Pharmacist Involvement in Improving Asthma Outcomes in Community Pharmacy Settings

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Resident Pharmacotherapy Rounds
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Objectives:

1. Examine the burden of asthma in the United States and Texas

2. Disseminate up-to-date information on managing asthma for persons twelve and older, covering the four components of asthma care outlined in the Expert Panel Report-3 (EPR-3)

3. Review the literature of asthma wellness programs in the community pharmacy setting

4. Discuss strategies to design, implement and evaluate a H-E-B community pharmacy program that aims to improve asthma outcomes while containing medical and health plan costs
Objective 1: Examine the burden of asthma in the United States and Texas

I. In the United States:
   a. More than 34 million adults have asthma\(^1\)
   b. Prevalence of asthma increased 75% from 1980-1994\(^2\)
   c. Asthma rates in children under the age five have increased more than 160% from 1980-1994\(^2\)
   d. It is estimated that the number of people with asthma will grow by more than 100 million by 2025\(^3\)

II. Each year, this leads to:
   a. More than 10 million work days missed\(^4\)
   b. Nearly 2 million asthma-related emergency room visits\(^4\)
   c. $14.7 billion in healthcare expenditures
      i. $5 billion in indirect cost, such as lost productivity\(^1\)
      ii. Prescription drugs are largest single direct medical expenditure (over $6 billion)\(^1\)
   d. More than 33,000 asthma-related deaths\(^5\)

III. Impact in Texas:\(^6\)
   a. Asthma affects one in ten people
   b. Annual financial burden is over $391.5 million in inpatient admissions
   c. 300 deaths/year
   d. Only 15% of asthma patients report being symptom free

IV. The results of 10,139 patients who completed the Asthma Control Test (ACT) showed that 85% of patients think their asthma is well controlled but:\(^7\)
   a. 58% had more than 1 exacerbation within the past year
   b. 46% had been prescribed an oral corticosteroid
   c. 41% had poor control (ACT score < 19)
   d. 40% had an asthma-related ER visit
   e. 39% of patients treated with only albuterol were not well controlled
   f. 11% had an asthma-related hospitalization
Objective 2: Disseminate up-to-date information on managing asthma for persons twelve and older, covering the four components of asthma care outlined in EPR-3

I. Expert Panel Report-3

a. 4 components considered essential to effective asthma management:
   i. Assessment and monitoring
   ii. Education for a partnership in asthma care
   iii. Control of environmental factors and comorbid conditions that affect asthma
   iv. Pharmacotherapy

b. Evidence-based recommendations:
   i. Evidence A: Randomized, controlled trials (RCTs), rich body of data
   ii. Evidence B: RCTs, limited body of data
   iii. Evidence C: Nonrandomized trials and observational trials
   iv. Evidence D: Panel consensus judgment

c. **Component #1: Assessment and monitoring**
   i. Control of asthma is viewed in the context of two following domains:

      1. **Reducing impairment**
         a. Goals:
            i. Prevent chronic and troublesome symptoms (e.g., coughing or breathlessness in the daytime, in the night, or after exertion)
            ii. Require infrequent use (≤2 days a week) of short acting beta agonist (SABA) for quick relief of symptoms
            iii. Maintain (near) normal pulmonary function
            iv. Maintain normal activity levels (including exercise and other physical activity and attendance at work or school)
            v. Meet patients’ and families’ expectations of asthma care

         b. Validated questionnaires for assessing impairment domain (NOT for assessing lung function or the risk domain):
            i. ATAQ = Asthma Therapy Assessment Questionnaire©
               1. Minimal important difference: 1.0
            ii. ACQ = Asthma Control Questionnaire©
               1. Minimal important difference: 0.5
            iii. ACT = Asthma Control Test TM
               1. Minimal important difference: not determined

      2. **Reducing risk**
         a. Goals:
            i. Prevent recurrent exacerbations of asthma, and minimize the need for ED visits or hospitalizations
            ii. Prevent progressive loss of lung function; for youths, prevent reduced lung growth
            iii. Provide optimal pharmacotherapy with minimal or no adverse effects
### Classification of Asthma Severity (Youths ≥12 years of age and adults)

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Intermittent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
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<tbody>
<tr>
<td>Impairment</td>
<td></td>
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<tr>
<td>Normal FEV₁/FVC</td>
<td></td>
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<tr>
<td>8–19 yr</td>
<td>85%</td>
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<tr>
<td>20–39 yr</td>
<td>80%</td>
<td></td>
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<tr>
<td>40–59 yr</td>
<td>75%</td>
<td></td>
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<tr>
<td>60–80 yr</td>
<td>70%</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week but not daily</td>
<td>Daily</td>
<td>Throughout the day</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
<td>3–4x/month</td>
<td>&gt;1x/week but not nightly</td>
<td>Often 7x/week</td>
</tr>
<tr>
<td>Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
<td>&gt;2 days/week but not &gt;1x/day</td>
<td>Daily</td>
<td>Several times per day</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
<td>Minor limitation</td>
<td>Some limitation</td>
<td>Extremely limited</td>
</tr>
<tr>
<td>Lung function</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal FEV₁ between exacerbations</td>
<td>• FEV₁ &gt;80% predicted</td>
<td>• FEV₁ &gt;80% predicted</td>
<td>• FEV₁ &gt;60% but &lt;80% predicted</td>
<td>• FEV₁ &lt;60% predicted</td>
</tr>
<tr>
<td>FEV₁/FVC normal</td>
<td>• FEV₁/FVC normal</td>
<td>• FEV₁/FVC normal</td>
<td>• FEV₁/FVC reduced 5%</td>
<td>• FEV₁/FVC reduced &gt;5%</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
<td>≥2/year (see note)</td>
<td></td>
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</tbody>
</table>

**Figure 1:** Classifying asthma severity in people ≥ 12 years old who are not currently taking long-term control medications. Level of severity is determined by assessment of risk and impairment by the patient’s recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.

### How to gain and maintain control with minimal medication and side effects:

1. A stepwise approach is recommended (See Appendix A)
2. Asthma severity dictates the type, amount and scheduling of medication for initiating therapy and level of asthma control for adjusting therapy (Evidence A)
3. Step-down therapy is essential to identify the minimum medication necessary to maintain control

   a. ICS may be reduced about 25–50% every 3 months (Hawkins et al. 2003; Lemanske et al. 2001)
4. If the add-on therapy initially administered does not lead to improvement in asthma control, discontinue it and consider a trial of a different add-on therapy before stepping up (Evidence D)

5. Before step up in therapy, review:
   a. Adherence to medication
   b. Inhaler technique
   c. Environmental control
   d. Comorbid conditions

6. **For the impairment domain**, adding LABA, rather than increasing the dose of ICS, more consistently results in improvements (EPR—Update 2002)

7. **If the risk domain is of particular concern**, then a balance of potential risks needs to be considered
   a. Adding LABA to low-dose ICS
      i. Potential benefit:
         1. Reduces the frequency of exacerbations to a greater extent than doubling the dose of ICS (Masoli et al. 2005)
      ii. Potential risk:
         1. Rare life-threatening or fatal exacerbations
   b. Increasing the dose of ICS
      i. Potential benefit:
         1. Significantly reduce the risk of exacerbations, but this benefit may require up to 4x the ICS dose (Pauwels et al. 1997)
      ii. Potential risk:
         1. Systemic effects; with medium-dose risk is small

<table>
<thead>
<tr>
<th>Lowest level of treatment required to maintain control (See figure 4–5 for treatment steps.)</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent</td>
<td>Persistent</td>
</tr>
<tr>
<td>Step 1</td>
<td>Mild</td>
</tr>
<tr>
<td>Step 2</td>
<td>Step 3 or 4</td>
</tr>
</tbody>
</table>

**Figure 2**: Classifying severity of asthma once symptoms are well controlled by lowest level of treatment necessary to maintain control. Classification of asthma severity is used for clinical research; whereas, the level of control is used to monitor clinical treatment.

iv. Monitoring and follow-up
   a. When initiating therapy, monitor at 2- to 6- week intervals
   b. Follow-up at 1- to 6- months, depending on the level of control
      i. Maintain good control for at least 3 months before increasing interval to every 6 months
   c. Consider 3-month intervals if a step down in therapy is anticipated
   d. Either peak flow monitoring or symptoms monitoring may be equally effective (Evidence B)
e. Long-term peak flow monitoring is recommend for patients with:
   i. Moderate or severe persistent asthma
   ii. History of severe asthma exacerbations
   iii. Difficulty perceiving asthma control
f. Provide all patients a written asthma action plan

### Classification of Asthma Control

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<thead>
<tr>
<th>Components of Control</th>
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<tbody>
<tr>
<td></td>
<td>Well-Controlled</td>
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<td>Impairment</td>
<td></td>
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<tr>
<td>Symptoms</td>
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<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>FEV₁ or peak flow</td>
<td>&gt;80% predicted/ personal best</td>
</tr>
<tr>
<td>Validated Questionnaires</td>
<td></td>
</tr>
<tr>
<td>ATAQ</td>
<td>0</td>
</tr>
<tr>
<td>ACQ</td>
<td>≤0.75*</td>
</tr>
<tr>
<td>ACT</td>
<td>≥20</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Exacerbations</td>
<td>0–1/year</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>Evaluation requires long-term followup care</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.</td>
</tr>
</tbody>
</table>

**Figure 3:** Assessing asthma control in people ≥ 12 years old who are currently taking their asthma maintenance medications. Level of severity is determined by assessment of risk and impairment by the patient’s recall of previous 2-4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs. For treatment purposes, patients who had 2 or more exacerbations requiring oral systemic corticosteroids in the past year may be considered for same as patients who have persistent asthma.

d. **Component #2: Education for a partnership in asthma care**
   i. Proven effective techniques:
      a. Shared clinician/patient decision-making about the goals of treatment, medications to use and actions to take to promote asthma control
      b. Regular follow-up by a consistent health care provider
      c. Documentation of key education points taught to track progress and communicate with other healthcare providers
ii. Key educational points to teach patients:

a. Basic facts about asthma
   i. Contrast between airways of a person who has and a person who doesn’t have asthma; role of inflammation
   ii. What happens to the airways in an asthma attack

b. Roles of Medications
   i. Understanding the differences between long-term control and quick-relief

c. Patient skills
   i. Taking medications correctly
      1. Have patient demonstrate inhaler technique
      2. If appropriate, have patient demonstrate the use of a valved holding chamber or spacer
      3. Review at each visit because these skills can deteriorate rapidly
   ii. Identifying and avoiding triggers
   iii. Self-monitoring to:
      1. Assess level of asthma control
      2. Monitor symptoms, if prescribed, with peak flow meter
      3. Recognize early signs of worsening asthma
   iv. Using written asthma action plan to know when and how to:
      1. Take daily actions to control asthma
      2. Adjust medication in response to signs of worsening asthma
      3. Seek medical care as appropriate

d. Patients especially need to be reminded to:
   i. Inhale slowly
   ii. Activate the inhaler only once for each breath
   iii. To use dry powdered inhalers devices correctly

e. Component #3: Control of environmental factors and comorbid conditions

i. Avoid common environmental triggers:
   a. Tobacco smoke
   b. Smoke from wood stoves
   c. Strong orders
   d. Exertion outdoors mid-afternoon when levels of air pollution are highest
   e. Sulfite-containing foods
   f. Formaldehyde and volatile organic compounds
   g. Dust-mites and indoor fungi
   h. Animal antigens
   i. Cockroaches
   j. Cold air

ii. Treating the following conditions may improve asthma management:
   a. Allergic bronchopulmonary aspergillosis (Evidence A)
   b. Gastroesophageal reflux (Evidence B)
c. Obesity (Evidence B, limited studies)
d. Obstructive sleep apnea (Evidence D)
e. Rhinitis/sinusitis (Evidence B)
f. Chronic stress/depression (Evidence D)

iii. Medication sensitivities:

a. Aspirin
   i. 21% of adults and 5% of children with asthma have aspirin-induced asthma
   ii. 39% of adults asthma patients admitted to a hospital experienced severe-to-fatal exacerbations after taking aspirin and certain NSAIDs
   iii. Prevalence of aspirin sensitivity increase with age and asthma severity
   iv. Patient counseling:
      1. Ask patients if aspirin and other NSAIDs have caused bronchospasm (Evidence C)
         a. If so, inform patients of potential for these drugs to precipitate severe and even fatal exacerbations
      2. Adult patients who have severe persistent asthma or nasal polyps should be counseled regarding the risk of using these drugs (Evidence C)

b. Beta-Blockers
   i. Nonselective beta-blockers can cause asthma symptoms (Odeh et al. 1991; Schoene et al. 1984)
      1. Avoid nonselective beta-blockers, including those in ophthalmological preparations (Evidence B)
   ii. Examples of nonselective beta-blockers
      1. Carteolol ophthalmic
      2. Coreg® carvedilol
      3. Trandate® labetalol
      4. Cogard® nadolol
      5. Levatol® penbutolol
      6. Pindolol
      7. Inderal® propranolol
      8. Betapace® sotalol
      9. Timolol
      10. Timoptic® timolol ophthalmic

c. Cardioselective beta-blocker alternatives to nonselective beta-blockers:
   1. Sectral® acebutolol
   2. Tenormin® atenolol
   3. Zebeta® bisoprolol
   4. Brevibloc® esmolol
   5. Lopressor®/ Toprol-XL® metoprolol
   6. Kerlone® betaxolol
   7. Betoptic S® betaxolol ophthalmic
   8. Bystolic® nebivolol
f. Component #4: Pharmacotherapy

a. Quick-relief medications
   i. Anticholinergics (ipratropium)
      1. Mechanism of action:
         a. Inhibit muscarinic cholinergic receptors and reduce intrinsic vagal tone of the airway
      2. Place in therapy:
         a. Provides little additive benefit to SABA in moderate-to-severe asthma exacerbations
         b. May be used as an alternative to those who can’t tolerate SABA (Evidence D)
   ii. Short acting beta agonist, SABAs (albuterol, levalbuterol, pirbuterol)
      1. Mechanism of action:
         a. Relax smooth muscles in airways
      2. Place in therapy:
         a. First choice for relief of acute symptoms and prevention of exercise induced bronchospasm (Evidence A)
         b. Daily use is not recommended
            i. Use of >1 canister/month = inadequate control
   iii. Theophylline (methylxanthines)
      1. Mechanism of action:
         a. Provides broncodilation by increasing cAMP
      2. Place in therapy:
         a. Used for nocturnal asthma, but has fallen out of favor due to systemic effects and need to monitor serum levels
   iv. Systemic corticosteroids (prednisone)
      1. Mechanism of action:
         a. Inhibits multiple inflammatory cytokines
         b. Block late-phase reaction to allergen
      2. Place in therapy:
         a. Short courses to gain prompt control

b. Long-term control medications
   i. Non-steroidal agents (cromolyn sodium, nedocromil, theophylline)
      1. Mechanism of action:
         a. Stabilize mast cells and interfere with chloride channel function
         b. Block early and late-phase reaction to allergen
         c. Mild to moderate bronchodilator
         d. Mild anti-inflammatory effects
      2. Place in therapy:
         a. Alternative for mild persistent asthma (Evidence A)
         b. Preventive treatment prior to exercise or unavoidable exposure
         c. Sustained-release theophylline is a used as alternative adjunct to ICS (Evidence A)
   ii. Leukotriene receptor antagonists (montelukast, zafirlukast)
      1. Mechanism of action:
a. Block leukotrienes from binding in the airways, preventing bronchoconstriction, mucous secretion, vascular permeability, and eosinophil recruitment

2. Place in therapy:
   a. Alternative for mild persistent asthma (Evidence A)
   b. Adjunct to ICSs but for patients ≥12 years they are not preferred to LABAs (Evidence A)

iii. 5-lipoxygenase pathway inhibitor (zileuton)
   1. Mechanism of action:
      a. Inhibits the formation of leukotrienes
   2. Place in therapy:
      a. Alternative adjunctive therapy (Evidence D)
         i. Liver function monitoring is essential

iv. Long acting beta-agonists, LABAs (salmeterol, formoterol)
   1. Mechanism of action:
      a. Prolonged relaxation of airway muscles
   2. Place in therapy:
      a. Not to be used as monotherapy for long-term control (Evidence A)
      b. Benefits of LABA + ICS combo must be weighed against the risk of rare severe exacerbations
         i. For patients with moderate persistent asthma the options should be equally weighed
         ii. For patients with severe persistent asthma or asthma not controlled at step 3, the combo LABA + ICS is preferred (Evidence A)
      c. May be used to prevent exercise induced bronchospasm (Evidence A)
         i. Duration is less than 5 hours with chronic use
         ii. Discourage since it may disguise poorly controlled persistent asthma (Evidence D)

v. Immunomodulators (Omalizumab)
   1. Mechanism of action:
      a. Monoclonal antibody prevents binding of IgE to the high-affinity receptors on basophils and mast cells
   2. Place in therapy:
      a. Adjunct for patients ≥12 years who have year-round allergies and severe persistent asthma despite taking inhaled corticosteroids (Evidence B)

vi. Corticosteroids (dexamethasone, beclomethasone, triamcinolone, flunisolide, fluticasone, budesonide, mometasone, ciclesonide)
   1. Mechanism of action:
      a. Reduce airway hyper-responsiveness
   2. Place in therapy:
      a. Most potent and effective anti-inflammatory (Evidence A)
      b. Inhaled corticosteroids (ICS) are cornerstone for all levels of persistent asthma
      c. Long-term use of oral steroids for severe persistent asthma
Objective 3: Review the literature of asthma programs in community pharmacy settings

I. 15 prospective studies evaluated the benefit of pharmacists’ interventions in community pharmacies in Australia, Europe, and North America

a. Narhi (2000)\textsuperscript{10}
   i. Design:
   1. 1-year intervention followed by 1-year usual care at 4 sites
   2. Visit every 3 months for education, monitoring of therapy and self-management skills
   3. Patient age (y): 41.3 ± 12.2
   4. Completed/enrolled: 28/31

   ii. Study outcomes:
   1. Decrease in daytime wheeze from baseline to 1 year (< 0.01)
   2. No patients with peak expiratory flow rates (PEFR) values <70% optimal value (no reported p-value)

b. Herborg (2001)\textsuperscript{11}
   i. Design:
   1. 1-year controlled, with 31 sites
   2. Visit every month for education and monitoring of therapy
   3. Patient age (y): 38.8 ± 12.3 (Intervention, I), 42.4 ± 11.4 (Control, C)
   4. Completed/enrolled: 413/500

   ii. Study outcomes:
   1. Asthma Morbidity Index decreased from 1.99 to 1.52 (I) vs from 2.10 to 1.88 (C) (p = 0.022)
   2. Peak expiratory flow rate (PEFR) increased from 467.7 to 476.3 (I) vs from 446.9 to 445.7 L/min (C) (p = 0.98)
   3. Living With Asthma Questionnaire (LWAQ) decreased from 1.6 to 1.4 (I) vs from 1.7 to 1.6 (C) (p = 0.017)

c. Schutz (2001)\textsuperscript{12}
   i. Design:
   1. Patient age (y): 45.9 ± 12.5 (C)
   2. Completed/enrolled: 164/242

   ii. Study outcomes:
   1. FEV\textsubscript{1} increased 6.4% (I) vs 6.7% (C) (p = 0.475)
   2. Severity (PCP-rated using the German Asthma Guidelines) decreased from 1.63 to 1.48 (I) vs from 1.61 to 1.66 (C) (p = 0.219)
   3. LWAQ increased from 58.1 to 66.6 (I) vs from 53.7 to 55.8 (C) (p = 0.018)

d. Cordina (2001)\textsuperscript{13}
   i. Design:
   1. 1-year randomized controlled trial with 22 sites
   2. Visit every 4 months for education, monitoring of therapy, and drug therapy recommendations
   3. Patient age (y): 41.3 ± 18.4 (I), 45.8 ± 18.1 (C)
   4. Completed/enrolled: 119/152

   ii. Study outcomes:
   1. Symptoms: 80% (I) vs 64% (C) no wheezing/only nighttime wheeze (p = 0.051); 36% (I) vs 20% (C) nighttime wheeze all or most of the time (p-value not available)
2. PEFR: no difference
3. LWAQ: mean change of $-0.0064 \pm 0.24$ (I) vs $0.0061 \pm 0.35$ (C) ($p = 0.053$)

e. Stergachis (2002)$^{14}$
   i. Design:
   1. 1-year randomized controlled trial with 38 sites
   2. Visit frequency not predetermined
   3. Pharmacist provided education and monitoring of therapy
   ii. Patient age (y): $11.5 \pm 3.4$ (I), $11.8 \pm 3.1$ (C)
   iii. Completed/enrolled: 274/330
   iv. Study outcomes:
   1. No changes in FEV$_1$ percent predicted, data not provided

f. Barbanel (2003)$^{15}$
   i. Design:
   1. 3 months randomized controlled trial with 1 site
   2. Initial consultation with telephone follow-up for education and self-management skills
   3. Patient age (y): $45 \pm 17$ (I), $47 \pm 17$ (C)
   4. Completed/enrolled: 23/24
   ii. Study outcomes:
   1. North of England Asthma Symptoms Scale decreased from $26.3 \pm 4.8$ to $20.3 \pm 4.2$ (I) vs from $27.8 \pm 3.7$ to $28.1 \pm 3.5$ (C) ($p < 0.001$)

g. Emmerton (2003)$^{16}$
   i. Design:
   1. 6-month noncontrolled trial with 5 sites
   2. Visit once a month for education and monitoring of therapy
   3. Patient age (y): not reported, included pediatric and adult subjects
   4. Completed/enrolled: 96/100
   ii. Study outcomes:
   1. Symptoms: improved in 50 participants, worsened in 27, and did not change in 19 (data not provided) (I)
   2. Daily average PEFR indicated 2/3 had some improvement (data not provided) (I)

h. Saini (2004)$^{17}$
   i. Design:
   1. 6-month parallel, controlled (2 control groups) trial with 12 sites
   2. Visits at baseline, 1, 3, and 6 months for education, monitoring of therapy, self-management skills
   3. Patient age (y): $43 \pm 10$ (I), $52 \pm 15$ (C-1), $42 \pm 18$ (C-2)
   4. Completed/enrolled: 87/102
   ii. Study outcomes:
   1. Peak flow index (PFI) increased from $82.7 \pm 8.2\%$ to $87.4 \pm 8.9\%$ (I) ($p < 0.001$)
   2. Mean severity score decreased from $2.6 \pm 0.5$ to $1.6 \pm 0.7$ (I) ($p = 0.001$)

i. Mangiapane (2006)$^{18}$
   i. Design:
   1. 1-year controlled trial with 39 sites
2. 5 visits during for education, monitoring of drug therapy and self-management skills
3. Patient age (y): 43.1 ± 13.7

ii. Study outcomes:
1. Symptoms decreased from 3.1 ± 2.3 to 2.5 ± 2.3 (I) (p < 0.001)
2. FEV₁ increased from 2.8 ± 1.0 to 2.9 ± 1.0 L (I) (p = 0.48)
3. FVC: remained 3.8 ± 1.3 L (initial and final) (I) (p = 0.26)
4. PEFR increased from 402.9 ± 114.9 to 433.4 ± 110.3 (I) (p < 0.001)
5. LWAQ increased from 44.4 ± 14.3 to 49.8 ± 13.5 (I) (p < 0.001)

j. Armour (2007)²⁹
i. Design:
1. 6 month randomized controlled trial with 50 sites
2. 4 required visits and 1 optional; pharmacist provided education, monitoring of therapy and self-management skills
3. Patient age (y): 49.3 ± 17.0 (I), 50.9 ± 15.9 (C)
4. Completed/enrolled: 351/396

ii. Study outcomes:
1. FEV₁ decreased from 75.4 ± 22.5 to 74.1 ± 22.0% predicted (I) vs from 79.3 ± 22.8 to 79.7 ± 22.9% predicted (C) (p = 0.12)
2. FEV₁/FVC decreased from 86.2 ± 15.7% to 86.0 ± 15.6% predicted (I) vs from 87.8 ± 15.8% to 88.2 ± 15.9% predicted (C) (p = 0.37)
3. Mild severity increased from 2.6% to 3.0% (I) vs from 1.5% to 1.6% (C) (p < 0.001); moderate severity decreased from 9.4% to 9.1% (I) vs from 27.7% to 27.2% (C) (p < 0.001); severe classification decreased from 88.0% to 87.9% (I) vs from 70.8% to 71.2% (C) (p < 0.001)

k. Smith (2007)²⁰
i. Design:
1. 6-month controlled, parallel trial with 21 sites
2. 3 required visits and 1 optional for monitoring of therapy, education, and goal setting
3. Patient age (y): 51.4 ± 18.4 (I), 54.5 ± 20.1 (C)
4. Completed/enrolled: 91/109

ii. Study outcomes:
1. Asthma Quality of Life Questionnaire (AQLQ) decrease from 2.25 ± 0.91 to 1.70 ± 0.55 (I) vs from 2.17±0.89 to 1.90±0.83 (C) (p = 0.05)

l. Saini (2008)²¹
i. Design:
1. 6-month parallel, controlled trial with 20 pharmacists (12 I, 8 C)
2. 4 visits for assessing needs, goal setting, education, and self-management skills
3. Patient age (y) 50.8 ± 15.3 (I), 50.4 ± 18.4 (C)
4. Completed/enrolled: 83/90

ii. Study outcomes:
1. PEFR went from 369.8±103.2 to 385.0±111.0 L/min (I) (p = 0.002)
2. PFI increased from 75.4 ± 13.6% to 85.6 ± 16.4% (I) (p < 0.001)
3. AQLQ decreased from 40.1 ± 13.5 to 34.3 ± 12.3 (I) vs 37.8 ± 15.2 (C) (p = 0.10)
### The Asheville Project: Long-Term Clinical, Humanistic, and Economic Outcomes of a Community-Based Medication Therapy Management Program for Asthma

<table>
<thead>
<tr>
<th>Objective</th>
<th>To assess clinical, humanistic and economic outcomes of a community-based medication therapy management (MTM) program for 207 asthma patients over 5 years</th>
</tr>
</thead>
</table>
| Design    | Quasi-experimental  
Noncontrolled, intent-to-treat  
Longitudinal, pre-post study  
12 pharmacy locations in Asheville, North Carolina  
5 year duration |
| Patient Population | Patients covered by the City of Asheville or Mission Hospitals’ health care plans with a diagnosis of asthma, regardless of baseline control or severity  
Mean age 41.7 years  
103 patients out of the 203 enrolled completed the study |
| Endpoints | FEV₁  
Asthma severity  
Symptom frequency  
Degree to which asthma affected people’s lives  
Presence of an asthma action  
Asthma-related emergency department/hospital events  
Changes in asthma-related costs over time |
| Intervention | Initial education by a certified asthma educator  
Regular long-term follow-up by pharmacists using scheduled consultations  
Monitoring and recommendations to physicians |
| Methods | MTM services for employees with asthma that included self-care education provided by a certified asthma educator  
Financial incentives consisting of waived medication copays paid for by the employer’s health plan |
| Results | Average FEV₁ increased from only 50% of patients having a normal FEV₁ to 75% of patients and from 17% of patients being in the severe range to only 4% (p<0.0008 for all comparisons)  
Severity of asthma classification: 55% improved, 33% had no change, 8% were worse (p<0.003)  
Frequency of being awakened by asthma at night ≥ 2 times/week decreased from 28% to 12% (p=0.01)  
Frequency of being awakened by asthma at night < 1 time/month increased from 55% to 81% (p=0.01)  
Frequency of asthma attacks ≥ 2 times per week decreased from 35% to 16% (p=0.0011)  
Frequency of asthma attacks < 1 time/month increased from 50% to 75% (p=0.0011)  
Asthma action plans increased from 63% to 99%  
Emergency visits decreased from 9.9% to 1.3% per year  
Hospitalizations decreased from 4.0% to 1.9% per year  
Missed/nonproductive work days decreased from 10.8 days/year to 2.6 days/year  
Patients were 6 times less likely to have an ED/hospitalization event  
Direct cost savings averaged $725/patient/year  
Indirect cost savings estimated to be $1,230/patient/year |
| Authors’ conclusions | Asthma patients reach and maintain significant clinical improvement and economic cost-savings despite increased medication use through long-term MTM services |
| Limitations | Lack a randomized control group  
Selection bias since participation was voluntary  
Unequal data-gathering pre- and post-MTM might introduce unaccounted variance |
| Comments | To date, the study with the longest follow-up  
Waived copays may have favorably biased results by improving access to medications  
Unable to determine what interventions (asthma education, long-term follow-up, financial incentives) caused observed improvements |
The BC Community Pharmacy Asthma Study: A study of clinical, economic and holistic outcomes influenced by an asthma care protocol provided by specially trained community pharmacists in British Columbia

<table>
<thead>
<tr>
<th>Objective</th>
<th>• To demonstrate a significant difference in clinical economic and quality of life outcomes in asthma patients who received pharmaceutical care</th>
</tr>
</thead>
</table>
| Design | • Randomized controlled trial  
• 18 pharmacy locations in Canada  
• 1 year duration |
| Patient Population | • Pharmacists recruited patients in local community  
• Mean age 48 years, range 7-84 years  
• 204 patients out of the 405 enrolled completed the study |
| Endpoints | • PEFR  
• Asthma severity  
• Symptom frequency  
• Degree to which asthma affected people’s lives  
• Asthma-related emergency department/hospital events |
| Intervention | • 1 hour visit every 2-3 weeks for 3 visits, then every 3 months  
• Pharmacists assessed readiness for change to appropriately tailor education of self-management skills and to adjust therapy |
| Methods | • Patients randomized to usual care, enhanced care, and control groups  
• Usual care included initial interview with pharmacist to complete a symptoms, drug utilization and knowledge assessment, education on inhaler technique and project; patients were asked to turn in monthly PEFR calendars, number of days off work/school and ED/hospital visits  
• Enhanced care included all of the above in the usual care group plus teaching of self-management skills and an asthma action plan as outlined in protocol  
• Controls did not receive any special interventions |
| Results | • Total symptom score decreased 11% from 1.081 to 0.531 (I) vs from 1.058 to 0.928 (C) (p < 0.001)  
• Days off school/work were reduced by 0.6 days/month  
• Use of SABAs was reduced 50%  
• PEFR increased from 349.4 to 383.4 L/min (I) vs from 344.1 to 351.9 L/min (C) (p = 0.0002)  
• Overall quality of life improved by 19%, AQLQ-J scores increased from 4.294 to 5.133 (I) vs from 4.234 to 4.400 (C) (p = 0.0001)  
• ED visits decreased 75% from 0.165 to 0.043 (I) vs from 0.377 to 0.213 days in previous months (C) (p = 0.4757)  
• Hospital visits decreased 75% from 0.123 to 0.078 (I) vs from 0.143 to 0.160 days in previous months (C) (p = 0.9396) |
| Authors’ conclusions | • Specially trained pharmacists can produce impressive improvements in clinical, economic and humanistic measures for asthma patients following a protocol  
• Cost analysis reinforces intensive pharmaceutical care is more cost effective than usual care in terms of most direct and indirect costs in asthma patients  
• The health care system needs to produce incentives for such care |
| Limitations | • Selection bias to patients whose asthma was uncontrolled  
• Self-filling prophecy since pharmacists were conducting a study with regular costumers as subjects |
| Comments | • Pharmacists were highly motivated to improve asthma care and were well paid ($75 for usual care/ patient and $300 for each patient in enhanced care)  
• Successful ingredients to community pharmacy asthma wellness programs include teaching self-management skills in person and giving patients written action plans  
• Decent reimbursement for pharmacist’ time may be another ingredient |
**Objective**

- To assess the effectiveness of a pharmaceutical care program for patients with asthma or chronic obstructive pulmonary disease (COPD)

**Design**

- Randomized controlled trial
- Conducted at 36 community drugstores in Indianapolis, Ind.
- Outcomes were assessed in 947 (85.1%) participants at 6 months and 898 (80.7%) at 12 months

**Patient Population**

- 1113 participants with active COPD or asthma from July 1998 to December 1999
- Number in the control group with asthma that completed the study was 207
- 898 patients out of the 1113 enrolled completed the study
- Patient age in years: 44.7 ± 14.2 (pharmaceutical care, PC), 46.6 ± 15.1 (peak flow meter, PFM), 44.6 ± 15.5 (usual care, UC)

**Endpoints**

- PEFRs
- Breathing-related ED or hospital visits
- Health-related quality of life (HRQOL)
- Medication compliance
- Patient satisfaction

**Intervention**

- Pharmaceutical care group (n=447) had pharmacists who had access to recent patient-specific clinical data (PEFRs, ED visits, hospitalizations, and medication compliance), training, customized patient educational materials, and resources to facilitate program implementation
- PEFR monitoring control group (n = 363) received a peak flow meter, instructions about its use, and monthly calls to elicit PEFRs. However, PEFR data were not provided to the pharmacist
- Usual care group (n=303) received neither peak flow meters nor instructions in their use; during monthly telephone interviews, PEFR rates were not elicited.

**Methods**

- Visit frequency not predetermined
- Pharmacist had access to records of patient PEFR, hospitalizations, and ED visits
- Pharmacist provided education and monitoring therapy through monthly telephone interviews

**Results**

- At 12 months, patients receiving pharmaceutical care had significantly higher peak flow rates than the usual care group (P = 0.02) but not than PEFR monitoring controls (P = 0.28)
- No significant between-group differences in medication compliance or HRQOL
- Asthma patients receiving pharmaceutical care had significantly more breathing-related ED or hospital visits than the usual care group (odds ratio, 2.16; 95% confidence interval, 1.76-2.63; P=0.001)
- Patients receiving pharmaceutical care were more satisfied with their pharmacist than the usual care group (P=0.03) and the PEFR monitoring group (P=0.001) and were more satisfied with their health care than the usual care group at 6 months only (P = 0.01)

**Authors’ conclusions**

Pharmaceutical care compared with usual care...
- Increased patients’ PEFRs
- Provided little benefit compared with peak flow monitoring alone
- Increased patient satisfaction
- Increased the amount of breathing-related medical care sought

**Limitations**

- Despite ample opportunities to implement the program, pharmacists accessed patient-specific data only about half of the time and documented actions about half of the time that records were accessed

**Comments**

- Pharmacists were not enthused nor paid well ($50/month)
- Cumbersome system of documenting data, telephone interviews and peak flow meter monitoring were not associated with good outcomes
- Self-management education and written action plans were lacking in pharmaceutical care group
- Poor implementation of the program yielded poor results
Objective 4: Discuss strategies to design, implement and evaluate a H-E-B community pharmacy program that aims to improve asthma outcomes while containing medical and health plan costs

I. Goals and objectives:
   a. Short-term vision
      i. Develop a comprehensive program with a clear set of objectives shared by patients, healthcare providers and insurers
   b. Intermediate goal
      i. Convince H-E-B corporate that the cost of the program will be offset by a decline in member claims while patient satisfaction is maintained and quality of life improved
   c. Long-term vision
      i. H-E-B pharmacists provide enhanced asthma education covering the four components of EPR-3 and subsequent updates to their clients at 1- to 6-month intervals, depending on the level of control

II. Personnel requirements:
   a. Have pharmacists interested in providing the advance level of asthma care become certified asthma educators through the National Asthma Educator Board
   b. Use office support personnel schedule appointments and take care of faxes
   c. Employ financial accounting and data processing employees
   d. Appoint a physician who has demonstrated a commitment to the care of patients with asthma patients to be medical director of the program

III. Logistic issues
   a. Develop a clinical setting at H-E-B facilities with set hours of operation
   b. Use referral sources from inpatient populations, clinics, school nurses, public health nurses, manage care operations and self-referrals
   c. Have certified pharmacists speak regularly to medical and corporate groups within their community

IV. Implementation strategies
   a. Start a pilot program at large distribution facilities
   b. Target H-E-B employees and dependents covered by H-E-B health insurance
   c. Partner with local physicians for buy-in
   d. Host lunchtime seminars for patients with brochures of incentives
   e. Individually tailor content of delivery based on personal needs
   f. Encourage patients to discuss pharmacists’ recommendations with physicians

V. Administration, legal, and liability issues
   a. Consult with fields of law and insurance to ensure program complies with all necessary regulations
   b. Partner with a durable medical equipment provider to make special arrangements for pricing, expediting insurance claims and delivery

VI. Evaluation plan: Outcomes
   a. Assess risk domain by recording:
      i. Number of ED and hospital visits for one year pre- and post- MTMs
ii. FEV₁ measured at each visit using digital peak flow meter
b. To access impairment domain, have patients complete the ACT survey at each visit
   i. ACT survey ask the patients in the last four weeks:
      1. How much of the time did asthma keep them from getting as much work done at work, school, or home
      2. How often they had shortness of breath
      3. How often did asthma symptoms wake them up at night
      4. How often they used their rescue inhaler or nebulizer
      5. How they would rate their asthma
   ii. A score less than 19 indicates asthma is not under control
c. Costs
   i. Health insurance claims using BlueCrossBlueShields of Texas data
   ii. Patient report of days missed of school/work
   iii. Medication adherence using H-E-B pharmacy software
d. Patient Self-Management
   i. Presence of asthma action plan using symptom or peak flow monitoring
   ii. Proper inhaler and device technique
   iii. Severity of asthma based on EPR-3 guidelines

VII. Budget
a. AstraZenca has provided funding to partially pay for pharmacists’ time
b. Allow patients to pay fee out-of-pocket
c. Convince insurance companies to pay
d. Apply for grants
e. Lobby for pharmacists to be reimbursed for asthma education using current procedural terminology (CPT) codes
f. Elicit donations and allow funders to provide tax-deductible contributions²⁵
g. Switch to hourly wage for staff instead of per-visit system²⁵
h. Ensure funding costs do not grow faster than revenue generated²⁵
i. Do not allow payers to limit the number of visits per cycle²⁵

VIII. Evaluating program impact
a. Begin at the initial programming stage and continue over life of program to provide feedback to stakeholders
   i. Develop a systemic way to record data securely input outcomes in a MTM computer software program
   ii. Keep a balanced account of costs of delivering services and savings due to interventions
   iii. Develop instruments with H-E-B computer software to monitor adherence
   iv. Determine what strategies are most successful and what adjustments to make to overcome obstacles
   v. Share evaluation findings and lessons learned with others
      1. Present poster at APhA Annual Meeting and Exposition
      2. Submit manuscript for publication
Step 1, 2, and 3 preferred therapies (Evidence A); Step 3 alternative therapy for LTRA (Evidence A), theophylline (Evidence B), and zileuton (Evidence D); Steps 2–4 Immunotherapy is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches; Step 4 preferred therapy (Evidence B), alternative therapy LTRA & theophylline (Evidence B) and zileuton (Evidence D); Step 5 preferred therapy (Evidence B); Step 6 preferred therapy (EPR–2 1997) and omalizumab (Evidence B); In step 6, before oral systemic corticosteroids are introduced, a trial of high-doseICS + LABA + either LTRA, theophylline, or zileuton may be considered, although this approach has not been studied in clinical trials.
References: