727	CN-1166369 9-A	CN202310595774.2	876148 13	Vibrating prone pad	The invention discloses an oscillating prone cushion which comprises a first rubber cushion, wherein a second rubber cushion is fixedly connected to one side of the upper surface of the first rubber cushion, a supporting mechanism is fixedly connected to the upper surface of one end of the first rubber cushion, and a turnover mechanism is arranged at one end of the second rubber cushion. When a patient is prone on the upper surface of the first rubber pad, the chest of the patient is arranged in the inner cavity of the upper groove of the lying pillow, gas is filled in the gas inlet pipe through the gas filling port, so that the gas enters the inner cavities of the first plurality of gas bags, the first gas bag is inflated, the first inflated gas bag pushes the upper body of the patient to move upwards, the chest of the patient is supported upwards, the inflated gas bag pushes the rotating plate to rotate upwards, the upper surface of the rotating plate pushes one side of the waist of the patient upwards, the upper body of the patient is lifted upwards conveniently, and the patient can be lifted up and turned over conveniently. Meanwhile, the vibration sputum excretion machine is used for vibrating the chest of the prone position patient, so that the prone position sputum excretion is realized, and the vibration sputum excretion machine is an important measure for improving ventilation of the pneumonia patient.

716	CN-1091723 17-B	CN201811098539.X	649086 54	Old person's phlegm device that clears lung	The invention discloses a lung clearing and sputum excretion device for old people, and relates to the technical field of medical instruments in respiratory medicine. It comprises a wearing unit, a vibration unit and a sputum suction unit; the wearing unit comprises a positioning plate and a wrapping clothes surrounding the chest of the human body; a protection bag is arranged at the rear end of the positioning plate; a plurality of bag cavities are uniformly sewn in the protective bag; the bag cavity is filled with shear thickening liquid; a plurality of threaded holes are arranged on the positioning plate in a penetrating manner from front to back; the vibration unit comprises a mounting pipe in threaded connection with the threaded hole; the front part in the installation pipe is fixedly provided with an electromagnet; the rear end of the electromagnet is fixedly connected with a pressure spring; the rear end of the pressure spring is fixedly connected with a knocking column; the sputum suction unit comprises a tool table and a negative pressure pump; the periphery of the head part of the sputum suction tube is uniformly connected with a rubber tube; the rubber tube is filled with magnetic powder. The invention has the beneficial effects that: by utilizing the matching of the quick high-frequency knocking and the shearing thickening liquid, the patient is better protected, the vibration is transmitted, the stimulation of the air passage is enhanced, and the sputum excretion treatment effect is improved.

713	CN-2173396 59-U	CN202123424150.X	83042587	Auxiliary sputum excretion device capable of generating air flow pressure oscillation by using expiratory power	The utility model relates to a medical treatment auxiliary instrument technical field discloses an application is exhaled power and is produced supplementary sputum discharging device of air pressure oscillation, and it includes the air cavity, the inside of air cavity separates into the first cavity of top and the second cavity of below through the floor, communicate each other through setting up the gas pocket at the floor middle part between first cavity and second cavity, set up the air current vibrating arm in the first cavity, the one end of air cavity sets up the blow gun, the other end of air cavity sets up the air current governing valve, the utility model discloses synthesize and utilize malleation (PET) of expiration period to combine and vibrate (ITO) technique in the thorax, when the user feels that there is phlegm or other mucus to be difficult coughing up or cough difficulty, can high-efficiently get rid of sputum through the expiration training, simultaneously the utility model discloses be suitable for the user of each age bracket, operation, easy dismounting.

690	CN-1091723137-A	CN201811098539.X	649086 54	A kind of the elderly's clearing lung-heat expectoration device	The invention discloses a kind of the elderly's clearing lung-heat expectoration devices, are related to Respiratory Medicine the field of medical instrument technology.It includes wearable unit, vibration unit and suction sputum unit；The wearable unit includes positioning plate and the package clothing around human chest；Positioning plate rear end is provided with protective bag；Several bag of chamber is uniformly sewed in protective bag；Bag is intracavitary to be filled with shear thickening liquid；Front and back is provided through multiple threaded holes on positioning plate；The vibration unit includes the installing pipe being threadedly coupled with threaded hole；Front is fixedly installed with electromagnet in installing pipe；Electromagnet rear end is fixedly connected with pressure spring；The rear end of pressure spring is fixedly connected with percussion column；The suction sputum unit includes tool stand and negative pressure pump；The head periphery of sputum aspirator tube is uniformly connected with rubber tube；Magnetic powder is filled in rubber tube.The beneficial effects of the present invention are: tapping the cooperation with shear thickening liquid using quick high frequency, preferably protecting patient and transmitting vibration, enhancing air flue stimulation improves expectoration effect.

684	CN-1094982 28-B	CN201811311121.2	657476 23	Lung rehabilitation treatment device based on cough sound feedback	The invention provides a lung rehabilitation treatment device based on cough sound feedback, which comprises a data integration component, a data processing component and a data application component. The data integration part adopts a sound sensitive sensor and an acceleration sensor to detect physiological and pathological acoustic signals of airway clearance behaviors. The data processing part adopts a deep learning technology to classify the cough, the throat and other related sound vibration signals. The data application part adopts an acoustic feedback technology to adjust a lung rehabilitation training scheme and evaluate the lung rehabilitation treatment effect. The invention can collect the sound vibration information brought by cough, throat clearing, swallowing, breathing, snoring and the like on the head, the neck or the upper chest, and realizes the real-time monitoring evaluation, the personalized intervention and the continuous management of the effectiveness of the airway clearance behavior.

683	CN-1123157770-A	CN202011243658.7	743171999	Neonate's sputum elimination treatment head and treatment case and treatment bed	The invention provides a neonate sputum excretion treatment head, a treatment box and a treatment bed, and relates to the technical field of neonate medical instruments, wherein the treatment head comprises a shell, one end of the shell is sealed by a convex soft rubber layer, a vibration motor is arranged in the shell and close to the soft rubber layer, one end of the vibration motor, which is far away from the soft rubber layer, is fixed on a telescopic cylinder, a damping reel is arranged on the vibration motor, a traction rope, one end of which is fixed on the soft rubber layer, is wound on the damping reel, and a rack which is meshed with the damping reel is arranged at the middle-rear section of the telescopic cylinder in the shortening direction; the shell is connected to the rapping mechanism. The treatment box comprises a chain transmission mechanism for driving the treatment head to move in the whole thorax, the treatment bed comprises a bed board, the treatment box is adjustably arranged on one side of the bed board, a bed fence is arranged on the other side of the bed board, and a hip guard plate opposite to the bed fence is arranged on the box body. Solves the problems that the force channel and the frequency for discharging the sputum of the newborn are not easy to control and the sputum discharging effect is not good due to the easy fatigue of an operator in the prior clinic.

681	CN-2195793887-U	CN202320389190.5	876948661	Beating device of full chest vibration sputum excretion machine	The utility model provides a beating device of a full chest vibration sputum excretion machine, which comprises a protection box, wherein a concave groove is formed in the front surface of the protection box, a servo motor is fixedly connected to the right side of the bottom of an inner cavity of the protection box, an output shaft of the servo motor is in transmission connection with a driving wheel, a driven wheel is arranged on the right side of the bottom of the inner cavity of the protection box, a rotary table is arranged on the left side of the bottom of the inner cavity of the concave groove, a transmission rod is fixedly connected to the top of the driven wheel, and one end of the transmission rod, far away from the driven wheel, penetrates through the inner cavity of the concave groove and is fixedly connected with the rotary table; according to the utility model, the servo motor, the driving wheel, the driven wheel, the turntable, the transmission rod, the movable plate, the connecting plate, the fixed cylinder, the connecting rod and the fixed plate are arranged, so that the auxiliary beating effect is achieved, the back of a patient can be beaten, the auxiliary sputum excretion machine is used for promoting sputum of the patient, the structure is simple, the use is convenient, convenience is brought to old users, and the wearing time and complicated use steps are reduced.

680	CN-1137863326-A	CN202111202166.8	79184892	Respiratory disease patient airway clearance device	The airway clearance device for the respiratory disease patient effectively solves the problem of high working strength when medical staff apply clearance to the patient; the automatic cutting machine comprises a U-shaped plate, wherein a box body is connected in the U-shaped plate in a sliding mode, a rotating shaft is connected in the box body in a rotating mode, a front end face gear is connected behind the rotating shaft in a sliding mode, a grooved wheel is arranged at the front end of the front end face gear, a T-shaped rod is arranged in the box body, an inserting column is arranged on the T-shaped rod, a transmission shaft is connected in the box body in a rotating mode, and a rear end face gear is arranged on the transmission shaft; a pressure rod is connected in the box body in a sliding mode, a bowl-shaped plate is arranged at the lower end of the pressure rod, an inclined groove is formed in the upper side of the pressure rod, an ejector rod is connected in the box body in a sliding mode, an inclined block is arranged on the ejector rod, a cylindrical rod is rotatably connected to the lower side in the box body, and semicircular blocks are arranged at the front end and the rear end of the cylindrical rod respectively; the invention has ingenious conception and convenient use, can beat or vibrate the chest wall of a patient, can help the patient to discharge sputum in an air channel, and reduces the working strength of medical staff.

678	US-2020 0268 601-A1	US16860814	72142546	SYSTEM AND METHODS FOR PULMONARY EXPANSION THERAPY (PXT)	A pulmonary expansion therapy (PXT) device may be a handheld or wearable device that covers specific lung fields and may generate negative pressure fields locally. The device also may provide vibratory/percussion therapy for airway clearance. The PXT may generate a localized negative pressure field non-invasively to the exterior of the chest wall, thereby increasing the functional residual capacity in underlying lung fields. As a result, increased ventilation and perfusion to the targeted internal lung field may be achieved by creating a decrease in the external barometric pressure relative to the more positive intrinsic airway pressures. The PXT device also may improve lung compliance by elevating the chest wall to compensate for the dysfunction of the respiratory musculature responsible for lifting the chest wall. In some embodiments, once a targeted functional residual capacity (FRC) has been established, vibration or percussion may be applied.
678	WO-2021 2220 62-A1	US2021/02907 4	78332177	SYSTEM AND METHODS FOR PULMONARY EXPANSION THERAPY (PXT)	A pulmonary expansion therapy (PXT) device may be a handheld or wearable device that covers specific lung fields and may generate negative pressure fields locally. The device also may provide vibratory/percussion therapy for airway clearance. The PXT may generate a localized negative pressure field non-invasively to the exterior of the chest wall, thereby increasing the functional residual capacity in underlying lung fields. As a result, increased ventilation and perfusion to the targeted internal lung field may be achieved by creating a decrease in the external barometric pressure relative to the more positive intrinsic airway pressures. The PXT device also may improve lung compliance by elevating the chest wall to compensate for the dysfunction of the respiratory musculature responsible for lifting the chest wall. In some embodiments once a targeted functional residual capacity (FRC) has been established, vibration or percussion may be applied.

678	US-2017019676 2-A1	US1547288 6	58386785	Pulmonary Expansion Therapy (PXT) Devices	A pulmonary expansion therapy (PXT) device may be a handheld device that covers specific lung fields and may generate negative pressure fields locally. The device also may provide vibratory/percussion therapy for airway clearance. The PXT may generate a localized negative pressure field non-invasively to the exterior of the chest wall, thereby increasing the functional residual capacity in underlying lung fields. As a result, increased ventilation and perfusion to the targeted internal lung field may be achieved by creating a decrease in the external barometric pressure relative to the more positive intrinsic airway pressures. The PXT device also may improve lung compliance by enabling a medical professional to grab and elevate the chest wall to compensate for the dysfunction of the respiratory musculature responsible for lifting the chest wall. In some embodiments, once a targeted functional residual capacity (FRC) has been established, vibration or percussion may be applied.
678	US-1076559 1-B2	US1547288 6	58386785	Pulmonary expansion therapy (PXT) devices	A pulmonary expansion therapy (PXT) device may be a handheld device that covers specific lung fields and may generate negative pressure fields locally. The device also may provide vibratory/percussion therapy for airway clearance. The PXT may generate a localized negative pressure field non-invasively to the exterior of the chest wall, thereby increasing the functional residual capacity in underlying lung fields. As a result, increased ventilation and perfusion to the targeted internal lung field may be achieved by creating a decrease in the external barometric pressure relative to the more positive intrinsic airway pressures. The PXT device also may improve lung compliance by enabling a medical professional to grab and elevate the chest wall to compensate for the dysfunction of the respiratory musculature responsible for lifting the chest wall. In some embodiments, once a targeted functional residual capacity (FRC) has been established, vibration or percussion may be applied.

673	CN-2153505538-U	CN202120404595.2	79623085	Respiratory muscle training and integrated lung-heat clearing instrument with vibrating sputum excretion function	The utility model discloses a respiratory muscle training and vibration sputum excretion integrated lung-clearing instrument, wherein a wearing component is fixedly arranged on the right side of a control component, the number of charging and sucking pumps is two, the charging and sucking pumps are fixedly arranged at the upper end and the lower end in a fixed cover, chest air cushions are fixedly arranged at the left end and the right end on the upper side of the front end of a vest, abdomen air cushions are fixedly arranged at the middle end and the lower end of the vest, a back cushion is fixedly arranged at the rear end of the vest, and a massager is fixedly arranged in the back cushion. Therefore, the use is convenient, the subsequent bubble invasion and disinfection to the wearing assembly are realized, and the clinical practicability is expanded.
665	KR-2023001109 9-A	KR1020210091708	851084 86	ULTRASONIC VEST FOR PEOPLE WITH RESPIRATORY DISEASES	The present invention is an ultrasonic generating vibrating vest for respiratory patients, which is formed in a vest worn on the upper body, a plurality of ultrasonic units attached to and detached from the inside of the vest, and a band on the side of the vest, the front of the vest depending on the size of the upper body. A velcro portion for adjusting the size by wrapping and a coupling portion coupled to the velcro portion and provided along the longitudinal direction on the front surface of the vest, and the ultrasonic generator discharges sputum by applying ultrasonic vibration to the chest wall.
665	KR-1025671555-B1	KR1020210091708	851084 86	ULTRASONIC VEST FOR PEOPLE WITH RESPIRATORY DISEASES	The present invention is an ultrasonic generating vibrating vest for respiratory patients, which is formed in a vest worn on the upper body, a plurality of ultrasonic units attached to and detached from the inside of the vest, and a band on the side of the vest, the front of the vest depending on the size of the upper body. A velcro portion for adjusting the size by wrapping and a coupling portion coupled to the velcro portion and provided along the longitudinal direction on the front surface of the vest, and the ultrasonic generator discharges sputum by applying ultrasonic vibration to the chest wall.

663	RU-2008145559-A	RU2008145559A	4267993 7	METHOD FOR TREATING BRONCHIAL OBSTRUCTION SYNDROME IN THE PRESENCE OF RESPIRATORY PATTERN BACTERIAL INFLAMMATION	A method of treating bronchial obstruction syndrome in the presence of bacterial inflammation of the respiratory tract by inhalation of an antibiotic solution with a mucolytic substance, characterized in that the treatment is carried out in three stages daily, at the first stage, 250 mg of Fluimucil-antibiotic IT are inhaled, at the second stage, through 30 minutes after inhalation, a vibrational effect on the patient's chest is performed for 15 minutes using the HIVAMAT-200 apparatus; in the third stage, 6-7 hours after vibration exposure, inhalation is performed 250 mg of the drug "Fluimucil-antibiotic IT", with a course of treatment of 5-7 days.

661	CN-1137863326-B	CN202111202166.8	791848992	Respiratory disease patient airway clearance device	The airway clearance device for the respiratory disease patient effectively solves the problem of high working strength when medical staff apply clearance to the patient; the device comprises a U-shaped plate, wherein a box body is connected in the U-shaped plate in a sliding manner, a rotating shaft is connected in the box body in a rotating manner, the rear side of the rotating shaft is connected with a front end face gear in a sliding manner, a grooved wheel is arranged at the front end of the front end face gear, a T-shaped rod is arranged in the box body, an inserting column is arranged on the T-shaped rod, a transmission shaft is connected in the box body in a rotating manner, and a rear end face gear is arranged on the transmission shaft; a pressure rod is connected in the box body in a sliding mode, a bowl-shaped plate is arranged at the lower end of the pressure rod, an inclined groove is formed in the upper side of the pressure rod, an ejector rod is connected in the box body in a sliding mode, an inclined block is arranged on the ejector rod, a cylindrical rod is rotatably connected to the lower side in the box body, and semicircular blocks are arranged at the front end and the rear end of the cylindrical rod respectively; the invention has ingenious conception and convenient use, can beat or vibrate the chest wall of a patient, can help the patient to discharge sputum in an air channel, and reduces the working strength of medical staff.
658	UA-7160-U	UA2004090788 3U	348832 34	METHOD FOR PHYSICAL REHABILITATION OF CHILDREN WITH BRONCHIAL ASTHMA	The method for the physical rehabilitation of the children with the bronchial asthma consists in several manipulations performed in the initial supine or probe position. The therapeutic percussion is performed, the chest is compressed, and the forced expirations with coughing are applied. The therapeutic percussion is followed by vibrations. The chest compression is accompanied by the forced expirations. In addition, the ribs are sprung with accompanying forced expirations and coughing. The draining position is changed. The rotation is performed in the lateral position. The body is raised from below in supine position. The breathing with the squeezed lips is also practiced.

652	CN-2160913633-U	CN202120016029.4	806861 10	Disposable vibration sputum excretion instrument waistcoat for children	The utility model discloses a disposable vibration sputum excretion instrument waistcoat for children, which comprises a waistcoat body, wherein the waistcoat body comprises a front opening front and a rear air bag, two sides of the front opening front are respectively connected with two sides of the rear air bag, an inflation cavity is arranged in the rear air bag, an air inlet connected with an air pipe of a sputum excretion instrument is arranged on one side of the rear air bag, and the front opening front and the rear air bag are made of flocking fabrics. Compared with the prior art, beneficial effect lies in, this novel back gasbag that only needs at the vest sets up can reduce the manufacturing cost of gasbag to the flocking price is lower and feel soft, and further reduce cost, every patient can both purchase alone one, avoids cross infection, also can reduce the disinfection requirement, more is fit for using as disposable article. In addition, the front placket does not need to be inflated, so that the chest cavity of the child is not squeezed, and discomfort is reduced.
646	CN-1037678 13-A	CN201410035522.5	50560882	Applied research of self-made multifunctional concave pad used after cardio-thoracic surgery	On the basis of long-term clinical practice and observation, a concave pad is designed according to the chest anatomical features and the thoracotomy incision position, and conforms to the anatomical features of human body chest. The concave pad presses on a surgical incision and helps a patient have a comfortable body position, the pain caused by the chest wall vibration can be reduced, the comfort level is improved, the tussive force and the self-confidence of the patient are increased, the sputum is easily discharged, and the occurrence of the postoperative pulmonary complications is reduced. In order to scientifically verify the clinical effect of the therapy, and further guide the clinical application, the research is purposely carried out.

645	IN-2022110769 83-A	IN202211076983		CUSTOMIZED BIOFEEDBACK FLUTTER DEVICE AND METHOD FOR RESPIRATORY DISORDERS	The current invention pertains to designing of a customized flutter device with audio-visual up gradation for mobilization of sputum among respiratory disorders. In certain embodiments, the flutter device was connected with a microphone so that as the patient performs expiration through the device the signal is channelized through microcontroller and reaches the Liquid Crystal Display (LCD) displays. When the expiration is encouraged the ball in the flutter device oscillates and creates vibration in the chest wall and simultaneously feedback of a balloon, buzzer or light will be enhanced to encourage the person. Prolonged expiration helps to improve collateral ventilation and also prevents airway collapse mobilizes the sputum. With the help of the software the performance results of frequency and expiration time are stored for statistical analysis. In further embodiments, the device is a portable device.

631	CN-2019591866-U	CN201120048347U	445217 10	Air vibration type sputum eliminating machine	An air vibration type sputum eliminating machine belongs to the technical field of medical instruments, and comprises a casing, an air chamber, a first tympanic disk, a second tympanic disk, an engine, an air inducing mechanism, a tympanic disk actuating mechanism, an air tube and a wearing device for a patient to wear. The casing is provided with a frame, the air chamber is encircled by a first side plate, a second side plate, a third side plate, a fourth side plate, a top plate and a bottom plate, and an air cavity is formed in the air chamber. The first tympanic disk is fittingly positioned on a first tympanic disk cavity arranged on the first side plate, and the second tympanic disk is fittingly positioned on a second tympanic disk cavity arranged on the second side plate. The engine is fixed onto the bottom plate or the frame, and a power shaft of the engine extends into the air cavity through the bottom plate. The air inducing mechanism is fixed onto the frame and communicated with the air cavity, the tympanic disk actuating mechanism positioned inside the air cavity is connected with the power shaft, the first tympanic disk and the second tympanic disk, one end of the air tube is communicated with the air cavity, and the other end of the air tube is fittingly connected with the wearing device. The air vibration type sputum eliminating machine has no limitation on utilization places and is simple in overall structure, labor intensity of operators can be reduced, knocking and patting effects on chest and back of a patient are fine, and sputum eliminating is benefited.

611	CN-1156246674-B	CN202211438597.9	849108 39	Auxiliary device for respiratory tract diagnosis	The invention belongs to the technical field of diagnosis assistance, and particularly relates to an auxiliary device for respiratory tract diagnosis, which comprises an auxiliary diagnosis main body, a degree of freedom adjusting mechanism, a chest expansion deep breathing auxiliary mechanism and a chest wall vibration type back beating auxiliary mechanism, wherein the chest expansion deep breathing auxiliary mechanism is arranged on the auxiliary diagnosis main body; the invention provides a thoracic expansion deep breathing auxiliary mechanism, which enables the thoracic cage to be expanded to the maximum extent through abdominal breathing by means of the mutual matching of an abdomen fitting assembly, a visual abdominal breathing feedback assembly, a first adjusting assembly and a second adjusting assembly, enables alveoli at the lower part of the lung to stretch and contract, enables more oxygen to enter the lung, and is beneficial to acquiring sputum samples.

605	CN-2150208 62-U	CN202120565200.7	79153478	ICU patient stands up sputum discharging multifunctional bed	The utility model relates to a ICU patient stands up multi-functional bed of sputum elimination, including the bed body and base, the bed body includes support frame and bed board frame, and the support frame links to each other with the base, and the bed board frame is erect on the support frame, and the bed board frame includes head bed board, back bed board and shank bed board, and back bed board top is provided with a plurality of heads that shake, and the head that shake is connected with the controller electricity, and the controller sets up on the support frame, and the shank bed board is articulated mutually and links to each other through first articulated shaft with back bed board, and support frame one side is provided with a actuating mechanism, a actuating mechanism with first articulated shaft links to each other and rotates through a actuating mechanism control. Through adopting above-mentioned technical scheme, a plurality of heads that shake have controller control to adjust, carry out orderly chest back sputum discharging through physiotherapy, from bottom to top, from outside to inside law vibration, the controller changes frequency, dynamics direction and the time of the head vibration that shakes according to the patient's condition, convenient to use, reducible ICU nursing staff's that is in short supply manpower and energy.

593	CN-1167258 28-A	CN202310804185A		Auxiliary device is tempered in recovered postoperative of cardiothoracic surgery	The utility model provides a heart chest surgery postoperative rehabilitation exercise auxiliary device, relates to postoperative rehabilitation technical field, including support frame, adjusting connection spare, seat, back, handrail, sputum excretion device and oxygen suppliment device, connect through adjusting connection spare between support frame and the seat, the seat top is equipped with the back, and the back is close to patient's one side symmetry and is equipped with two handrails, is equipped with sputum excretion device on the back between two handrails, and one side of seat is equipped with oxygen suppliment device, and oxygen suppliment device sets up between support frame and seat; the invention has strong practicability and is very convenient to use, and the support frame is arranged to support the patient when walking, so that the physical strength of the patient is saved, and the safety of the patient is ensured; by arranging the oxygen supply device, oxygen is supplied to the patient after the patient moves, so that the epoxy amount in the blood of the patient is improved; through the sputum excretion device, the back of a patient after exercise is vibrated, the establishment of cough reflection is promoted, and sputum excretion of the patient is facilitated.

584	CN-2058146355-U	CN201620532144.6	575688440	A kind of portable bat expectorant device	This utility model provides a kind of portable bat expectorant device, belong to medical instruments field, it includes that cross section is hemispheric bat expectorant device body and handle, this bat expectorant device body has cavity, handle is arranged at the side clapping expectorant device body away from cavity, the opening part of cavity is provided with and claps the bolster that expectorant device body removably connects, and this bolster is along clapping the circumferentially disposed of expectorant device body.This portable bat expectorant device is easy to use, it is easy to carry, simple to operate, it is in by clapping unlucky bat expectorant device and human body under the imbalance of air pressure and pressure, the vibration of empty chamber air and bat expectorant device drives thorax and the motion of each respiratory muscle, make the sputum effective drainage of each lung section, the external expectoration suffering from the various people of respiratory system disease is made to have obtained bigger improvement, by this equipment expectoration, not only enhance the eliminating of sputum, and effectively reduce the probability of pulmonary infection further, also improve life and the life quality of patient while improving patient comfort.

572	RU-2609992-C1	RU2016103397	584572	METHOD FOR IMPROVEMENT OF SPUTUM EXPECTORATION	FIELD: medicine.SUBSTANCE: invention relates to medicine, namely to pulmonology, and can be applied for treatment of patients with bronchoobstructive diseases to improve sputum expectoration. Complex impact, which includes laser and ultrasonic therapy, carried out at the background of standard therapy, is realized. Ultrasonic therapy is realised on the same day with laser therapy. First, ultrasonic therapy is performed, influencing two paravertebral fields in chest area for two minutes for each. Frequency of vibrations is 880 kHz, intensity is 0.4 W/cm2. Then, laser therapy is performed. Device "LASMIC" with matrix laser head ML01K (ML-904-80) is applied. Impact is realised in contact way on five fields: Krenig field on the right, Krenig field on the left, on medium line of area of medium third of sternum, projection of right adrenal gland and projection of left adrenal gland. Each field is exposed to impact for 100 seconds in the following mode: pulse power 50 W, pulse repetition rate: 1 procedure - 80 Hz, 2 procedure - 500 Hz, 3 - 1500 Hz, 4 - 3000 Hz, the remaining procedures - 10000 Hz, on projection of adrenal glands - maximal frequency 3000 Hz. Course of complex impact constitutes 8-10 procedures.EFFECT: method ensures improvement of sputum expectoration and increase treatment efficiency of patients with bronchoobstructive diseases due to anti-inflammatory, anesthetic, antispasmodic, defibrosing effects, enhancement of microcirculation, achieved by combined application of ultrasonic therapy and laser irradiation.6 tbl, 2 ex
557	RU-2393854-C1	RU2008145559A	426799 37	METHOD OF TREATING BRONCHIAL OBSTRUCTION SYNDROME IN PATIENT WITH BACTERIAL INFLAMMATION	FIELD: medicine. SUBSTANCE: invention refers to medicine, namely to pulmonology, and can be used for treating bronchial obstruction syndrome in a patient with bacterial inflammation of airway. That is ensured by inhalations of 250 mg of "Fluimucil-antibiotic IT". In 30 minutes after inhalation, the patient's chest is exposed to vibrations generated by HIVAMAT 200 apparatus for 15 minutes. In 6-7 hours later, inhalation of 250 mg of "Fluimucil-antibiotic IT" is performed again. Treatment is daily for 5-7 days. EFFECT: method is effective, provides recovery in a relatively short time, being herewith noninvasive, painless and without by-effects that allows to be recommended for wide use in paediatrics. 1 ex

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5 5 4	CN - 10 20 68 37 4-B	CN2 011 100 462 28A	4 4 0 2 7 2 5 4	Air-vibr atin g sput um excr etin g instr ume nt and pati ent-wor n devi ce ther eof	The invention discloses an air-vibrating sputum excreting instrument and a patient-worn device thereof, which belong to the technical field of medical appliances. The air-vibrating sputum excreting instrument comprises a shell, an air chamber, a first eardrum disk, a second eardrum disk, a power machine, an air induction mechanism, an eardrum actuating mechanism, a ventilation tube and a worn device, wherein the shell is provided with a frame; the bottom of the frame is provided with rollers or support legs; the air chamber is formed by encircling a first side plate, a second side plate, a third side plate, a fourth side plate, a top plate and a bottom plate; an air cavity is formed in the air chamber; the first side plate is provided with a first eardrum disk cavity; the second side plate is provided with a second eardrum disk cavity; the first eardrum disk is arranged on the first eardrum disk cavity; the second eardrum disk is arranged on the second eardrum disk cavity; the power machine is fixed on the bottom plate or the frame; the air induction mechanism is fixed on the frame and is communicated with the air cavity; the eardrum disk actuating mechanism is positioned in the air cavity and is connected with a power shaft, the first eardrum disk and the second eardrum disk; the worn device is worn by a patient; and one end of the ventilation tube is communicated with the air cavity, and the other end of the ventilation tube is connected with the patient worn device in a matching way. The invention has the advantages that: the air-vibrating sputum excreting instrument has no limit on using occasions; the overall structure of the instrument is simple; the labor intensity of operating personnel can be lowered; and the instrument has good chest and back beating effects on the patient and contributes to sputum excretion.

554	CN-1020683 74-A	CN2011100462 28A	44027254	Air-vibrating sputum excreting instrument and patient-worn device thereof	The invention discloses an air-vibrating sputum excreting instrument and a patient-worn device thereof, which belong to the technical field of medical appliances. The air-vibrating sputum excreting instrument comprises a shell, an air chamber, a first eardrum disk, a second eardrum disk, a power machine, an air induction mechanism, an eardrum actuating mechanism, a ventilation tube and a worn device, wherein the shell is provided with a frame; the bottom of the frame is provided with rollers or support legs; the air chamber is formed by encircling a first side plate, a second side plate, a third side plate, a fourth side plate, a top plate and a bottom plate; an air cavity is formed in the air chamber; the first side plate is provided with a first eardrum disk cavity; the second side plate is provided with a second eardrum disk cavity; the first eardrum disk is arranged on the first eardrum disk cavity; the second eardrum disk is arranged on the second eardrum disk cavity; the power machine is fixed on the bottom plate or the frame; the air induction mechanism is fixed on the frame and is communicated with the air cavity; the eardrum disk actuating mechanism is positioned in the air cavity and is connected with a power shaft, the first eardrum disk and the second eardrum disk; the worn device is worn by a patient; and one end of the ventilation tube is communicated with the air cavity, and the other end of the ventilation tube is connected with the patient worn device in a matching way. The invention has the advantages that: the air-vibrating sputum excreting instrument has no limit on using occasions; the overall structure of the instrument is simple; the labor intensity of operating personnel can be lowered; and the instrument has good chest and back beating effects on the patient and contributes to sputum excretion.

543	CN-2151329999-U	CN202022535793.0	793492 4	Massage throw pillow for promoting patient to excrete phlegm	The utility model discloses a massage throw pillow for promoting patient sputum excretion, which relates to the field of medical appliances, and comprises a cotton layer, a shaping template, an air bag liner and a vibration device, wherein the cotton layer is rectangular and has a double-layer structure, and the air bag liner is positioned between the double-layer cotton layer; the first cotton layer on the left side is provided with a groove which is matched with the shape of the chest of a human body. The vibration device comprises a motor, a knocking device, a rear shell, a storage battery and a switch; the motor is positioned on the right side of the shaping template and is fixedly installed; the knocking device comprises a crankshaft, a knocking ring and a spring; the crankshaft is L-shaped and is fixedly connected with the output shaft of the motor; the knocking ring is in a circular ring shape, the top end of the crankshaft is located at the circle center of the knocking ring, and the top end of the crankshaft is connected with the knocking ring through a plurality of springs on the surface. The utility model provides a high comfort and use nimble phlegm technical scheme of promoting to arrange has avoided the inconvenient weak point of traditional sputum discharging equipment.

542	CN-2150 2197 9-U	CN202022655615.1	79160661	Simple hanging type sputum excretion machine	The utility model discloses a simple hanging type sputum excretion machine, which comprises a folding plate frame structure, wherein the folding plate frame structure comprises a first support plate and a second support plate, the first support plate is rotationally connected with the second support plate through a connecting shaft, one side of the second support plate is rotationally connected with a brace, the tail end of the brace is provided with a notch, the first support plate is fixedly connected with a hanging rod, and the second support plate is hung and buckled on the hanging rod through rotating the brace; the first supporting plate is slidably provided with an inserting table through a sliding plate, an inserting opening is formed in the inserting table, a fastening bolt is rotatably arranged on one side of the inserting table, a knocking head is inserted into the inserting opening, and a displacement opening is formed in the first supporting plate; the utility model discloses, need not other people cooperative operation to accessible lateral shifting inserts the platform and adjusts the vibration position of knocking the head, and is more convenient, and the user can lie prone and be the low chest height's of head posture, and the handheld phlegm of knocking the head and with the user's deep of personnel of facilitating the use is discharged, and the sputum discharging effect is better, uses as required, and is comparatively practical.

540	CN-2157798 29-U	CN202022622413.7	801243 63	Vest type pressure sleeve for promoting lung sputum excretion	The utility model provides a waistcoat type pressure sleeve for promoting lung sputum excretion, and relates to the technical field of medical auxiliary instruments. The waistcoat type pressure sleeve for promoting lung sputum excretion comprises a waistcoat front part and a waistcoat rear part which are connected in a buckling way; the front part of the waistcoat is sewn by an outer side air bag layer and an inner side air bag layer, and the periphery of the outer surface of the front part of the waistcoat is fixedly connected with a plurality of snap fastener buckles; the periphery of the inner wall of the rear part of the waistcoat is fixedly connected with a plurality of snap button female buttons corresponding to the snap button male buttons; the two sides of the front end of the front part of the waistcoat are respectively provided with an inflation and deflation module, and the inner sides of the front part of the waistcoat and the rear part of the waistcoat are respectively fixedly connected with a first breathable net and a second breathable net. Fill the vest structure of gassing formula through the design, after the patient dresses the upper cover vest, can drive human chest position synchronous vibrations through filling the gassing fast to supplementary patient can expectorate phlegm and mucus in the lung, thereby increases the air flow of patient's lung, makes the lung keep unblocked state all the time, and work efficiency improves greatly.

529	CN-2143881811-U	CN202022575438.6	78033788	Neonate's sputum elimination treatment head and treatment case and treatment bed	The utility model provides a neonate's therapeutic head of eliminating phlegm and treatment case and treatment bed relates to neonate's medical instrument technical field, and the therapeutic head includes that one end passes through the shell that the flexible glue layer of evagination is sealed, and the department that is close to the flexible glue layer in the shell is provided with vibrating motor, and vibrating motor keeps away from the one end of flexible glue layer and is fixed in telescopic cylinder, is provided with the damping reel on the vibrating motor, and the last solderless wrapped connection of damping reel has one end to be fixed in the haulage rope on the flexible glue layer, is provided with the rack with damping reel meshing in the middle and back section that telescopic cylinder shortens the direction; the shell is connected to the rapping mechanism. The treatment box comprises a chain transmission mechanism for driving the treatment head to move in the whole thorax, the treatment bed comprises a bed board, the treatment box is adjustably arranged on one side of the bed board, a bed fence is arranged on the other side of the bed board, and a hip guard plate opposite to the bed fence is arranged on the box body. Solves the problems that the force channel and the frequency for discharging the sputum of the newborn are not easy to control and the sputum discharging effect is not good due to the easy fatigue of an operator in the prior clinic.
523	RU-2289390-C2	RU2004116108A	376669 62	METHOD OF PRE-OPERATION PREPARATION OF PATIENTS SUFFERING FROM TUBERCULOMA OF LUNGS AND HAV	FIELD: medicine; phthisiology. SUBSTANCE: method is based upon course of electric-vibration acupressure by means of massaging unit. Massage is applied to skin covers around surface of thorax, including biologically active points above area of projection of main and proximal bronchus. Covers are subject to influence at frequency of 35-40 Hz and with amplitude of 0,5-0,7 mm. Procedure is complete daily, its duration changes from 3 to 15 minutes during 12-14 days. As chemical preparations, isoniazid in amount of 0,3 g, rhyphampicine of 0,6 g and ethambutol of 1,2 g are introduced. EFFECT: improved reflex stimulation of vegetative nervous system; improved secretion of bronchial glands. 1 ex, 2 tbl

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5 1 7	CN - 20 84 36 04 2-U	CN2 017 218 757 40.5	6 5 0 9 6 1 0 0	A kind of impulsive compressional air pump	The utility model discloses a kind of impulsive compressional air pump ; The technical issues of solution: inflation source, that is, air pump of expectoration vest mentioned in the background art noise in clinical use process is big, vibration is strong, gas leakage often results in gas-guide tube and vest disengaging, inflation is uneven, causes therapeutic effect poor, the high technical problem of medical staff's labor intensity.A kind of technical solution of use: impulsive compressional air pump, including electric machine support, motor, gas chamber is set on the electric machine support of motor, gas chamber is divided into left gas chamber and right gas chamber, through-hole is symmetrically opened up on two opposite sides on left gas chamber and right gas chamber, is respectively provided with rubber bowl at the aperture of two through-holes, is respectively provided with beating disk in two rubber bowls.Advantage: this impulsive compressional air pump greatly reduces vibration and noise when full chest oscillation sputum elimination machine operation, inflates tearing phenomenon that is more uniform, reducing rubber bowl to vest, reduce the possibility of gas leakage, reduce after-sales service frequency.

482	RU-2411964-C1	RU2009130176A	46309966	METHOD OF TREATING PATIENTS WITH HYPERTENSION DISEASE IN COMBINATION WITH BRONCHIAL ASTHMA	FIELD: medicine.SUBSTANCE: invention relates to medicine, namely, to physiotherapy and balneology and can be used for treatment of patients with hypertension disease in combination with bronchial asthma. In period from 11.00 to 15.00 carried out is electric stimulation of segmental reflexogenic zones and region of lungs projection with high-amplitude pulse bipolar current with biological feedback on area of hairy part of head by means of pectinate remote electrode, collar zone and thorax on intercostal spaces, with frequency 90 Hz, with total procedure duration 20-25 minutes. Impact is performed with gradual increase of current intensity until distinct painless vibration appears under electrode, in accordance with labial technique, daily, with 10-12 procedures per a course. After electric stimulation session in period from 15.00 to 18.00, additionally, balneotherapy is performed by artificial iodine-bromide baths, with temperature 36-37°C, 10-12 minute duration, every second day, 10-12 procedures per a course.EFFECT: invention makes it possible to increase efficiency of rehabilitation due to improvement of central and intracardial hemodynamics, indices of lipid exchange and antioxidant protection, enhancement of hypotensive and broncholytic effects of treatment with reduction of drug loading on patient's organism.2 tbl

476	CN-1166723 8-A	CN202310642150.1		Infant back beating instrument	The invention discloses an infant back-beating instrument, which comprises a storage box, a back-beating instrument main body and a balloon cover, wherein a box cover is movably arranged at the upper end of the storage box through a hinge, a placing groove and four disinfection bins are arranged at the upper end of the storage box, the back-beating instrument main body is placed in the placing groove, the balloon cover is placed in the disinfection bins, a charging seat is arranged at the right end of the storage box, a lifting handle is fixedly arranged at the front end of the storage box, a second control panel and four indicator lamps are arranged at the upper end of the box cover, and the positions of the four indicator lamps correspond to the positions of the four disinfection bins. According to the infant back beating instrument, the air in the balloon cover is oscillated through the air vibrator in the main machine, so that the chest and the back of an infant are gently beaten and vibrated, sputum excretion of the infant is facilitated, meanwhile, the balloon cover is soft in material, pain to the infant is avoided, the comfort level is high, the balloon cover and the back beating instrument main body are convenient to install and detach, recycling can be realized, the safety level is high, and the use cost is low.

448	RU-2464963-C1	RU2011117725A	4714725 4	METHOD OF TREATING PATIENTS WITH BRONCHIAL ASTHMA WITH ACCOMPANYING HYPERTENSION	FIELD: medicine.SUBSTANCE: invention relates to medicine, namely to therapy, physiotherapy, balneology. Method includes carrying out respiratory gymnastics, inhalations with mineral water, manual massage of chest, applications of peloids, electric stimulation at the background of drug basic therapy. During electric stimulation impact is performed by high-amplitude pulse current with biological feedback, with frequency 90-100 Hz and gradually increasing current intensity until sensation of painless vibration appears. On the first day impact is performed paravertebrally at the level D1-D7 and along 7-8 intercostal spaces. On the second day impact is performed paravertebrally and on collar area. Peloid therapy is carried out 20-30 minutes after electric stimulation. In first application impact is performed on chest at temperature 38-40°C and 20-30 minute exposure. On the second day of application impact is performed on collar area at temperature 35-36°C. Course of treatment includes 6-7 coupled impacts on each zone.EFFECT: method increases treatment efficiency and increases remission duration due to expressed local and systemic anti-inflammatory effect.2 tbl, 2 ex

433	JP-2010 5401 62-A	JP2010 527955 A	405 2385	Portable compression device with chest treatment clothes	The present invention provides a medical device for improving airway cleaning by vibrating a chest wall very quickly to improve bronchial discharge. The present invention relates to a medical device for vibrating the chest wall very quickly to facilitate airway cleaning and improve bronchial drainage. The main elements of this medical machine are three types: an air oscillator, an air expansion vest, and a flexible hose for connecting an air oscillator to the vest to transmit air pressure and peristalsis. The air oscillator is installed on a wheeled support and can be moved between many treatment locations. The support platform has a linear lift so that the height of the air oscillator can be adjusted to fit the place and the person. The air oscillator housing is fitted with a controller for convenient use. A handle is mounted on the housing, and the air oscillator can be manually moved there. A housing is fixed and supported by a frame connected to the upper stage of the support base. The parallel horizontal members of the frame are connected to the platform, which is coupled to the bottom of the air oscillator housing. Upright members connected to the horizontal members are coupled to both sides of the air oscillator housing. A U-shaped handle connected so as to protrude outward from the upright member makes it easy to move the support base and the air oscillator. [Selection] Figure 1

425	CN-2189437443-U	CN202228100 47.7	861102 80	Multifunctional sleeping mattress suitable for neonate	The utility model discloses a multifunctional sleeping mat suitable for newborns, which relates to the technical field of the new-born sleeping mat and has the technical scheme that: including the cushion, the cushion top is equipped with aerifys the guardrail, aerifys the guardrail and is the annular, and aerifys the guardrail and encircle setting up in cushion top surface edge, aerifys guardrail both ends head and be equipped with music player and noise detector respectively, aerifys the guardrail lateral surface and is equipped with a plurality of C high elasticity and accomodates the ring, and the cushion top is equipped with transparent face guard and is close to transparent face guard's headrest, and transparent face guard and headrest are surrounded by aerifing the guardrail, and the interlude at cushion top is equipped with two antiparallel arrangement's safety belt, and two safety belts are equipped with the hasp. The infant sleeping posture monitoring device monitors the infant sleeping posture, helps the infant adjust the saliva posture, and avoids occurrence of flat head diseases; high-frequency vibration sputum excretion can be carried out, and the smoothness of the respiratory tract is kept; can massage the back, chest and abdomen, and prevent apnea; just like artificial touching and massaging, the infant care device can smooth the insanitation of the infant, promote the normal psychological development of the infant and has the effect of safety.

401	RU-2609274-C1	RU2016103478	584574 94	METHOD OF TREATMENT OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE	FIELD: medicine.SUBSTANCE: invention relates to medicine, namely to pulmonology, and can be applied in treatment of patients with chronic obstructive pulmonary disease (COPD). Complex influence, which includes laser and ultrasonic therapy, carried out at the background of standard therapy, is realized. Ultrasonic therapy is realised on the same day with laser therapy. At first ultrasonic therapy is carried out, with impact on two paravertebral fields in chest area for 2 minutes for each. Frequency of vibration is 880 kHz, intensity 0.4 W/cm2. Then, laser therapy is carried out. Device "LASMIC" with matrix laser head ML01K (ML-904-80) is applied. Influence is realised in contact way on five fields: Krenig field on right, Krenig field on left, on medium line in the area of medium third of sternum, projection of right adrenal gland and projection of left adrenal gland. Each field is exposed to impact for 100 seconds in the following mode: pulse power 50 W, pulse repetition rate: 1 procedure - 80 Hz, 2 procedure - 500 Hz, 3 - 1500 Hz, 4 - 3000 Hz, the remaining procedures - 10000 Hz, on projection of adrenal glands - maximal frequency 3000 Hz. Course of complex influence constitutes 8-10 procedures.EFFECT: method ensures improved expectoration of sputum and increase of treatment efficiency of patients with COPD due to anti-inflammatory, anesthetic, antispasmodic, defibrosing effects, enhancement of micro circulation, achieved by combined application of ultrasonic therapy and laser irradiation.6 tbl, 2 ex

400	JP-2010508903-A	JP2009535361A	3936058 1	Compression device with mobile support	【Task】 An object of the present invention is to provide a medical device for vibrating the chest wall very quickly to facilitate airway cleaning and improve bronchial drainage. [Solution] The present invention relates to a medical device for vibrating the chest wall very quickly to facilitate airway cleaning and improve bronchial drainage. The main elements of this medical machine are three types: an air oscillator, an air expansion vest, and a flexible hose for connecting an air oscillator to the vest to transmit air pressure and peristalsis. The air oscillator is installed on a wheeled support and can be moved between many treatment locations. The support platform has a linear lift so that the height of the air oscillator can be adjusted to fit the place and the person. The air oscillator housing is fitted with a controller for convenient use. A handle is mounted on the housing, and the air oscillator can be moved by holding it with a hand. A housing is fixed and supported by a frame connected to the upper stage of the support base. The parallel horizontal members of the frame are connected to the platform, which is coupled to the bottom of the air oscillator housing. Upright members connected to the horizontal members are coupled to both sides of the air oscillator housing. A U-shaped handle connected so as to protrude outward from the upright member makes it easy to move the support base and the air oscillator. [Selection] Figure 1

386	KR-1020 66589-B1	KR1020190154379	696387 40	Extracorporeal Respiration muscle rehabilitation and Secretion Clearance by Positive/Negative Pressure	The present invention relates to a positive / negative extracorporeal respiratory muscle rehabilitation and airway secretion eliminator, the purpose of which is to use the valve unit in the cough induction, chest wall vibrator or negative pressure chest wall vibrator, simplifying the structure of the valve unit and In addition, the present invention provides a positive / negative extracorporeal respiratory muscle rehabilitation and airway secretion eliminator to reduce the manufacturing cost by exchanging some parts. It includes an air pressure generating unit for sucking the air through the air inlet and at the same time to discharge the air through the air outlet; A flow path is formed through which the outside air passes through the air pressure generating unit to the patient side port and discharges the air provided to the patient side port to the outside, and selectively switches the flow path to provide a positive pressure or a negative pressure to the patient side port. And a valve unit, wherein the first flow passage and the second flow passage are partitioned into partition walls, and the air inlet is connected to the first flow passage, and the air outlet is connected to the second flow passage. A first communication hole and a second communication hole are formed to be coupled to the valve body and the valve body, and correspond to the upper portion of the first flow passage, and the third and fourth communication holes correspond to the upper portion of the second flow passage. A first valve cover having a ball formed therein, and coupled to an upper portion of the first valve cover, and rotatably installed about a central axis on the communication holes; A valve disc having an opening formed thereon to communicate diagonally between the first through fourth communication holes and the fourth through communication hole, and coupled to an upper portion of the first valve cover to which the valve disc is coupled, wherein the second communication hole and the fourth communication hole are combined. A second valve cover including a through long hole formed to correspond to an upper portion of the upper portion, an intake port and an exhaust port formed to correspond to an upper portion of the first communication hole and a third communication hole, and an upper portion of the second valve cover; And a third valve cover having a patient side port formed therein and closing the through-hole so that a flow path is formed therein, and a driving motor for a valve installed at the bottom of the valve unit to rotate the valve disc. , Connecting any one of armor and mask hose to the patient side port of the valve unit, and according to the connection of the vest, armor and mask hose The flow path is used to change the mode of the vest, armor and mask hose.

303	KR-1014712333-B1	KR1020107007126	405238 85	PORTABLE AIR PULSATOR AND THORACIC THERAPY GARMENT	The present invention relates to a medical device for vibrating the chest wall very rapidly to facilitate airway cleaning and improve bronchial evacuation. The main elements of this device are three types: an air oscillator, an air expansion vest, and a flexible hose that connects the air oscillator to the vest for air pressure and beating. The air oscillator is mounted on a wheeled support that can move between different treatment locations. The support has a linear lift, so the height of the air oscillator can be adjusted to suit the location and the person. The housing of the air oscillator has a control unit for convenient use. There is a handle on the housing, so you can hold it handy and move the air oscillator. The housing is fixedly supported in a frame connected to the upper end of the support. Parallel horizontal members of the frame are connected to the platform, and the platform is coupled to the bottom of the housing of the air oscillator. Upstanding members connected to the horizontal member are coupled to both sides of the housing of the air oscillator. U-shaped handles projecting outward from the upstanding member facilitate the movement of the support and the air oscillator.

132	KR-2021001470 5-A	KR1020210007867	745593 78	www.18338891.com	Daon Trademark's trademark registration competency evaluation ranked No. 1 in the country, call 1833-8891, free trademark registration consulting, and trademark registration are essential requirements of the business. Search with the brand of Daon on Naver{www.18338891.com} ---------- Smartphone, mobile phone, homepage, cooking method, artificial intelligence, automobile, fine dust, cosmetics, led, LED, production method, manufacturing method, robot, corporation, inspection, program, trademark registration, trademark application, business name registration, camera , oled, bicycle, semiconductor, printed circuit board, stem cell, cell, anticancer, mask pack, clothes, shoes, furniture, desk, chair, tube, packaging, printing, bleach and other laundry preparations; Cleaning, polishing and abrasive materials; Non-medical soap; Fragrances, essential oils, non-medical cosmetics, non-medical hair lotions; Non-medical toothpaste, pharmaceutical, medical and veterinary preparations; Medical hygiene agents; Dietary foods and preparations for medical or veterinary use, food for infants; Dietary supplements for human or animal use; Plaster, trauma treatment material; Dental filling materials, dental wax; disinfectant; Pest control agent(驅除劑); Fungicides, herbicides, general metals and their alloys, ores; Metal construction and construction materials; Metal mobile structures; Non-electrical general metal cables and wires; Small metal products; Metal containers for storage or transport; Safes, machinery and machine tools; Motors and engines (except for land vehicles); Mechanical couplings and transmission components (except for land vehicles); Non-passive farm equipment; Burangi(孵卵器); Vending machines, science, navigation, surveying, photography, film, optics, weighing, measuring, signaling, inspection (surveillance), lifesaving and educational equipment; Devices for the conduction, conversion, transformation, accumulation, regulation or control of electricity; Devices for recording, transmitting or reproducing sound or video; Magnetic data media, recording discs; CD, DVD and other digital recording media; Coin operated machinery; Cash registers, calculators, data processing devices, computers; Computer software, fire extinguishing equipment, paper and cardboard; prints; Bookbinding material; Picture; Stationery and office supplies (excluding furniture); Stationery or household adhesives; Art and drafting materials; Painting brush; textbook; Sheets, films and bags made of plastic for packaging; Printing type, printing block, Leather and imitation leather; fell; Luggage and carrying bags; Umbrellas and parasols; Walking cane; Whip and horse harness; Animal collars, leashes and clothing, non-metallic building materials; Non-metallic rigid pipes for construction use(硬質管); Asphalt, pitch and bitumen; Non-metallic mobile buildings; Non-metallic monuments, furniture, mirrors, picture frames; Non-metallic containers for storage or transportation; Raw or semi-finished bones, horns, whiskers or najeon; Shell; Haeposeok(海泡石); Pumpkin (raw stone), household or kitchen utensils and containers; Comb and sponge; Brush (except paint brush); Materials for making brushes; Cleaning equipment; Unprocessed or semi-finished glass for non-construction purposes; Glassware, ceramics and earthenware, ropes and twine; Net; Tents and tarpaulins; Awnings made of fabric or synthetic materials; sail; Bags for transporting and storing cargo; Filling materials (except paper/cardboard/rubber or plastic); Raw fibers for textiles and their substitutes, yarn for textiles, textiles and textile substitutes; Household linen; Woven or plastic curtains, clothing, shoes, hats, lace and embroidery, ribbons and decorative laces; Buttons, hooks and eyes, pins and needles; Harmony (造花); Hair ornaments; Wigs, carpets, carpets, mats, linoleum and other floor coverings; Non-woven wall hangings, recreational equipment, toys; Video game device; Gymnastics and sports equipment; Ornaments for Christmas trees, meat, fish, poultry and leaf birds; Meat extract; Processed, frozen, dried and cooked fruits and vegetables; Jelly, jam, candied fruit; egg; Milk and other dairy products; Edible oils and fats, coffee, tea, cocoa and substitute coffee; rice; Tapioca and Sago; Grain flour and grain preparations; Bread, pastries and sweets; Edible ice; Sugar, honey, molasses; Food yeast, baking powder; Salt; Mustard (spice); Vinegar, sauce (condiment); Spice; Ice, raw agriculture, aquaculture, horticultural and forestry products; Raw or semi-processed grains and seeds; Fresh fruits and vegetables, fresh herbs; Fleshy plants and flowers; Bulbs, seedlings and grain seeds for cultivation; Living animals; Animal feed and beverages; Malt, beer; Mineral water, carbonated water and other non-alcoholic beverages; Fruit drinks and fruit juices; Beverage syrup and beverage preparation, alcoholic beverages (excluding beer), smoking equipment; matches Sample storage cartridge used in DNA analysis equipment, reagent cartridge used in DNA analysis equipment, reagent container used in DNA analysis equipment, DNA analysis equipment, DNA sequence analyzer, gas analysis equipment, decompression chamber, genome Analyzer, genomic information analysis device, weighbridge, air analysis device, display for air analysis device, process control experiment device, color layer analyzer for science or laboratory, chromatograph for science or laboratory, science or experiment Practical air gas generator, scientific or laboratory incubation plate, scientific or laboratory chromatograph, scientific or research dissecting instrument container, scientific teaching laboratory training equipment, scientific laser, scientific immunostainer, scientific cardiac activity recorder, Scientific liquid chromatograph injector, scientific liquid chromatograph column, scientific filtration membrane, scientific heat exchange crucible, scientific glass tube, scientific glassware, scientific glass bottle, scientific magnetic separator, scientific distillation device, scientific vacuum Probe, scientific diagnostic equipment, scientific tube (pipette), scientific spirometer, scientific nucleic acid array, nanoparticle size analyzer, multi-nucleic acid analysis instrument, multi-nucleic acid sequence analyzer, multi-nucleic acid sequence analysis device, protein and Peptide synthesis device, protein analysis device, sample storage cartridge used in protein analysis device, reagent cartridge used in protein analysis device, reagent container used in protein analysis device, retort, retort holder, capillary tube, microstructure Array slide, micro titration device (except for medical use), betatron, spectroscopic colorimeter (except for medical diagnosis), fractionation collector, molecular analysis device, burette, non-medical hyperbaric oxygen chamber, non-medical use Dissecting equipment dedicated container, acidity analyzer, oxygen transport device, industrial betatron, industrial particle spectral foreign material analyzer, industrial particle foreign material detector, industrial particle foreign material analyzer, color layer analysis column, biological safety cabinet, biological glassware, biological specimen, biology Reagent cartridge used for drug analysis equipment, reagent container used for biological drug analysis equipment, laboratory equipment for biological drug analysis, water content measurement in petroleum products Jeongyong scientific device, bacterial incubator, cell culture observation device, cell incubator,

					bioreactor for cell culture, disposable plastic bioreactor for cell culture, circulation device, spectrum analyzer (except for medical use), test tube, holder for test tube, food analysis Apparatus, real-time gas analyzer, fermentation device for laboratory equipment, laboratory equipment (except for medical use), ultrafiltration membrane for laboratory equipment, anaerobic chamber for laboratory or scientific use, petri dish for laboratory research, laboratory pipette, for laboratory scientific experiment Air gas generator, laboratory gas mixer, laboratory gasifier, laboratory humidifier, laboratory heating furnace, laboratory drying oven, laboratory science specimen, laboratory optical equipment, laboratory stirrer, laboratory furnace (爐), laboratory crucible, laboratory dispenser, laboratory cotton swab (experimental device), laboratory vial, laboratory bioanalyzer, laboratory biochip tester, laboratory biochip analysis device, laboratory biochip manufacturing unit, laboratory exhaust Apparatus, laboratory incubator, laboratory blender, laboratory separator, laboratory analysis device, laboratory grinder, laboratory separating funnel, laboratory beaker, laboratory triangular grill, laboratory growth bed, laboratory bacterial incubator, laboratory use Cell incubator, laboratory pure water production device, laboratory reagent analyzer, laboratory reagent storage stand, laboratory laboratory bench, laboratory liquid analysis device, laboratory filtration membrane, laboratory filtration device, laboratory oven, laboratory oscilloscope, laboratory centrifugal concentrator , Laboratory centrifuge, Laboratory glass drying equipment, Laboratory glassware, Laboratory glass bottle sealer, Laboratory glass filter, Laboratory hazardous substance tester, Laboratory ionizer, Laboratory physicochemical equipment, Laboratory incubator (medical use Excluding), laboratory automatic chromatographer, laboratory automatic ion exchange chromatographer, laboratory magnetic stirrer, laboratory workbench, laboratory tray, laboratory storage tube, laboratory storage tube, laboratory insulating bottle (flask) , Laboratory insulation container, laboratory constant temperature incubator, laboratory hollow glass container, laboratory hollow glassware, laboratory distillation machine, laboratory distillation equipment, laboratory use Distillation tower, laboratory vacuum bottle, laboratory vacuum device, laboratory vacuum distillation tower, laboratory vacuum probe, laboratory vibration separator, laboratory shaker, laboratory shake incubator, laboratory ultrasonic cleaner, laboratory ultrasonic diagnostic device, laboratory use Laminar flow cabinet, laboratory special equipment, laboratory flask, laboratory filter, laboratory filter diaphragm, laboratory hygrostat, laboratory thermostat, laboratory constant temperature water tank, laboratory constant temperature circulation water tank, laboratory nucleic acid amplification device, laboratory ash Dishes, laboratory rotating agitator, laboratory fume hood, laboratory heating block, laboratory gas chromatograph, laboratory ceramic equipment, laboratory model, laboratory beaker, laboratory chromatograph, laboratory chromatograph detector, laboratory chromatograph Sample pretreatment device for experiment, sample injection device for experimental chromatographic device, extractor for experimental chromatographic device, filler for experimental chromatographic device, column for experimental chromatographic device, experimental chromatographic column, laboratory biological safety cabinet, experimental bioreactor, for experiment Stove, laboratory glass tube, laboratory glassware, laboratory physics and chemistry machine, laboratory printed circuit board support, laboratory disposable dispenser syringe, laboratory particle laser light diffraction analyzer, laboratory particle spectral foreign material analyzer, experimental particle foreign material detector, experimental particle foreign material analyzer, experimental recycling Dispenser syringe, laboratory tray, laboratory petri dish, laboratory plastic instrument, laboratory pipette rack, laboratory pipette tip, laboratory chemical instrument, laboratory protein sequence analyzer, laboratory bioreactor, laboratory biological sample poison and laboratory instrument for pathogen detection, combustion spoon , Oil analyzer, dissolution tank, fluid bed dryer, glass bottle plug, gene analysis and extraction device, physicochemical device for gene analysis, tube for gene analysis, tube support for gene analysis, plate for gene analysis, instrument for gene information analysis, gene investigation and analysis Apparatus, physicochemical device and apparatus, diaphragm for physicochemical device, particle accelerator, particle detection device, particle generator, particle sorting device, particle detector, automatic chromatographic analysis device, titration cell, titration controller, electron beam accelerator, ultra high speed liquid chromatograph, ultra high speed liquid Chromatograph device, test bench Tooth, Petri dish (bacterial culture dish), pipette bottle, pipette tip, nucleic acid array and nucleic acid synthesis device, experimental equipment for preparing nucleic acid samples, blood and other body fluid measurement/test/analysis research laboratory analyzer, chemical reactor, environment Test chamber (temperature simulation equipment) 3D viewing stereoscopic device, 3D viewing projector stereoscopic filter, 3D projector, LCD projector, LED microscope, LED magnifying glass, LED objective lens, X-ray electron microscope, inspection mirror, inspection mirror, Bosscope for inspection work, microscope for tool, optical waveguide, light reflector, optical viewing screen, optical fiber lens (excluding medical use), optical fiber viewer (excluding medical use), optical fiber receptor, optical fiber periscope, optical mirror, reflector for optical machinery, Microscopic measuring screw for optical instruments, optical instruments (excluding glasses and photographic instruments), pouch for optical instruments, optical lens, optical beam deflector, optical image shifter, optical sight, optical target monitor, optical target tracking device, optical target detector , Optical illuminator, optical objective lens, optical correction lens, optical apertomizer, optical prism, optical filter, optical magnifying glass, optical image enhancement device, optical image generator, optical device filter, optical table, Light microscope, interchangeable lens, telescopic sight for warship weapon, refracting telescope, metal microscope, objective optical lens, telescopic sight for cannon, telescopic target sight for cannon, data projector, magnifying lens, magnifying glass house, magnifying glass holder, magnifying string, Digital projector, digital readable telescope, rifle gun telescope, laser cannon target sight, laser gun target sight, micro projector, microtome, telescopic scale, telescope, telescope phloem (lens cylinder), telescopic sight, telescope lens, Telescope reflector, telescope tripod, telescope auto-collimator, telescope prism, telescopic target monitor, telescopic target tracking device, telescopic target detector, telescopic sight, macro microscope, multimedia projector, door mounted Pip-Hole, Optical Viewing Glass for Moon (Pip-Hole), Magnified Pip-Hole for Moon, Mini Beam Projector, Jewelry Measuring Optical Instrument, Bosscope, Spectroscope, Orthogonal Projector for Analysis, Video Screen, Video Projection Machine, hunting

					binoculars, biological microscope, constellation projector, surgical microscope, telescope for smartphone, microscope for smartphone, magnifying glass for smartphone, scanning ion conduction microscope device and instrument, light filter for screen, stand type LED magnifying glass , Stroboscope, spyglass (small telescope), slide or photo projector, slide projection lens, slide box, slide projector, collimator, silostat, visual display, real ring register, binoculars, binocular tripod, binocular case, ophthalmic surgery Microscope, LCD projector, telescopic sight for archery, projector including projection scanner, projector, projection screen, image projection device, movie screen, reflector for movie shooting, movie equipment, pouch for movie equipment, film recording device, film recorder, film Recording machine equipment, film lens, film reel, film projector, film equipment and equipment, film playback equipment, film production equipment, film processing equipment, film camera, film camera, film camera fixing device, film camera Case, movie editing projector, movie film projection screen, movie film developing machine, movie film editor, movie film editor tool, entertainment industry projector, overhead projector slide, atomic microscope device and apparatus, phase converter, contour projector , Medical microscopes, stereoscopic imaging projectors, projection screens for stereoscopic images, microscopes including stereoscopic microscopes, stereoscopic mirrors, stereoscopic devices, autofocus type projectors, sighting devices stabilized by gyro stabilizers, periscopes, equatorial telescopes, infrared optics Instruments, field emission scanning electron microscopes, target sights for electronic cannons, target sights for electronic guns, electron microscopes, eyepieces, instruments including eyepieces, sighting telescopes, devices and instruments for scanning ion microscopy, scanning confocal laser microscopes , Scanning Laser Microscope, Scanning Electron Microscope, Scanning Probe Microscope, Zoom Lens, Zoom Microscope, Lens for Fingerprint Recognition Device, Telephoto Aiming Device for Ground Weapons, Condenser, Astronomical Telescope, Spectrophotometer for Astronomical Measurement, Ultra microtome, ultra microscope, full-strength sight (alignment device for firearm aiming), telescope for camera, camera Rayong microscope, magnifying glass for camera, transmission electron microscope, polarizing filter, polarizing microscope, shell collimator, projector, projector lens, projector screen, prism, planetarium, film adjuster, film dryer, film matrix, film developer, mounted on aircraft Night vision goggles, night vision telescopes mounted on aircraft, telescopic sighting devices for aviation weapons, microscopes, diffraction devices for microscope inspection, microscopes and related parts, microscopes and their parts, microscope base, microscope image processor Microscope, microscope concentrator, microscope slide container, microscope lamp, microscope lens, microscope slide, microscope device and apparatus, microscope illumination device, microscope phloem (lens cylinder), microscope prism, fluorescent screen , Home theater projector, telescopic sight for firearms, sighting telescope for firearms, screen projector, magnifying glass, illuminator, diffraction device (precision measuring device) 35MM camera, 3D camera rig control module, CCD camera, CCTV IR dome camera, CCTV lens, CCTV Camera, CCTV Camera Controller, CCTV Camera Housing, DSLR Camera, TV Camera, Camera Using Photosensitive Panel, Surveillance Camera, Instrument Panel Camera, Golf Ball Trajectory Analysis Camera, Golf Swing Analysis Video Camera, Golf Swing Analysis Camera , Industrial digital camera, optical shutter, exposure meter, multi-purpose camera, multi-frame view camera, video camera, digital video camera, digital still and video camera, digital still and video camera control module, digital camera, digital camera LCD protective film, digital camera Fixture, adapter for digital camera and camcorder, connector for digital camera and camcorder, digital camera body, exposure meter for digital camera, display for digital camera, lens for digital camera, lens cap for digital camera, monitor for digital camera, digital camera Waterproof pouch, body cap for digital camera, protective sleeve for digital camera, skin for digital camera, stand for digital camera, liquid crystal for digital camera, electronic docking station for digital camera, digital car Cover for camera, flash for digital camera, LCD hood cover for digital camera, digital camcorder, accessory shoe cover for digital camera, LCD monitor cover for digital camera, light box, rapid scan camera, lens shutter, lens hood, retina camera (medical use) Excluding), video camera for monitoring, multi-purpose camera for monitor, wireless CCTV camera, CCTV camera for unmanned surveillance, broadcasting video camera, security camera, spectroscopic photographic device, detachable camera, video camera housing, video surveillance camera, video recorder Portable video camera, video camera, video camera stand, video camera (camcorder), lens for video camera, image sensor for video camera, photo duplicator, equipment for photo analysis, photo processor, photo measuring instrument, mount for photosensitive plate, photo polisher , Camera carrying bag, photographic equipment, photographic equipment bag, photographic equipment bag and case, exposure meter for photographic equipment, exposure meter for photographic equipment, carrying (portable) bag, lens for photographic equipment, case for photographic equipment, photographic equipment, Carrying bag for photographic equipment, lens cap for photographic equipment, ring for mount adapter for photographic equipment, battery compartment cover for photographic equipment, body cap for photographic equipment, strap for photographic equipment, eyepiece for photographic equipment, eyepiece cap for photographic equipment, liquid crystal monitor cover for photographic equipment, image for photographic equipment Sensor, eyecup for photographic equipment, pouch for photographic equipment, shutter for camera, shutter release for camera, aperture for camera, case for camera, positioning device for picture slide, frame for picture slide, photo darkroom, photo darkroom, etc., photo Darkroom lamp, photo darkroom light bulb, photo darkroom filter, photo drying rack, photo light source (flashlight), container for photo equipment, exposure meter for photo, drainer for photo, lens brush for photo, non-photosensitive plate for photo, Photo shelf, photo flash bulb, photo wash tray, photo speed measuring device, photo screen, photo slide, photo angle finder, photo UV filter, photo equipment, photo camera, photo finder, Photo flashlight, photo filter, photo magnifier, photo spool, photo printer, photo Drying device for printing, carrying bag for photographic equipment, support for photographic equipment, photo-production equipment, screen for engraving photo, photo engraver, photo development/printing/enlarging or finishing machine, photo developer, photo enlarger, industrial inspection Equipment camera, camera with linear image sensor, flash light bulb, shutter sensor, underwater camera, camera for smartphone, lens for still camera, slide framing device, mount for slide film, facial recognition thermal imager, thermal imager, thermal image fire Detection camera, thermal transfer camera, IP camera for video conferencing, camcorder holder

					for motorcycle, camera for monitoring and inspection equipment at nuclear power plant, web camera holder, webcam, gloss device for printing, disposable camera, camcorder for automobile, automatic developing film type video camera, Automatic development film camera, infrared camera, electronic surveillance television camera, macro lens, aperture gauge, instant photo production camera, vehicle black box camera, vehicle camera, vehicle rear camera, vehicle recognition camera, astrophotography lens, intruder monitoring Camera, camera, camera strap, camera strap pocket, camera lens cap, camera lens adapter ring, camera lens hood, camera cap, camera and photo equipment bag, camera stand, plastic film cover for camera protection, camera bag , Camera strap, camera case, camera hood, camera bag, camera lens, camera lens case, camera bag, camera strap, camera rangefinder, camera light filter, camera exposure meter, camera light device, camera Lens, lens conversion adapter for camera, lens shutter for camera, lens filter for camera, lens hood for camera, rig for camera, mount for camera, magazine for camera, suspenders for camera, monopod for camera, waterproof case for camera, camera Protective cap for camera, viewfinder for camera, tripod for camera, self-timer for camera, shutter for camera, shutter release for camera, strap for camera, spool for camera, eyepiece for camera, eyepiece cap for camera, accessory shoe cover for camera, LCD monitor cover for camera, night identification device for camera, close-up ring for camera , Aperture for camera, crease box for camera, close-up lens for camera, tilting head for camera, flashgun for camera, flashlight for camera, flashlight device for camera, camcorder, camcorder holder, camcorder fixing device, plastic film cover for camcorder protection , Protective film for camcorder screen, camcorder skin, camcorder stand, camcorder cover, camcorder case, compact digital camera, solar photography device, television camera tube, television camera, television camera, teleconverter, transparent organic light emitting diode Built-in digital camera, closed circuit television camera, print dryer (photo equipment), print cutter (photo equipment), flash light equipment, film strip viewer, film take-up device, film camera, film cutting device, night vision installed on aircraft Infrared camera, video camera, camera for video conferencing, camera for rear image storage, altimeter with built-in or using GPS function, barometer with built-in or using GPS function, bearing compass with built-in or using GPS function, pedometer with built-in or using GPS function數計), speedometer with built-in or using GPS function, inertial sensor with GPS function, crystal temperature sensor with GPS function, pressure sensor with GPS function, temperature sensor with GPS function, gyro sensor with GPS function, LED operation Recognition sensor, LED position sensor, LVDT sensor controller, precision measuring instrument for hazardous substance inspection with X-ray inspection equipment, pH meter, variable speed controller, acceleration sensor, accelerometer, acceleration sensor, gasoline meter, gas/solid substance Temperature and humidity measuring device, gas/liquid and solid test device, gas meter, gas concentration measuring device, gas meter, gas sensor, gas testing device, gas pressure meter, home thermometer, home temperature monitor, home temperature meter, angle gauge , Goniometer, protractor, protractor (measurement device), angle measurement device, interferometer, photosensitive sensor, gamma counter, thermal energy meter, thermal controller, square paper for thermal temperature measurement, personal weighing scale, personal electronic weighing scale, Distance and dimension measuring instruments, distance measuring instruments, Distance measuring device, distance recording device, distance sensor, calibration gauge, gauge, gauge block, inclinometer, hardness tester, hardness tester, inclination indicator, inclination measuring device, inclinometer, inclination measuring device, theodolite, measuring instrument, measuring instrument testing instrument, weighing Equipment, separating tower for weighing, weighing scale, weighing cup, calculating scale, counter, counter balance weight, high/nogo plug gauge, high/nogo gauge, altimeter, altitude measuring instrument, goring gauge, rubber tester , High pressure pressure gauge, pyrometer, treble meter, golf shaft measuring instrument, golf swing speed measuring device, golf distance measuring device, golf club gauge, tool measuring device, air measuring device, air pollution measuring device, air temperature sensor, air regulator Measurement and control device, air collector, industrial or military metal detector, industrial temperature measuring device, air-fuel ratio gauge, resonator, automatic control device for supercharger, boost pressure gauge, granule meter, scientific separation tower, scientific thermometer, scientific use Temperature monitor, scientific temperature sensitivity test device, scientific temperature sensor, scientific temperature measuring device, scientific probe, inertial sensor, observation device, photometer, photometer, photometric analyzer (except for medical use), photometer (Excluding medical use), optical disc tester, optical meter, optical fiber temperature probe (except for medical use), optical sensor, luminometer, optical measuring instrument, optical waver, optical sensor, optical speed sensor, optical shape measuring device, optical equipment Inspection measuring instrument, optical electronic sensor, optical measuring instrument, optical measuring part, calibrator, calibration ring, spherical meter, structure tester, refractometer, winding, balance tester , Balance device, grip size gauge, approximate value detector, proximity sensor, metal strength tester, metal hardness tester, metal analysis and measurement device, surface defect test and inspection device of metal sheet, metal testing device, metal compression tester, metal material tester, metal Mechanical direction indicator panel, metal luminous direction indicator panel, metal electric direction indicator panel, metal detector, pressure gauge of resin in mold, thermometer of resin in mold (for non-medical use), flow meter of resin in mold, temperature monitoring device of mold injection machine, water supply Water level gauge for facilities, liquid automatic regulator for water supply facilities, Machine tool sensor, mechanical thermometer, machine room temperature control device, machine temperature limiter, machine temperature control device, machine temperature control device (electric switch), basic unit weighing device, meteorological observation machine, meteorological observation device (氣球), machine needle for meteorological observation, meteorological observation equipment, meteorological sensor, meteorological information device, barometer, electromotive force, gas flow meter, gas measuring instrument, bubble level, length measuring instrument, length gauge, depth Measurement sensor, depth measuring device, thread gauge, screw measuring instrument, screw tapping gauge, compass, heating meter, endurance test device, navigation device for navigation, internal combustion engine test device, weather tester , Coolant temperature detector, nogoring gauge, logic probe, concentration meter, height adjuster, urine specific gravity meter, leak sensor, leak measuring device, leak detector, leak detector, eye

					refractometer, scaled glassware, ruler , Calibration device, avalanche probe, Newton dynamometer, dial gauge, multi-axis directivity detector, confectionery thermometer, sugar content meter, girder depth measurer, large scale (horizontal scale), city meter, dynamometer, motion detection sensor, motion recognition sensor, Proximity sensor for motion detection, coaxial resonator, ball, thickness gauge, diesel injection nozzle tester, diesel oil emission tester, digital pH meter, digital meat thermometer, digital weather station, digital luggage scale, digital sensor (except for medical use), digital Thermometer (except for medical use), digital indicator, digital vacuum sensor (except for medical use), digital measuring equipment, digital tachometer, digital torque gauge, digital readout gauge, digital panel meter, digital force meter, digital function generator, level meter, Level meter, level gauge, level sensor, level switch, radar altimeter, laser distance meter, laser level meter, laser displacement sensor meter, laser speed meter, laser scanning densitometer, laser sensor, laser measuring device, rate gyro, log, ring gauge , Ring size measuring instrument, mastering gauge, micrometer, micrometer instrument, microwave sensor, microwave sensor, horse (meter), area meter, hourglass, model sensor, Bathroom scales, wood testing machines, weighing devices, water storage capacity measuring devices, electronic measuring devices for faucets, physical analyzers (except for medical use), physical analysis devices (except for medical use), physical data measuring devices, Water temperature gauge, water volume precision measuring instrument, water volume measurement cup, water level gauge for water volume measurement, liquid level gauge for water volume measurement, liquid level sensor for water volume measurement, scale for water volume measurement, object detection sensor, Micro hardness tester, meter converter, density meter, wind bag (wind gauge), wind measuring device, variometer, biosensor, biochip tester, reflectance meter, luminescence measuring device, flight path controller for launch vehicle, power plant Control sensor, radioactivity measuring device, radiation measuring device, radiation detector sensor, radiation measuring device, radiation measuring device sensor, radiation detecting device, radiation dose meter, atomic detector for detecting radiation particles, radiation measuring device, radiation tube, azimuth measuring device, Spinning yarn counter, direction indicator compass, exhaust gas temperature gauge, valve pressure indicator plug, displacement s...

APÊNDICE C – GEOMAPA – PATENTES – PLATAFORMA DIMENSIONS®

"About the data: Analytical views - Country/Territory - Exported on Sep 22, 2023. Criteria: '("chest wall oscillation" OR ("chest" AND "wall" AND "oscillation") OR "chest wall oscillation" OR ("high" AND "frequency" AND "chest" AND "wall" AND "oscillation") OR "high frequency chest wall oscillation" OR ("chest wall oscillation" OR ("chest" AND "wall" AND "oscillation") OR "chest wall oscillation" OR ("high" AND "frequency" AND "chest" AND "wall" AND "compression") OR "high frequency chest wall compression") OR (("chested" OR "thorax" OR "thorax" OR "chest" OR "chests") AND ("vibrate" OR "vibrated" OR "vibrates" OR "vibrating" OR "vibration" OR "vibration" OR "vibrations" OR "vibrational" OR "vibrator" OR "vibrators")) OR "Vibrotherapy") AND ((("airway" OR "airway s" OR "airways") AND ("clearance" OR "clearances")) OR ("sputum" OR "sputum" OR "sputums") OR ("bronchial" OR "bronchiale" OR "bronchials"))' in title and abstract; Publication Year is 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 or 2015 or 2014 or 2013 or 2012 or 2011 or 2010 or 2009 or 2008 or 2007 or 2006 or 2005 or 2004 or 2003. © 2023 Digital Science & Research Solutions Inc. All rights reserved. Parts of this work may also be protected by copyright of content providers and other third parties, which together with all rights of Digital Science, user agrees not to violate. Redistribution / external use of this work (or parts thereof) is prohibited without prior written approval. Please contact info@dimensions.ai for further information."

Name	Patents
China	67
United States	18
Singapore	15
South Korea	12
Russia	8
Brazil	3
Turkey	2
India	1
Ukraine	1

APÊNDICE D – GEOMAPA – PUBLICAÇÕES – PLATAFORMA DIMENSIONS®

Chart	
Category	**Publications**
United States of America	**64**
United Kingdom	**35**
Australia	**18**
Brazil	**16**
Canada	**16**
Italy	**15**
Belgium	**14**
France	**7**
Japan	7
Taiwan	6
India	5
Netherlands	5
Turkey	5
Ukraine	5
Germany	4
Spain	4
Ireland	4
Russia	4
Switzerland	3
Chile	3
China	3
Egypt	3
Israel	3
South Korea	3
Czech Republic	2
New Zealand	2
Portugal	2
Singapore	2
United Arab Emirates	1
Austria	1
Bulgaria	1
Denmark	1
Estonia	1
Finland	1
Greece	1
Croatia	1
Hungary	1

Iran	1
Lithuania	1
Moldova	1
Madagascar	1
Mexico	1
Norway	1
Peru	1
Poland	1
Qatar	1
Romania	1
Saudi Arabia	1
Sweden	1
Slovenia	1
Thailand	1
Tunisia	1
Uruguay	1

ANEXO 1 – AMSTAR-2® - A MEASUREMENT TOOL TO ASSESS SYSTEMATIC REVIEWS-2: UMA FERRAMENTA DE MEDIÇÃO PARA AVALIAR REVISÕES SISTEMÁTICAS-2.

AMSTAR 1: As perguntas de pesquisa e os critérios de inclusão para a revisão incluíram os componentes do PICO?

AMSTAR 2: O relatório da revisão continha uma declaração explícita de que os métodos de revisão foram estabelecidos antes da realização da revisão e o relatório justificava algum desvio significativo do protocolo?

AMSTAR 3: Os autores da revisão explicaram sua seleção dos desenhos de estudo para inclusão na revisão?

AMSTAR 4: Os autores da revisão utilizaram uma estratégia abrangente de busca na literatura?

AMSTAR 5: Os autores da revisão realizaram a seleção dos estudos em duplicata?

AMSTAR 6: Os autores da revisão realizaram extração de dados em duplicata?

AMSTAR 7: Os autores da revisão forneceram uma lista de estudos excluídos e justificaram as exclusões?

AMSTAR 8: Os autores da revisão descreveram os estudos incluídos em detalhes adequados?

AMSTAR 9: Os autores da revisão utilizaram uma técnica satisfatória para avaliar o risco de viés em estudos individuais que foram incluídos na revisão?

AMSTAR 10: Os autores da revisão informaram sobre as fontes de financiamento dos estudos incluídos na revisão?

AMSTAR 11: Se a metanálise foi realizada, os autores da revisão usaram métodos apropriados para a combinação estatística dos resultados?

AMSTAR 12: Se a metanálise foi realizada, os autores da revisão avaliaram o impacto potencial do risco de viés em estudos individuais sobre os resultados da metanálise ou outra síntese de evidência?

AMSTAR 13: Os autores da revisão consideraram o risco de viés em estudos individuais ao interpretar/discutir os resultados da revisão?

AMSTAR 14: Os autores da revisão forneceram uma explicação satisfatória e discussão de alguma heterogeneidade observada nos resultados da revisão?

AMSTAR 15: Se realizaram síntese quantitativa, os autores da revisão realizaram uma investigação adequada do viés de publicação (viés de estudo pequeno) e discutiram seu provável impacto nos resultados da revisão?

AMSTAR 16: Os autores da revisão relataram alguma fonte potencial de conflito de interesses, incluindo algum financiamento que receberam para conduzir a revisão?