Saudi Journal of Medicine and Public Health

https://saudijmph.com/index.php/pub

https://doi.org/10.64483/202412495

Analysis of Multidisciplinary Team Structures for Enhancing Diagnostic Precision and Therapeutic Adherence in Pediatric Asthma, Bronchiolitis, and Cystic Fibrosis within Primary Care Settings

Waad Rayhan Alquayqie [(1)] , Mazen Ayidh Mohammed Alotaibi [(2)] , Ahad Rayhan Alquayqie [(3)] , Mona Ali Alghamdi [(4)] , Wejdan Hussein Aldossari [(5)] , Sahar Ahmad Ali Aydhe [(6)] , Mohammed Ibrahim ALQasem [(7)] , Saad Al-Marri [(8)] , Seham Ibrahim Ali [(9)] , Wajdan Zaid Almudir [(10)] , Nawal Mohammed Hamad Arishi [(11)] , Faisal Hussain Muzaybi [(12)] , Kholoud Ali Muhammad Rezk-Allah [(13)] , Abdullah Ibrahim Hassan Al Name [(14)]

(1) Al-Ma'athar Housing Health Center, Ministry of Health, Saudi Arabia,
(2) Al-Uraija Al-Gharbi Health Center – Riyadh, Ministry of Health, Saudi Arabia,
(3) Dumat Al-Jandal General Hospital, Al-Jawf, Ministry of Health, Saudi Arabia,
(4) Riyadh, Al-Shifa 2 Primary Healthcare Center, Ministry of Health, Saudi Arabia,
(5) Al-Shifa 2 Primary Healthcare, Ministry of Health, Saudi Arabia,
(6) Al-Shifa 2 Primary Healthcare Center, First Settlement, Ministry of Health, Saudi Arabia,
(7) Badr 2 Primary Healthcare Center, Riyadh, Ministry of Health, Saudi Arabia,
(8) Al-Shifa Second Health Center, Riyadh, Ministry of Health, Saudi Arabia,
(9) Al-Dar Al-Bayda Second Center, Riyadh, Ministry of Health, Saudi Arabia,
(10) General Directorate of Health Employees in Jazan, Ministry Branch, Saudi Arabia,
(11) Jazan Health Cluster,Ministry of Health, Saudi Arabia,
(12) Almowassam General Hospital,Ministry of Health, Saudi Arabia,
(13) Imam Abdulrahman Al-Faisal Hospital,Ministry of Health, Saudi Arabia,
(14) Erada Mental Health Hospital – Jazan,Ministry of Health, Saudi Arabia

Abstract

Background: Pediatric respiratory conditions, including bronchiolitis, asthma, and cystic fibrosis (CF), represent a leading cause of morbidity and healthcare utilization in childhood. Their effective management in the family practice setting is complicated by overlapping symptomatology and the necessity for longitudinal, holistic care. **Aim:** This narrative review aims to synthesize evidence on a cohesive, team-based framework for diagnosing and managing common pediatric respiratory illnesses within primary care, delineating the specific roles of all team members. **Methods:** A comprehensive literature search was conducted across PubMed, Scopus, and CINAHL databases from 2010 to 2024, focusing on multidisciplinary care, diagnosis, and primary care management of the target conditions. **Results:** The review outlines an integrated model where family physicians coordinate with nurses, respiratory therapists, and medical secretaries to optimize care. Key strategies include structured history-taking, appropriate use of diagnostic labs (e.g., viral PCR, spirometry, sweat chloride tests), in-office nebulizer treatments, and systematic family education. This model improves diagnostic accuracy, enhances adherence to therapy, and ensures efficient care coordination. **Conclusion:** A deliberate, role-defined multidisciplinary team approach in family practice is critical for managing pediatric respiratory conditions effectively, leading to improved clinical outcomes, reduced hospitalizations, and increased family satisfaction.

Keywords: Pediatric Asthma, Bronchiolitis, Cystic Fibrosis, Interdisciplinary Health Team, Primary Health Care

Introduction

Respiratory illnesses constitute the most frequent reason for acute pediatric consultations in family practice and a leading cause of hospitalization in children under five years of age (Alhaddad et al., 2023). The spectrum encountered in primary care is vast, ranging from transient, self-limiting viral syndromes like the common cold to acute lower respiratory tract infections such as bronchiolitis and pneumonia, and further extending to chronic, life-altering diseases like asthma and cystic fibrosis. This epidemiological burden places family practices at the frontline of pediatric respiratory health, serving as the first point of contact, the principal site for ongoing

*Corresponding author e-mail: Wadalrw2030@gmail.com (Waad Rayhan Alquayqie).
Receive Date: 19 December 2024, Revise Date: 30 December 2024, Accept Date: 31 December 2024

management of chronic conditions, and the crucial coordinator of care with subspecialists (Cardoso et al., 2013).

The diagnostic and management challenge inherent in this setting is profound. Symptoms such as cough, wheeze, tachypnea, and respiratory distress are nonspecific, serving as common final pathways for a diverse array of pathologies (Bush, 2022). Differentiating between viral bronchiolitis and the first presentation of asthma in a wheezing infant, or recognizing the subtle signs of an atypical chronic condition like cystic fibrosis amidst a backdrop of commonplace childhood infections, requires nuanced clinical judgment. This challenge is compounded by the developmental limitations of pediatric patients, who may be unable to articulate symptoms or perform objective pulmonary function tests (Martin et al., 2022; Zhou et al., 2023).

Furthermore, optimal management of these conditions, particularly chronic ones, extends far beyond the prescription of pharmacotherapy. It encompasses comprehensive patient and family education, psychosocial support to address the anxiety and burden of chronic illness, meticulous environmental control advice, advocacy for immunization, and seamless care coordination across multiple providers and settings (Council on Children with Disabilities, 2014). The traditional, hierarchical model of a single physician attempting to address all these dimensions during a brief consultation is increasingly recognized as inefficient, unsustainable, and often inadequate to meet the complex needs of children with respiratory diseases and their families (Somé et al., 2020).

Consequently, this review argues for the explicit adoption, formalization, and optimization of a multidisciplinary team (MDT) approach within the family practice setting. This model strategically leverages the distinct and complementary skills of family physicians, resident physicians, registered nurses, respiratory therapists, and medical secretaries/administrators. By creating a structured, communicative, and patient-centered system, this team can transform the clinical encounter from a reactive, episodic event into a proactive, continuous partnership. The ultimate aim is to improve diagnostic precision, enhance therapeutic adherence, prevent exacerbations and hospitalizations, and significantly improve the quality of life for pediatric patients and their caregivers. This review will synthesize the evidence supporting this model, detail its operationalization for common conditions, and discuss the practical challenges and future directions for implementation.

The Multidisciplinary Team

The efficacy of team-based care is not inherent in mere aggregation of professionals; it is predicated on clear role definition, mutual respect, and deliberate interprofessional communication channels. Each member contributes a unique piece to the comprehensive care puzzle, with the family physician serving as the lead diagnostician and final integrator (Table 1).

The family physician or pediatrician provides medical leadership, bearing ultimate responsibility for diagnosis and the overall management plan. This role involves synthesizing historical data gathered by nurses and residents, interpreting physical exam findings, reviewing diagnostic tests (e.g., spirometry interpreted by the RT, lab results), and formulating a holistic biopsychosocial plan (Will et al., 2019). The physician makes complex decisions regarding medication initiation/escalation, the need for specialist referral (e.g., to pediatric pulmonology, allergy, or CF center), and manages comorbidities. Crucially, they also foster the team culture, leading brief "huddles" to plan the day's complex patients and ensuring all team members are working from a shared understanding of the care plan.

The resident physician is integral to both service delivery and the educational mission. Under attending supervision, they perform detailed histories and physical examinations, developing and refining their clinical reasoning by constructing differential diagnoses for common presentations like chronic cough or recurrent wheeze (Khan et al., 2021). They are often tasked with initial patient and family counseling, drafting asthma action plans, and following the longitudinal progress of patients with chronic conditions. This role provides essential hands-on training in the very team-based model they will ideally lead or participate in during future practice (Saxby et al., 2019).

Nursing staff are the operational backbone of the respiratory MDT. Their role begins with skilled triage, identifying high-risk patients (e.g., infants with bronchiolitis showing signs of distress) who require immediate physician attention (Ralston et al., 2014). Nurses conduct structured initial and follow-up histories, often using validated tools to assess asthma control or environmental triggers. They administer treatments per protocol, including nebulized bronchodilators, intramuscular corticosteroids for acute asthma, and vaccines. A core function is foundational patient education: teaching basic inhaler and spacer technique, demonstrating nasal suctioning for infants, and providing written materials on illness management (Russell et al., 2021). Their continuous, supportive contact with families builds trust and allows for the identification of psychosocial stressors or adherence barriers that may not surface during the physician encounter.

The respiratory therapist (RT), whether embedded within the practice or available for consultation, provides a level of technical expertise that is transformative. For diagnosis, they are the specialists in conducting high-quality, reproducible spirometry, including bronchodilator response testing, which is the gold-standard objective measure

for asthma in cooperative children (GINA committee, 2023). They possess advanced skills in airway clearance techniques (e.g., postural drainage, use of oscillating positive expiratory pressure devices) critical for cystic fibrosis and bronchiectasis, providing hands-on training to patients and families (Morrow, 2019). The RT is also the definitive authority on inhaler device technique, capable of identifying and correcting subtle errors that commonly undermine asthma control, and can manage complex nebulizer regimens (Melani, 2021; Jacobson et al., 2022). Their involvement elevates the practice's capability to manage moderate-to-severe disease within the medical home.

Often underappreciated, the medical secretary is the essential hub for administrative efficiency and care continuity. This role manages the entire referral lifecycle: generating referrals to specialists, tracking their completion, and ensuring consultation reports are filed and acted upon (Cogan et al., 2023). They maintain proactive immunization registries, recalling patients with asthma or CF for annual influenza and pneumococcal vaccines—a vital preventive function (Centers for Disease Control and Prevention [CDC], 2022). They coordinate the flow of laboratory and imaging results, schedule follow-up visits at guideline-recommended intervals, and manage communication with schools or home care agencies. This meticulous administrative orchestration prevents the fragmentation of care, reduces medical errors, and allows clinical staff to focus on direct patient care (Rotenstein et al., 2023). Figure 1 illustrates a multidisciplinary team–based model for the management of pediatric asthma, bronchiolitis, and cystic fibrosis in family practice.

Table 1: Core Roles and Responsibilities in the Pediatric Respiratory Care Multidisciplinary Team

Team Member	Key Clinical Responsibilities	Key Coordination & Educational Responsibilities
Family Physician	Final diagnosis & differential; medication prescription; complex decision-making; physical exam synthesis.	Team leadership, specialist referral coordination, complex family counseling, and oversight of care plan.
Resident Physician	Detailed history & physical exam; initial differential diagnosis; performing procedures under supervision.	Drafting management plans & asthma action plans; patient education under supervision; longitudinal patient follow-up.
Nursing Staff	Triage & vital signs; structured history (e.g., asthma control test); vaccine & nebulizer administration.	Basic inhaler/spacer technique training; provision of written action plans; family support & reinforcement of education; liaison.
Respiratory Therapist	Conducting & interpreting spirometry/PFTs; performing bronchial challenge tests; airway clearance therapy.	Advanced inhaler device training; teaching & supervising airway clearance techniques; managing home oxygen/nebulizer programs.
Medical Secretary	--	Managing specialist referrals & tracking; immunization recall; coordinating lab/path results; scheduling follow-ups; record management.

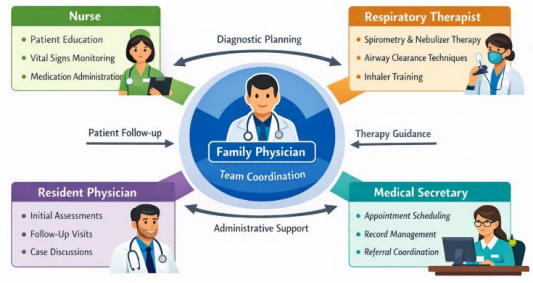

Figure 1. Multidisciplinary Team Model for Pediatric Respiratory Care in Primary Care Settings

A Team-Based Clinical Pathway

Bronchiolitis

Bronchiolitis, primarily caused by Respiratory Syncytial Virus (RSV), epitomizes a condition where a team-based approach optimizes care by adhering to evidence-based guidelines and providing structured family support. Diagnosis remains clinical, based on a constellation of findings in a young infant: coryza, cough, tachypnea, and exam findings of wheeze and/or crackles (Ralston et al., 2014). The nurse's role in triage is critical to swiftly identify "red flags" such as apnea, significant hypoxia (SpO2 <90%), or poor feeding that necessitate immediate physician assessment.

While routine testing is not recommended, the strategic use of rapid multiplex PCR from a nasopharyngeal swab (collected by nursing) for viruses like RSV and influenza has value within the MDT model. A positive result, communicated clearly by the physician or nurse, can: 1) confirm the viral etiology, reinforcing the expected 7-14 day natural history to parents; 2) reduce parental anxiety and the demand for unnecessary antibiotics; and 3) guide isolation precautions within the clinic (Mansbach et al., 2012). The physician must differentiate bronchiolitis from other causes of wheeze, such as early asthma, pneumonia, or anatomic anomalies.

Management is supportive. The RT may advise on and demonstrate safe techniques for nasal suctioning (Lin et al., 2022). The use of nebulized

hypertonic saline or bronchodilators is not routinely recommended but may be considered in specific inpatient settings; the RT's expertise is key if such therapies are employed (Harrison et al., 2018). The most impactful intervention is consistent, empathetic education delivered primarily by nursing. This includes counseling on maintaining hydration, using saline drops and suction, recognizing warning signs for return (e.g., worsening retractions, lethargy), and reassuring parents about the self-limited course (O'Brien & Borland, 2015). The medical secretary ensures a follow-up plan is in place, particularly for high-risk infants (e.g., those born preterm), and facilitates communication if hospitalization is required.

Asthma

Asthma management is where the MDT model truly shines, transitioning care from reactive exacerbation management to proactive control. Diagnosis relies on a compatible history of recurrent, variable respiratory symptoms (wheeze, cough, chest tightness) and objective evidence of variable expiratory airflow limitation (GINA, 2023). Beyond the history taken by the physician and nurse, spirometry performed by the RT is central. In children aged 5-6 years and older, a demonstration of bronchodilator reversibility (increase in FEV1 >12% and >200 mL) or excessive variability in lung function over time provides confirmation. For younger children, a structured symptom diary and a documented clinical response to a trial of controller medication are diagnostic mainstays (Bacharier, Guilbert, & Mauger, 2021).

Once diagnosed, the team activates a chronic care pathway. The physician prescribes appropriate controller therapy (typically inhaled corticosteroids). The nurse provides initial education on the purpose of "preventer" vs. "reliever" medications and basic device technique. However, studies consistently show that most patients, including parents administering to children, misuse inhalers (Volerman et al., 2020). Here, the RT performs a vital "rescue" function, conducting detailed device-specific training (slow tidal breathing for nebulizers, coordinated actuation-breath for metered-dose inhalers with spacers), which significantly improves drug delivery and clinical outcomes (Usmani et al., 2018).

The collaborative development of a written Asthma Action Plan (AAP) is a cornerstone. The physician defines the zones (green/yellow/red) and medication adjustments; the nurse or RT translates this into clear, accessible language and reviews it with the family; the medical secretary ensures a copy is filed and that follow-up is scheduled to review it (Dhippayom et al., 2022). The team also addresses comorbidities: the physician may coordinate referral for allergy testing if indicated (Lang, 2014), while nursing reinforces environmental control measures (e.g., dust mite covers, pet dander avoidance). The secretary's systematic recall for annual influenza vaccination and regular asthma control reviews ensures preventive care is not lost to follow-up.

Cystic Fibrosis

CF care requires a tight-knit partnership between the specialized CF center and the primary care MDT. The family practice's role is pivotal in early detection, routine health maintenance, and acute illness co-management (Sanders & Fink, 2016). Suspicion should be triggered by a history of recurrent respiratory infections, failure to thrive, steatorrhea, or a family history. In this scenario, the MDT mobilizes efficiently: the nurse coordinates the collection of a sweat chloride test (the diagnostic gold standard), the secretary expedites sending the sample and results, and the physician promptly refers the patient to an accredited CF center for confirmatory testing and genotyping (Farrell et al., 2017; Langfelder-Schwind et al., 2022).

In the co-management model, the family practice MDT handles critical elements of routine care. This includes ensuring strict adherence to the recommended immunization schedule, especially for influenza, pneumococcus, and COVID-19. The team monitors growth parameters and nutritional status, providing initial dietary counseling and coordinating with the CF center's dietitian (Smyth et al., 2014). They diagnose and treat common intercurrent illnesses, such as sinusitis or simple bronchitis, in communication with the specialist team.

Perhaps the most valuable day-to-day contribution is in reinforcing the arduous daily regimen of therapies. The RT becomes a key ally, providing ongoing coaching and troubleshooting for the airway clearance techniques (chest physiotherapy, high-frequency chest wall oscillation vests) prescribed by the center, ensuring proper technique is maintained at home (Ciet et al., 2022). Nursing provides indispensable psychosocial support, acknowledging the tremendous treatment burden on the child and family and screening for signs of anxiety or depression, which are highly prevalent (Quittner et al., 2014). This supportive, coordinated wrap-around care within the local medical home is essential for patient well-being and adherence (Table 2).

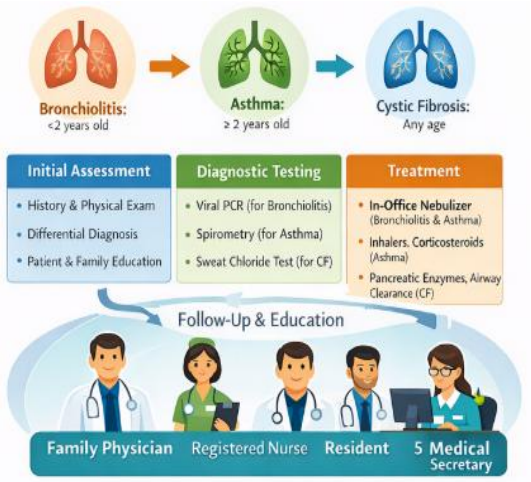

Figure 2. Diagnostic and Therapeutic Pathways for Common Pediatric Respiratory Conditions in Primary Care

Figure 2 outlines initial assessment, condition-specific diagnostic testing (e.g., viral PCR, spirometry, sweat chloride testing), acute treatment strategies, and long-term follow-up and education. Color-coded pathways emphasize age-appropriate differentiation, coordinated team involvement, and evidence-based decision-making.

Table 2: Multidisciplinary Team Interventions Across the Care Continuum for Key Conditions

Condition	Diagnostic Phase	Acute Management Phase	Chronic/Preventive Phase
Bronchiolitis	**Nurse:** Triage, viral swab. **MD:** Clinical Dx, diff Dx.	**Nurse:** Supportive care education, suction demo. **RT:** Nebulizer admin (if used).	**Secretary:** High-risk infant follow-up. **Nurse:** Reinforce warning signs, normal course.
Asthma	**RT:** Spirometry. **MD/Nurse:** History, exam.	**Nurse/RT:** Acute bronchodilator admin. **MD:** Systemic steroid decision.	**RT:** Advanced device training. **Team:** AAP creation. **Secretary:** Immunization & control visit recall.
Cystic Fibrosis	**Nurse:** Sweat test coordination. **MD:** Referral.	**MD/Nurse:** Treat intercurrent illness. **RT:** Acute airway clearance support.	**RT:** Reinforce daily therapies. **Nurse:** Psychosocial support, nutrition. **Secretary:** Immunization tracking.

Critical Pillars of Effective Team-Based Care

The MDT optimizes diagnostic stewardship. Point-of-care testing (e.g., rapid streptococcus, influenza/RSV PCR), efficiently performed by nursing, allows for immediate, targeted clinical decisions during acute visits, reducing unnecessary antibiotic prescriptions (Chen & Er, 2022). For asthma, moving spirometry from a rarely used referral test to a routine in-office procedure under the RT's domain provides objective data that guides diagnosis and monitors control (Xie et al., 2016). The team must also collectively understand the limitations of diagnostics, such as avoiding routine chest radiographs in uncomplicated asthma or bronchiolitis, thereby reducing cost and radiation exposure (Harris et al., 2011).

Education within the MDT model is dynamic, layered, and continuous. The physician provides the authoritative explanation of the diagnosis, pathophysiology, and prognosis. The nurse and RT then translate this knowledge into practical skills through repetitive, hands-on training with devices (spacers, nebulizers, peak flow meters, airway clearance devices) (Kew et al., 2017). This "see one, do one, teach one" approach, reinforced at subsequent visits, is far more effective than a one-time verbal explanation. Education must be culturally sensitive and engage parents as true partners in care, which has been shown to improve outcomes in chronic conditions like asthma (Chan et al., 2021). The medical secretary supports this by providing reliable, written educational materials in appropriate languages and ensuring clear follow-up instructions are communicated.

Fragmented care is a major source of medical error, patient frustration, and poor outcomes. The administrative functions led by the medical secretary are the antidote. A systematic process for managing referrals—with tracking to ensure the consultation occurred, and the report was received and reviewed—closes a critical loop in patient safety (Powell et al., 2023). Proactive immunization tracking and recall are especially vital for respiratory patients. Efficient use of the Electronic Health Record (EHR) is crucial; it must serve as a shared information platform where each team member can document their contributions (e.g., nurse's education note, RT's spirometry results, secretary's referral tracking) and view a unified patient story, facilitating informed, collaborative decision-making (O'Malley et al., 2015).

Challenges and Future Directions

Implementing this model faces barriers, including funding for non-physician roles (embedded

RTs), a lack of formal interprofessional training, and time constraints for team huddles (Sargeant et al., 2008). Future directions include greater use of telehealth for routine monitoring and education, integrating pharmacists into the team for medication reconciliation, and developing standardized protocols for role delegation (Misra-Hebert et al., 2018). Research is needed to quantitatively demonstrate the cost-effectiveness and superior health outcomes of this integrated primary care model compared to traditional siloed care.

Conclusion

The diagnosis and management of pediatric respiratory conditions in family practice are inherently complex, demanding a blend of acute care, chronic disease management, and family-centered support. A deliberate, structured multidisciplinary team approach that fully utilizes the skills of family physicians, residents, nurses, respiratory therapists, and medical secretaries offers the most effective model to meet these demands. By clarifying roles in diagnosis, therapy, education, and coordination, this team can achieve earlier and more accurate diagnoses, improve treatment adherence, reduce unnecessary referrals and hospitalizations, and ultimately enhance the quality of life for children and their families. Embracing and formally structuring this collaborative model represents the future of high-quality, comprehensive primary care for pediatric respiratory health.

References

1. Alhaddad, A. J., Aljaroodi, S., Alkhasawneh, O. M., Dibo, R., Alturki, S. A., Aljamaan, K. A., ... & Alkharsah, K. R. (2023). Diagnosis of group A streptococcal pharyngitis in the paediatric emergency department using a fluorescence-based RADT: predicted impact on antibiotic prescription. *Journal of Medical Microbiology*, *72*(2), 001624. https://doi.org/10.1099/jmm.0.001624
2. Bush, A. (2022). Severe and difficult asthma: Diagnosis and management—Challenges for a low-resource environment. *Indian Journal of Pediatrics*, *89*(2), 156-162. https://doi.org/10.1007/s12098-021-03952-w
3. Cardoso, D. M., Gilio, A. E., Hsin, S. H., Machado, B. M., Paulis, M. D., Lotufo, J. P. B., ... & Grisi, S. J. E. (2013). Impact of the rapid antigen detection test in diagnosis and treatment of acute pharyngotonsillitis in a pediatric emergency room. *Revista Paulista de Pediatria*, *31*, 4-9. https://doi.org/10.1590/S0103-05822013000100002
4. Chan, M., Gray, M., Burns, C., Owens, L., Woolfenden, S., Lingam, R., ... & Homaira, N. (2021). Community-based interventions for childhood asthma using comprehensive approaches: a systematic review and meta-analysis. *Allergy, Asthma & Clinical Immunology*, *17*(1), 19. https://doi.org/10.1186/s13223-021-00522-9
5. Chen, Y. J., & Er, T. K. (2022). Distribution of viral respiratory infections during the COVID-19 pandemic using the FilmArray respiratory panel. *Biomedicines*, *10*(11), 2734. https://doi.org/10.3390/biomedicines10112734
6. Ciet, P., Bertolo, S., Ros, M., Casciaro, R., Cipolli, M., Colagrande, S., ... & Morana, G. (2022). State-of-the-art review of lung imaging in cystic fibrosis with recommendations for pulmonologists and radiologists from the "iMAging managEment of cySTic fibROsis"(MAESTRO) consortium. *European Respiratory Review*, *31*(163). https://doi.org/10.1183/16000617.0173-2021
7. Cogan, A. M., Rinne, S. T., Weiner, M., Simon, S., Davila, J., & Yano, E. M. (2023). Using research to transform electronic health record modernization: advancing a VA partnered research agenda to increase research impacts. *Journal of General Internal Medicine*, *38*(Suppl 4), 965-973. https://doi.org/10.1007/s11606-023-08289-y
8. Council on Children with Disabilities and Medical Home Implementation Project Advisory Committee, Turchi, R. M., Antonelli, R. C., Norwood Jr, K. W., Adams, R. C., Brei, T. J., ... & Sia, C. (2014). Patient-and family-centered care coordination: a framework for integrating care for children and youth across multiple systems. *Pediatrics*, *133*(5), e1451-e1460. https://doi.org/10.1542/peds.2014-0318
9. Dhippayom, T., Wateemongkollert, A., Mueangfa, K., Im, H., Dilokthornsakul, P., & Devine, B. (2022). Comparative efficacy of strategies to support self-management in patients with asthma: a systematic review and network meta-analysis. *The Journal of Allergy and Clinical Immunology: In Practice*, *10*(3), 803-814. https://doi.org/10.1016/j.jaip.2021.09.049
10. Farrell, P. M., White, T. B., Ren, C. L., Hempstead, S. E., Accurso, F., Derichs, N., ... & Sosnay, P. R. (2017). Diagnosis of cystic fibrosis: consensus guidelines from the cystic fibrosis foundation. *The Journal of pediatrics*, *181*, S4-S15. https://doi.org/10.1016/j.jpeds.2016.09.064
11. GINA committee. (2023). Global Strategy for Asthma Management and Prevention 2023 Update. *Global Initiative for Asthma: Fontana, WI, USA*.
12. Harris, M., Clark, J., Coote, N., Fletcher, P., Harnden, A., McKean, M., & Thomson, A. (2011). British Thoracic Society guidelines for the management of community acquired pneumonia in children: update 2011. *Thorax*, *66*(Suppl 2), ii1-ii23. https://doi.org/10.1136/thoraxjnl-2011-200598

13. Harrison, W., Angoulvant, F., House, S., Gajdos, V., & Ralston, S. L. (2018). Hypertonic saline in bronchiolitis and type I error: a trial sequential analysis. *Pediatrics*, *142*(3), e20181144. https://doi.org/10.1542/peds.2018-1144
14. Jacobson, J., D'Ambrosio, N., Hasko, S., Guarton, A., Cade, G., Kendra, M., ... & Cherian, S. (2022, October). Association of a respiratory therapist-led COPD hospital education program and 30-day hospital readmissions. In *Respiratory Care* (Vol. 67, No. Suppl_10, p. 3764633). Daedalus Enterprises Inc.. doi: 10.4187/respcare.20223764633
15. Kew, K. M., Malik, P., Aniruddhan, K., & Normansell, R. (2017). Shared decision-making for people with asthma. *Cochrane Database of Systematic Reviews*, (10). https://doi.org/10.1002/14651858.CD012330.pub2
16. Khan, E. K., Liptzin, D. R., Baker, J., Meier, M., Baker, C. D., & Lockspeiser, T. M. (2021). Pediatric resident education in pulmonary (PREP): a subspecialty preparatory boot camp curriculum for pediatric residents. *MedEdPORTAL*, *17*, 11066. https://doi.org/10.15766/mep_2374-8265.11066
17. Langfelder-Schwind, E., Raraigh, K. S., CF Newborn Screening Genetic Counseling Workgroup, Parad, R. B., Balcom, J. R., Birnbaum, V. K., ... & Tluczek, A. (2022). Genetic counseling access for parents of newborns who screen positive for cystic fibrosis: Consensus guidelines. *Pediatric Pulmonology*, *57*(4), 894-902. https://doi.org/10.1002/ppul.25806
18. Lin, J., Zhang, Y., Song, A., Ying, L., & Dai, J. (2022). Exploring the appropriate dose of nebulized hypertonic saline for bronchiolitis: a dose–response meta-analysis. *Journal of Investigative Medicine*, *70*(1), 46-54. https://doi.org/10.1136/jim-2021-001947
19. Mansbach, J. M., Piedra, P. A., Teach, S. J., Sullivan, A. F., Forgey, T., Clark, S., ... & MARC-30 Investigators. (2012). Prospective multicenter study of viral etiology and hospital length of stay in children with severe bronchiolitis. *Archives of pediatrics & adolescent medicine*, *166*(8), 700-706. doi:10.1001/archpediatrics.2011.1669
20. Martin, J., Townshend, J., & Brodlie, M. (2022). Diagnosis and management of asthma in children. *BMJ Paediatrics Open*, *6*(1), e001277. https://doi.org/10.1136/bmjpo-2021-001277
21. Melani, A. S. (2021). Inhaler technique in asthma and COPD: challenges and unmet knowledge that can contribute to suboptimal use in real life. *Expert Review of Clinical Pharmacology*, *14*(8), 991-1003. https://doi.org/10.1080/17512433.2021.1929922
22. Misra-Hebert, A. D., Perzynski, A., Rothberg, M. B., Fox, J., Mercer, M. B., Liu, X., ... & Stange, K. C. (2018). Implementing team-based primary care models: a mixed-methods comparative case study in a large, integrated health care system. *Journal of general internal medicine*, *33*(11), 1928-1936. https://doi.org/10.1007/s11606-018-4611-7
23. Morrow, B. M. (2019). Airway clearance therapy in acute paediatric respiratory illness: A state-of-the-art review. *South African Journal of Physiotherapy*, *75*(1), 1-12. https://hdl.handle.net/10520/EJC-179032b030
24. O'Malley, A. S., Draper, K., Gourevitch, R., Cross, D. A., & Scholle, S. H. (2015). Electronic health records and support for primary care teamwork. *Journal of the American Medical Informatics Association*, *22*(2), 426-434. https://doi.org/10.1093/jamia/ocu029
25. Powell, B. J., Fernandez, M. E., Williams, N. J., Aarons, G. A., Beidas, R. S., Lewis, C. C., ... & Weiner, B. J. (2019). Enhancing the impact of implementation strategies in healthcare: a research agenda. *Frontiers in public health*, *7*, 3. https://doi.org/10.3389/fpubh.2019.00003
26. Ralston, S. L., Lieberthal, A. S., Meissner, H. C., Alverson, B. K., Baley, J. E., Gadomski, A. M., ... & Hernandez-Cancio, S. (2014). Clinical practice guideline: the diagnosis, management, and prevention of bronchiolitis. *Pediatrics*, *134*(5), e1474-e1502. https://doi.org/10.1542/peds.2014-2742
27. Rotenstein, L. S., Holmgren, A. J., Horn, D. M., Lipsitz, S., Phillips, R., Gitomer, R., & Bates, D. W. (2023). System-level factors and time spent on electronic health records by primary care physicians. *JAMA Network Open*, *6*(11), e2344713-e2344713. doi:10.1001/jamanetworkopen.2023.44713
28. Russell, A. F., Nanda, A., & Bingemann, T. A. (2022). The vital role of the school nurse in managing asthma. *NASN School Nurse*, *37*(1), 8-12. https://doi.org/10.1177/1942602X211037260
29. Sargeant, J., Loney, E., & Murphy, G. (2008). Effective interprofessional teams:"contact is not enough" to build a team. *Journal of continuing education in the health professions*, *28*(4), 228-234. *DOI:* 10.1002/chp.189
30. Saxby, N., Beggs, S., Battersby, M., & Lawn, S. (2019). What are the components of effective chronic condition self-management education interventions for children with asthma, cystic fibrosis, and diabetes? A systematic review. *Patient education and counseling*, *102*(4), 607-622. https://doi.org/10.1016/j.pec.2018.11.001
31. Somé, N. H., Devlin, R. A., Mehta, N., Zaric, G. S., & Sarma, S. (2020). Team-based primary care practice and physician's services: Evidence from Family Health Teams in Ontario,

Canada. *Social science & medicine*, *264*, 113310. https://doi.org/10.1016/j.socscimed.2020.113310

32. Usmani, O. S., Lavorini, F., Marshall, J., Dunlop, W. C. N., Heron, L., Farrington, E., & Dekhuijzen, R. (2018). Critical inhaler errors in asthma and COPD: a systematic review of impact on health outcomes. *Respiratory research*, *19*(1), 10. https://doi.org/10.1186/s12931-017-0710-y
33. Volerman, A., Carpenter, D., & Press, V. (2020). What can be done to impact respiratory inhaler misuse: exploring the problem, reasons, and solutions. *Expert review of respiratory medicine*, *14*(8), 791-805. https://doi.org/10.1080/17476348.2020.1754800
34. Will, K. K., Johnson, M. L., & Lamb, G. (2019). Team-based care and patient satisfaction in the hospital setting: a systematic review. *Journal of Patient-Centered Research and Reviews*, *6*(2), 158. https://doi.org/10.17294/2330-0698.1695
35. Xie, Z., Wang, X., Sun, L., Liu, J., Guo, Y., Xu, B., ... & Shen, A. (2016). Appraisal of clinical practice guidelines on community-acquired pneumonia in children with AGREE II instrument. *BMC pediatrics*, *16*(1), 119. https://doi.org/10.1186/s12887-016-0651-5
36. Zhou, X., Zhang, P., Tan, H., Dong, B., Jing, Z., Wu, H., ... & Sun, X. (2023). Progress in diagnosis and treatment of difficult-to-treat asthma in children. *Therapeutic Advances in Respiratory Disease*, *17*, 17534666231213637. https://doi.org/10.1177/17534666231213637
37. Zoorob, R. J., Sidani, M., & Fremont, R. D. (2012). Team-based care in family medicine: A review of the evidence. *American Family Physician, 86*(7), 654–660.