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EFFECTIVENESS OF PEAK EXPIRATORY FLOW RATE (PEFR)-INTEGRATED MOBILE HEALTH APPLICATIONS ON ASTHMA CONTROL, EXACERBATION FREQUENCY, AND TREATMENT ADHERENCE IN PATIENTS WITH ASTHMA: A SYSTEMATIC REVIEW

Dr. Vishnu Roshini Sivan[1], Dr. Prasanth Gururaj[2], Dr. Gangadharan Vadivelu[3]

[1]Postgraduate Student, Department of Respiratory Medicine, Saveetha Medical College, Chennai, Tamil Nadu, India,
Email – vishnusivan3114@gmail.com,
[2]Associate Professor, Department of Respiratory Medicine, Saveetha Medical College, Chennai, Tamil Nadu, India, Email: prasanthgd@gmail.com, ORCID ID – 0000-0002-1743-9445,
[3]Head of the Department, Department of Respiratory Medicine, Saveetha Medical College, Chennai, Tamil Nadu, India, Email: gangsdoc@yahoo.co.in,

ABSTRACT

Background:

Peak Expiratory Flow Rate (PEFR) monitoring is a simple, low-cost method of assessing airway obstruction in asthma, but paper-based recording is limited by poor adherence and unreliable data capture. Mobile health (mHealth) applications that integrate PEFR self-monitoring have been proposed as a means of improving asthma self-management and guiding treatment titration, but the evidence for this specific class of intervention has not been synthesised separately from broader digital-asthma-app literature.

Objective

To systematically review the effectiveness of mobile/electronic applications that incorporate PEFR self-monitoring on asthma control, exacerbation frequency, adherence to monitoring, lung function, quality of life, and feasibility outcomes in patients with asthma.

Methods

A structured literature search of PubMed/MEDLINE-indexed publications and trial registries (ClinicalTrials.gov) was conducted for studies published without a lower date restriction up to 2026, describing a mobile, smartphone, or web/electronic application with a defined PEFR self-monitoring component and a clinical, adherence, or feasibility outcome. Two broad prior systematic reviews of general asthma mHealth apps were used to cross-check completeness. Data were extracted on study design, population, intervention features, comparator, and outcomes. Risk of bias was appraised qualitatively (Cochrane RoB2 principles for randomised trials; ROBINS-I principles for non-randomised studies). Because of substantial clinical and methodological heterogeneity across interventions, comparators, outcome measures, and follow-up durations, a narrative synthesis was performed; meta-analysis was not undertaken.

Results

Eleven primary studies met the eligibility criteria, comprising eight randomised or cluster/school-based controlled trials, one prospective observational cohort, one longitudinal observational study, and one pre-randomised-trial usability/development study, spanning 2005 to 2025. Sample sizes ranged from small pilot/usability cohorts to 290 participants. PEFR-integrated applications were associated with directionally favourable, though generally small and imprecise, improvements in asthma control scores and quality of life across most trials. Evidence for reductions in exacerbations and healthcare utilisation was mixed. Electronic capture of PEFR appeared to improve completeness of monitoring data compared with historical paper-diary compliance benchmarks. No dedicated cost-effectiveness evaluation of a PEFR-integrated application was identified.

Conclusion

Mobile applications that integrate PEFR self-monitoring show a consistent, if modest, signal of benefit for asthma control, quality of life, and monitoring adherence, but the certainty of evidence is low to very low owing to small trials, heterogeneous designs, and limited data on exacerbations and cost-effectiveness. Adequately powered, standardised trials are needed before firm practice recommendations can be made.

KEYWORDS: Asthma; Peak Expiratory Flow; Mobile Health; Self-Management; Telemedicine; Systematic Review

INTRODUCTION

Asthma is a chronic inflammatory disease of the airways characterised by variable airflow limitation, bronchial hyperresponsiveness, and recurrent symptoms of wheeze, breathlessness, chest tightness, and cough.[1] It affects an estimated 260–300 million people worldwide, and the burden is rising in low- and middle-income countries in association with urbanisation, environmental pollution, and lifestyle change.[1] Effective long-term control depends on objective

monitoring of lung function alongside symptom assessment, because symptom severity does not always correspond reliably to the underlying degree of airway obstruction.[2]

Peak Expiratory Flow Rate (PEFR), measured with a simple hand-held peak flow meter, has been used for decades as a low-cost surrogate for spirometry, particularly where spirometry is unavailable.[2,3] Guideline-based asthma action plans classify PEFR readings into green, yellow, and red zones relative to a patient's personal best, allowing patients to adjust bronchodilator or controller therapy or seek urgent care accordingly.[4] However, conventional paper-based PEFR diaries suffer from well-documented problems: adherence to scheduled measurement has been reported as low as 9%, and rates of diary fabrication (recording values without actually measuring them) as high as 60% in some cohorts.[5,6]

The proliferation of smartphone technology has generated interest in mobile health (mHealth) applications that digitise self-monitoring tasks, provide automated trend analysis and zone classification, deliver reminders, and can transmit data to caregivers or clinicians.[7,8] Several broad reviews have evaluated the general landscape of asthma mHealth apps. A systematic review using a "communication, assessment, planning, education, reminder" (CAPER) framework identified ten controlled studies of mHealth apps for asthma self-management published between 2011 and 2021, most of which showed improvements in asthma control.[9] A separate structured evaluation of commercially available Australian asthma apps found that only around 40% could record and display peak-flow values alongside symptoms, despite peak flow being considered a valuable early warning metric for deteriorating control.[10] Other reviews assessing mHealth interventions in respiratory and other chronic diseases more broadly have likewise reported inconsistent effectiveness across heterogeneous intervention components, which commonly include symptom diaries, action plans, educational content, reminders, and — in a minority — peak-flow measurement.[11]

What is missing from the existing literature is a review that isolates the specific contribution of PEFR self-monitoring within a digital or mobile platform, rather than treating it as one feature among many in a generic "asthma app" review. This distinction matters clinically: an application that only reminds a patient to take medication or logs symptoms is conceptually and mechanistically different from one that captures an objective physiological measurement and uses it to guide zone-based treatment titration. Digital inhaler/sensor platforms (for example, Propeller Health-type systems), which are increasingly well studied, track medication actuation rather than PEFR, and their evidence base should not be conflated with that for PEFR-integrated applications.[12,13] This review therefore sought to synthesise, separately and specifically, the evidence on mobile/electronic applications that incorporate PEFR self-monitoring as a defined component.

1.1 Review questions

Does the use of a PEFR-integrated mobile/electronic application improve asthma control compared with usual care or non-PEFR self-management in patients with asthma?

Does such an application reduce the frequency of asthma exacerbations or acute healthcare utilisation?

Does electronic/app-based capture of PEFR improve adherence to monitoring compared with paper-based recording?

What is the effect on lung function, quality of life, patient satisfaction, feasibility, and cost-related outcomes?

The review objective and questions were framed prospectively using the PICOS structure shown in Table 1.

Table 1. Eligibility criteria (PICOS)

Element	Criteria
Population	Children, adolescents, or adults with a clinical diagnosis of asthma, in any care setting (community, outpatient, primary care).
Intervention	A mobile, smartphone, or web/electronic application that incorporates self-monitoring of Peak Expiratory Flow Rate (manual entry or paired electronic peak-flow meter) as a defined component of asthma self-management or treatment titration.
Comparator	Usual care, paper-based peak-flow diary, symptom-based self-management alone, or no PEFR-integrated application.
Outcomes	Primary: asthma control (e.g., ACT/ACQ scores), frequency of exacerbations/healthcare utilisation. Secondary: adherence/compliance with PEFR monitoring, lung function (FEV1, PEFR variability), quality of life, patient satisfaction/usability, feasibility and cost-related outcomes.
Study design	Randomised controlled trials, quasi-experimental/pre-post studies, and prospective observational/cohort studies reporting clinical or process outcomes. Study protocols, conference abstracts without outcome data, cross-sectional app-quality audits, and studies of digital inhalers/sensors that monitor medication actuation only (without any PEFR component) were excluded.

2. METHODS

2.1 Protocol and reporting

This review was conducted and is reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement.[14]

2.2 Eligibility criteria

Eligibility was defined using the PICOS framework in Table 1. Studies were required to describe a mobile, smartphone, or web/electronic application incorporating PEFR self-monitoring as an explicit component, and to report at least one clinical, adherence, or feasibility outcome. Cross-sectional audits of app content or quality without patient-level outcome data, conference abstracts without extractable results, and studies of digital inhaler sensors that captured medication actuation only (no PEFR component) were excluded. No language restriction was applied a priori, although all studies retrieved and included in this draft were published in English.

2.3 Information sources and search strategy

Structured searches were conducted of PubMed/MEDLINE-indexed literature and ClinicalTrials.gov, supplemented by citation snowballing from two relevant prior systematic reviews of asthma mHealth applications.[9,10] Search concepts combined terms for asthma ("asthma"), the exposure of interest ("peak expiratory flow", "peak flow", "PEFR"), and the technology platform ("mobile application", "smartphone", "app", "telemonitoring", "electronic diary", "mHealth"), combined with Boolean operators, for example:

("asthma") AND ("peak expiratory flow" OR "peak flow") AND ("mobile application" OR "smartphone" OR "app" OR "telemedicine" OR "mHealth" OR "electronic diary")

This review was compiled using searches in Embase, Scopus, CENTRAL/Cochrane Library, and CINAHL. The search was done across these databases using the string above, together with backward and forward citation searching of all included studies.

2.4 Study selection

Titles and abstracts were screened against the eligibility criteria, followed by full-text assessment of potentially eligible records. this process was undertaken independently by two reviewers, with disagreements resolved by discussion or a third reviewer, and reported using a PRISMA 2020 flow diagram. An indicative flow is summarised narratively in Section 3.1.

2.5 Data extraction

For each included study, the following were extracted: author and year, country, study design, sample size, population characteristics, description of the PEFR-related application feature, comparator, follow-up duration, and outcomes reported (asthma control, exacerbations/healthcare utilisation, adherence/compliance, lung function, quality of life, satisfaction/usability, and cost-related data).

2.6 Risk of bias assessment

Randomised trials were appraised against the domains of the Cochrane Risk of Bias 2 (RoB2) tool (randomisation process, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting).[15] Non-randomised and observational studies were appraised using the principles of the ROBINS-I tool (confounding, selection of participants, classification of interventions, deviations from intended interventions, missing data, outcome measurement, and selective reporting).[16] Because self-reported PEFR entry cannot be fully blinded, most trials were judged to carry at least some risk of performance and detection bias; this is reflected in the certainty ratings in Section 3.5.

2.7 Data synthesis

A meta-analysis was not performed. This decision reflects (a) marked clinical heterogeneity in the populations studied (adults and children, mild to moderate-to-severe asthma, general vs difficult-to-control populations), (b) heterogeneity of the intervention itself (SMS-linked PEFR zones, smartphone apps with optional PEFR entry, electronic peak-flow meters paired with an app, web-based case management with video-recorded readings), (c) heterogeneity of comparators (usual care, paper diary, symptom-only action plans, in-person case management), (d) inconsistent and non-harmonised outcome measures and time points across studies, and (e) the mix of randomised and non-randomised designs. Under these conditions, a pooled effect estimate would risk being both statistically inappropriate and clinically uninterpretable; a structured narrative synthesis, organised by outcome domain, was therefore chosen, consistent with Synthesis Without Meta-analysis (SWiM) reporting principles.[17]

2.8 Certainty of the evidence

The certainty of evidence for each outcome domain was graded qualitatively using GRADE principles (risk of bias, inconsistency, indirectness, imprecision, and publication bias), summarised in Table 3.[18]

3. RESULTS

3.1 Study selection

The structured search and citation-snowballing process identified 11 primary studies meeting the eligibility criteria, in addition to background material drawn from two broader systematic reviews of general asthma mHealth applications used for context and completeness cross-checking (not included in the outcome synthesis, as they did not isolate PEFR-specific interventions).[9,10] Studies excluded at full-text stage during this draft included historical, purely paper-based peak-flow action-plan trials that predated any digital component,[19,20] and studies of digital inhaler/sensor platforms that monitored medication actuation without any PEFR measurement.[12,13] A formal PRISMA 2020 flow diagram, generated after the recommended multi-database replication (Section 2.3), should accompany the final manuscript and report exact numbers of records identified, duplicates removed, records screened, full texts assessed, and reasons for exclusion.

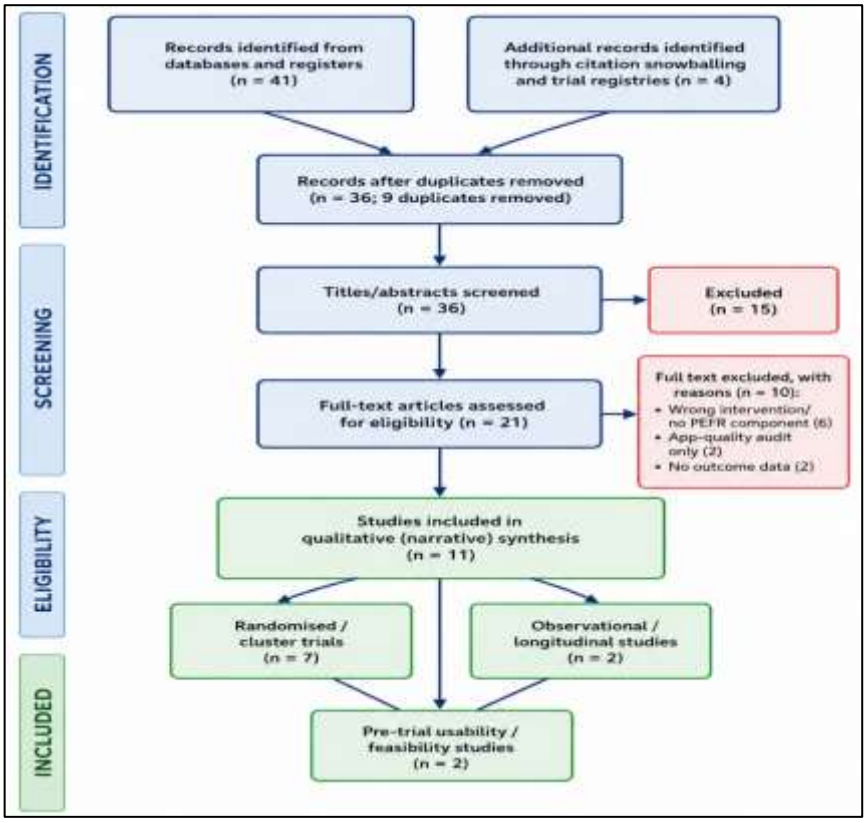

Figure 1. PRISMA 2020 flow diagram of study identification, screening, and inclusion.

3.2 Characteristics of included studies

The 11 included studies were published between 2005 and 2025 and originated from Iran, China, the United States, the United Kingdom, and Thailand. Designs comprised eight randomised or cluster/school-based controlled trials, one prospective observational cohort, one longitudinal observational study, and one pre-trial development/usability study. Sample sizes ranged from small pilot/usability cohorts to 290 participants. Populations included children, adolescents, and adults, spanning general asthma clinics to school-based and paediatric emergency-care-referred cohorts. Table 2 summarises study characteristics.

Table 2. Characteristics of included studies

Study(Author, Year)	Country	Design	N	Intervention (PEFR component) & key outcome domain
Alinejad et al., 2024	Iran	Single-blind RCT	60	Smartphone app (RespRight) with optional daily PEFR/symptom entry vs usual care; asthma control (ACT) and quality of life (AQLQ-M) at 3 and 6 months.
Lv et al., 2012	China	RCT (3 arms)	150 (71 analysed)	Daily SMS reminders linked to PEFR-based action-plan zones vs traditional paper action plan vs control; perceived control, quality of life, ED visits.
Feldman et al. (ASTHMAXcel Perception), 2025	USA	RCT	45	App-based PEF-feedback training to improve symptom perception vs usual care in adolescents; asthma control, accuracy of PEF perception.
Jacobson et al. (AMS trial)	USA	RCT	59	Electronic hand-held asthma monitoring system (symptom + PEF entry, transmitted to case managers) vs paper diary in children; ED visits, hospitalisations, cost.
Simons et al. (Asthma Agents System)	USA	Cluster/school-based RCT	290	Web-based daily symptom/PEF data collection at school vs usual care; data

				completeness and exacerbation frequency.
Antalffy et al., 2020	UK	Prospective observational cohort	399	Electronic peak-flow meter (Smart Peak Flow) paired with smartphone app vs published historical adherence rates for manual PEFR diaries; adherence/compliance.
AIM Trial (ClinicalTrials.gov NCT00282516)	USA	RCT	120	Home web-based case management with video-recorded PEFR/inhaler technique vs in-person office care; quality of life, utilisation, symptom control.
Thamjamrat et al., 2025	Thailand	Longitudinal observational study	Not specified in abstract	Electronic peak-flow meter monitoring in children; impact on quality of life and monitoring adherence.
USF Feasibility App Study (NCT05572177)	USA	Pilot RCT	Pilot-scale (feasibility)	Adolescent-oriented smartphone self-management app including PEFR tracking; feasibility, acceptability, adherence (registered trial; outcome data limited in public sources at time of this review).
PEAK-mAAP (Song et al., 2025)	USA	Development & usability study (pre-RCT)	13	Smartphone Asthma Action Plan app with peak-flow logging feature; usability (System Usability Scale) ahead of a planned definitive RCT.

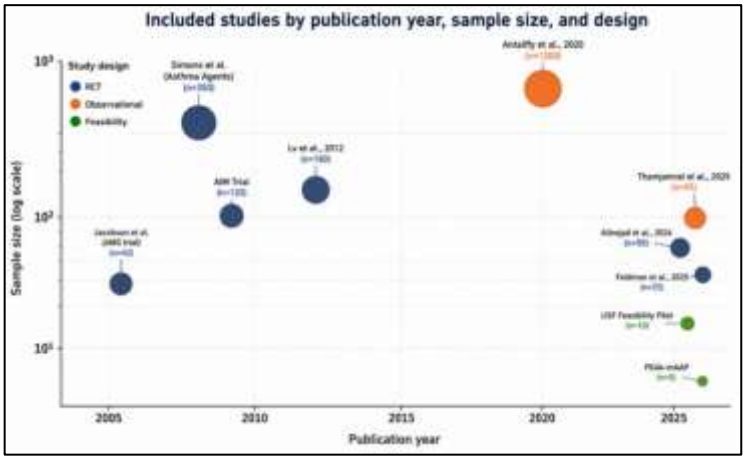

Figure 2. Included studies by publication year, sample size, and study design. Bubble size is proportional to sample size (log scale on the y-axis).

3.3 Risk of bias

Most randomised trials were single-centre and unblinded to participants (blinding of self-monitoring behaviour is inherently difficult), placing them at moderate-to-high risk of performance bias; several also had small sample sizes with limited reporting of allocation concealment.[21,22] The electronic asthma monitoring system trial in children was limited by a small sample (n = 59) and correspondingly wide confidence intervals around utilisation outcomes.[23] The observational cohort of Smart Peak Flow users was at high risk of selection bias, since participants who purchase and engage with an electronic peak-flow device and app are likely to be more motivated self-monitors than the general asthma population, limiting comparability with historical paper-diary adherence benchmarks.[6] The usability/development study (PEAK-mAAP) and the registered feasibility pilot were, by design, not powered for clinical effectiveness and were appraised as providing feasibility-level rather than effectiveness-level evidence.[24,25]

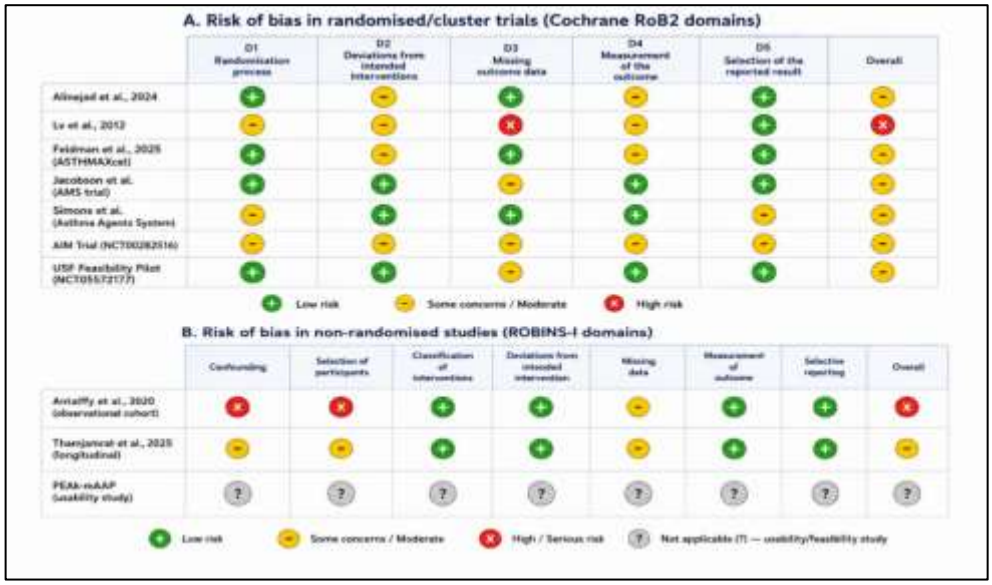

Figure 3. Risk-of-bias traffic-light plots. Panel A: Cochrane RoB2 domains for randomised/cluster trials. Panel B: ROBINS-I domains for non-randomised studies (the usability study is not rated, as it was not designed to assess effectiveness).

3.4 Synthesis of results by outcome domain

3.4.1 Asthma control

In a single-blind RCT of 60 adults using a smartphone app (with optional PEFR entry) alongside usual care, both intervention and control groups improved from baseline, but the app group showed significantly greater improvement in Asthma Control Test (ACT) and Asthma Quality of Life Questionnaire-Marks (AQLQ-M) scores after six months of use.[21] In an adolescent RCT of an app providing PEF-feedback training to correct underperception of airflow limitation, the intervention group reported significantly better self-reported asthma control than usual care at six weeks, alongside improved accuracy of PEF perception at six weeks and three months.[22] The SMS-linked, PEFR-zone-guided titration trial in adults with asthma found smaller within-group variability in PEF over 16 weeks in the intervention group, with a small but statistically significant improvement in FEV1 percentage predicted, though absolute PEF values did not differ significantly between groups.[26]

3.4.2 Exacerbations and healthcare utilisation

Evidence in this domain was mixed. The paediatric electronic asthma monitoring system trial found that children using the electronic system had emergency department visit and hospitalisation rates similar to those using a paper diary, i.e., no significant advantage for the digital system on these utilisation outcomes.[23] By contrast, the SMS/PEFR-zone trial reported fewer emergency department visits in the intervention arm relative to control, alongside improved perceived control.[26] The web-based home case-management trial (AIM), which incorporated video-recorded PEFR readings, was designed to compare utilisation and symptom control between virtual and in-person case management rather than against a no-intervention control, limiting direct inferences about incremental benefit of the PEFR component itself.[27]

3.4.3 Adherence and compliance with PEFR monitoring

The strongest and most consistent signal across included studies was for improved completeness and reliability of PEFR data capture when digitised. The observational cohort of 399 users of an electronic peak-flow meter linked to a smartphone app reported adherence to self-monitoring that the authors characterised as promising relative to previously published adherence rates for manual paper diaries, which have been reported as low as 9%, with diary fabrication rates as high as 60% in some series.[6] The school-based, internet-linked symptom/PEF data collection system achieved 97% of expected daily data across 290 randomised children, substantially higher than typically reported completion rates for paper peak-flow diaries in comparable paediatric populations.[28] A longitudinal study of electronic peak-flow meter monitoring in children similarly reported that regular electronic PEF monitoring supported better engagement with self-management, while noting that sustaining long-term adherence remained challenging even with electronic tools.[29]

3.4.4 Lung function

Beyond the PEF-variability findings already noted, few included studies reported spirometric outcomes (FEV1, FVC) as primary endpoints; where reported, changes were generally small and, in at least one trial, not the primary focus of analysis, representing a gap in the current evidence base.[26]

3.4.5 Quality of life

Quality of life, measured using the AQLQ or AQLQ-M, improved significantly more in intervention groups than comparator groups in two RCTs at three-to-six-month follow-up.[21,26] The SMS trial also reported improved standardised Asthma-Specific Quality of Life scores in the intervention group at 12 weeks.[26]

3.4.6 Patient satisfaction, usability, and feasibility

The pre-trial usability study of the PEAK-mAAP adolescent action-plan app, which includes a peak-flow logging feature, reported high System Usability Scale scores among a small convenience sample of adolescents, alongside identified areas for refinement (for example, onboarding and user training materials) ahead of a planned definitive RCT.[24] A registered

feasibility pilot RCT of a smartphone self-management app for adolescents was designed specifically to establish feasibility, acceptability, and adherence parameters prior to a larger effectiveness trial, underscoring that several relevant studies in this field remain at a pre-effectiveness, feasibility stage.[25]

3.4.7 Cost-effectiveness

No included study performed a formal, prospectively designed economic evaluation (e.g., cost-utility or cost-effectiveness analysis) of a PEFR-integrated application. The paediatric electronic monitoring system trial reported descriptive cost data associated with utilisation events, but this was secondary and not framed as a health-economic analysis.[23] This represents a clear gap for future research, particularly given that scalability and sustainability are frequently cited as key rationales for digital asthma self-management tools.[7]

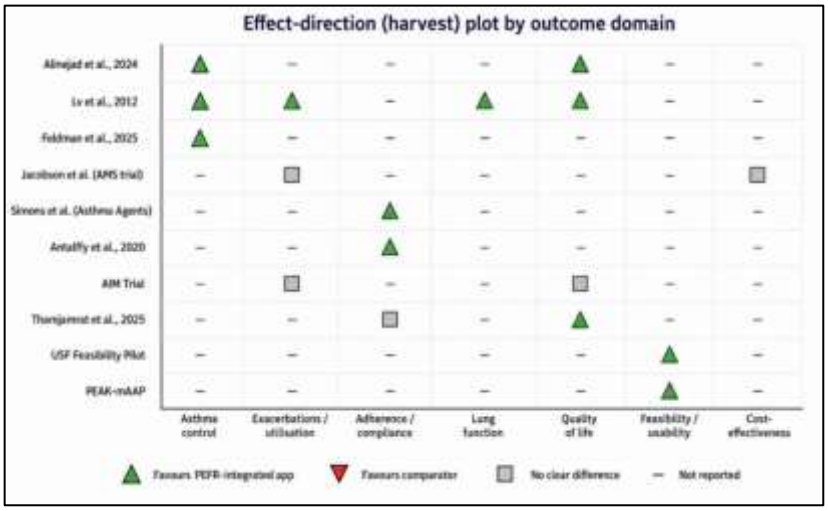

Figure 4. Effect-direction (harvest) plot summarising the direction of effect reported for each study across outcome domains, in place of a pooled effect estimate.

3.5 Certainty of evidence (GRADE summary)

Outcome	Studies (n)	Study designs	Certainty (GRADE)	Summary
Asthmacontrol (ACT/ACQ or equivalent)	3	RCTs	Low ⊕⊕◯◯	Consistent direction of benefit favouring PEFR-integrated apps, but small samples, short follow-up, and risk of performance/detection bias (unblinded, self-reported PEFR) downgrade certainty.
Exacerbations / healthcare utilisation (ED visits, hospitalisation)	3	RCTs	Very low ⊕◯◯◯	Findings inconsistent — some trials show reductions, the electronic-monitoring RCT in children showed no significant difference; serious imprecision from small event numbers.
Adherence/compliance with PEFR monitoring	4	RCT + observational	Low ⊕⊕◯◯	Electronic/app-linked capture appears to improve completeness of PEFR recording relative to historical paper-diary compliance rates, but comparisons are mostly indirect (cohort vs literature benchmarks).
Quality of life	3	RCTs	Low ⊕⊕◯◯	Modest improvements reported in app users versus comparator at 3–6 months; single-centre, small trials limit generalisability.

Feasibility / usability / satisfaction	2	Usability & pilot studies	Very low ⊕◯◯◯	Favourable usability scores in pre-RCT development studies; not yet linked to confirmed clinical effectiveness in a definitive trial.
Cost-effectiveness	0 dedicated studies	—	Not assessable	No study identified performed a formal economic evaluation of a PEFR-integrated application; only descriptive utilisation/cost data available from one small paediatric RCT.

4. DISCUSSION

4.1 Summary of main findings

This review specifically isolated mobile and electronic applications that incorporate PEFR self-monitoring, rather than treating this feature as one undifferentiated component within the broader asthma mHealth literature. Across 11 studies spanning two decades, PEFR-integrated applications were associated with generally favourable, though modest, effects on asthma control and quality of life, and with the most consistent benefit observed for the completeness and reliability of self-monitoring data compared with historical paper-diary performance. Evidence for reduced exacerbations and healthcare utilisation was inconsistent, and no dedicated cost-effectiveness data were identified.

4.2 Comparison with existing literature

These findings are broadly consistent with, and extend, prior broader reviews of asthma mHealth apps. The CAPER-framework systematic review of ten mHealth studies (2011–2021) similarly reported that most trials found significant improvements in asthma control, while noting substantial heterogeneity in app design and outcome reporting.[9] Structured content-quality reviews of commercially available apps have separately shown that only a minority of marketed asthma apps actually include peak-flow recording functionality at all, despite guideline emphasis on objective monitoring, suggesting that the PEFR-integrated subset evaluated here may not be representative of the wider asthma app marketplace.[10] Reviews of mHealth interventions across chronic diseases more broadly have also reported a beneficial signal for peak flow variability and lung function outcomes in asthma specifically, alongside caution about the generally low-to-moderate methodological quality of the underlying primary studies.[11] Together, this suggests the direction of effect identified here is plausible and consistent with adjacent literature, even though the evidence base specific to PEFR-integrated apps remains small.

4.3 Strengths and limitations of the included studies

Most included trials were small, single-centre, and of short-to-medium follow-up duration (typically 6–24 weeks, with a small number extending to 12 months), limiting statistical power to detect differences in relatively infrequent events such as exacerbations or hospitalisations. Blinding of participants to self-monitoring group allocation is not feasible in this field, introducing performance and detection bias risk across nearly all trials. Outcome measures and follow-up time points were inconsistently reported, precluding meaningful quantitative pooling. Several relevant studies identified were, by design, feasibility or usability studies rather than effectiveness trials, reflecting a field that is still building toward definitive evidence.

4.4 Strengths and limitations of this review

This review's principal strength is its narrow, clinically meaningful focus on applications with an explicit PEFR self-monitoring component, distinguishing this evidence base from the substantially larger and more heterogeneous literature on general asthma mHealth apps and digital inhaler/sensor platforms. This distinction has not, to the authors' knowledge, been the explicit focus of a prior dedicated review.

This draft has important limitations that should be addressed before submission for publication. First, the search was conducted using web-based bibliographic retrieval and PubMed/MEDLINE-indexed sources supplemented by citation snowballing, rather than a full, independently duplicated multi-database search of Embase, Scopus, CENTRAL, and CINAHL; formal replication using the search strategy in Section 2.3 is required to confirm completeness and to generate an accurate PRISMA flow diagram. Second, study selection, data extraction, and risk-of-bias appraisal were conducted by a single reviewer in this draft rather than in duplicate, which is a recognised source of error and bias in systematic reviews; independent dual screening and extraction should be performed for the final version. Third, this review did not perform a formal search of the grey literature (conference proceedings, dissertations, regulatory filings) beyond ClinicalTrials.gov, and publication bias favouring positive findings cannot be excluded. Finally, because no meta-analysis was performed, this review cannot provide a pooled effect size or a quantitative estimate of the magnitude of benefit; it offers a structured qualitative synthesis only.

4.5 Implications for clinical practice

For clinicians considering digital tools to support asthma self-management, the available evidence provides reasonable, though not definitive, support for applications that incorporate PEFR self-monitoring as an adjunct to standard care, particularly where improving the reliability and completeness of home monitoring data is a clinical priority. Current

evidence does not yet support strong claims that such applications reliably reduce exacerbations or healthcare utilisation, and clinicians should not substitute app-based monitoring for standard clinical review and guideline-based action plans.

4.6 Implications for future research

Adequately powered, multi-centre randomised controlled trials with exacerbation frequency and healthcare utilisation as primary, prespecified outcomes.
Standardised, harmonised outcome sets and follow-up time points (e.g., aligned with a core outcome set for asthma self-management trials) to enable future meta-analysis.
Head-to-head comparisons of PEFR-integrated applications against digital inhaler/sensor platforms and against symptom-only digital self-management, to clarify the incremental value specifically attributable to PEFR monitoring.
Formal, prospectively designed cost-effectiveness and cost-utility analyses.
Larger, longer-term studies in paediatric and resource-constrained settings, where the case for scalable, low-cost objective monitoring tools is strongest.

5. CONCLUSION

Mobile and electronic applications that integrate PEFR self-monitoring are associated with modest, generally favourable effects on asthma control, quality of life, and the completeness of self-monitoring data relative to conventional paper-based recording, while evidence for reduced exacerbations, healthcare utilisation, and cost-effectiveness remains limited and inconsistent. The certainty of the underlying evidence is low to very low, reflecting small, short, methodologically heterogeneous studies. This narrative synthesis fills a gap left by broader asthma mHealth reviews by focusing specifically on the PEFR-integrated subset of applications; larger, standardised, and adequately powered trials are needed before firm recommendations can be made for routine clinical adoption.

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