**Asthma Treatment Steps: Dynamic algorithm, Patterns, and Outcomes**

**Goals of study are**

1. Develop a pharmacy utilization treatment step algorithm based on the GINA guidelines using the PharMetrics® claims database.
2. Associate longitudinal pharmacy utilization treatment step patterns with patient characteristics.
3. Compare asthma outcomes by treatment step patterns within age categories

**What do we expect from Richard?**

1. Create SAS analytic files including
   1. Patients’ characteristic file
   2. Exposure file
   3. Outcome file

Please see example analytic files in **Data analysis file examples.doc** Word document and further definitions and codes in **Drug and ICD codes.xls** Excel file.

**Study period:** January 2006 – December 2013

**Population:** All patients with asthma within most recent 10% random sample database housed by CePOR

**Patient entry criteria:**

1. evidence of asthma at least two recorded diagnosis for asthma (icd-9:493.xx) within 1 year
2. having at least 24 months continuous eligibility after index date (follow-up period) and at least 6 months continuous eligibility before index date (pre-period)
3. Age 6-64 at index.

**Patient exclusion criteria:**

1. diagnosed with cystic fibrosis (ICD-9; 277.0x) or chronic obstructive pulmonary diseases (491.xx, 492.xx, 494.xx and 496.xx) or respiratory tract cancer (160.xx–164.xx or 231.xx) or bronchopulmonary dysplasia (770.7x) or respiratory distress syndrome (769.xx)
2. one of the following diagnoses: Addison disease (255.4x), glomerulonephritis (580.xx-582.xx), multiple sclerosis (340.xx), polymyositis/dermatomyositis (710.3x, 710.4x), rheumatoid arthritis (714.xx), scleroderma (710.1x), Sjogren disease (710.2x ), systemic lupus erythematosus (710.0x), uveitis (360.11, 363.20 364.3x ), vitiligo (709.01), Wegener granulomatosis (446.4x), Primary systemic vasculitis (447.6x), Crohn’s disease (555.0x-555.2x, 555.9x), Ulcerative colitis (556.0x – 556.6x, 556.8x, or 556.9x), Chronic eosinophilic pneumonia (518.3x), Idiopathic pulmonary fibrosis (516.3x or 515.xx), minimal change disease (581.3x), autoimmune hepatitis (571.42), Myasthenia Gravis (358.0x), Muscular dystrophy (359.0x, 359.1x, or 359.21), Still’s disease (714.2x), Churg Strauss syndrome (446.4x), Polymyalgia rheumatica (725.xx)

**Index date:** The first date of asthma diagnosis with 6 months eligibility before the index date (**NOTE:** asthma diagnosis can occur prior to the index date, however, these diagnoses would not have 6 months eligibility prior to the dates.)

**6 months**

**pre-period**

**1st year of post-period**

**2nd year of post-period**

**The first asthma diagnosis date (index date)**

**Treatment: Step 0**

**Treatment:**

**Step 1**

**Treatment:**

**Step 2**

**Treatment:**

**Step 3**

**Treatment:**

**Step 2**

**At least 2.5 year continuous enrollment**

**Note:** The post-period must be at least 2 years after the index date but could be longer than 2 years.

**Figure 1** An illustration of index date and follow-up period

**Exposure:** Asthma treatment step including step 0 – step 5 (see algorithm of each treatment step in figure 2 and codes in Excel file).

Anti-IgE inhibitor ***OR*** Oral corticosteroid (> 14 days’ supply/claim)

**Step 5**

Yes

No

Medium/High-dose ICS + LABA ***OR***

Medium/High-dose ICS/LABA combination ***OR***

Medium/High-dose ICS + Leukotriene modifier ***OR***

Medium/High-dose ICS + Methylxanthines

**Step 4**

Yes

No

Low-dose ICS + LABA ***OR***

Low-dose ICS/LABA combination ***OR***

Medium/High-dose ICS ***OR***

Low-dose ICS + Leukotriene modifier ***OR***

Low-dose ICS + Methylxanthines

**Step 3**

Yes

No

Low-dose ICS ***OR***

Leukotriene modifier ***OR***

Low-dose Methylxanthines ***OR***

Mast cell stablizers

**Step 2**

Yes

No

Short-acting beta-agonist only

**Step 1**

Yes

No

No asthma-related treatment (steps 1-5) (any gap >14 days)

**Step 0**

Yes

**Figure 2** Asthma treatment step algorithm

Each patient will have at least 1 treatment step but the patient could have many treatment steps over the observational time period. What we would like is start date and stop date of each treatment step for each patient.

Patient#A

Patient#B

1st fill: trt 2

2nd fill: trt 2

Overlap

Day 0

40 days gap

2nd fill: trt 2

Day 55

Day 60

Day 125

Day 165

Day 210

1st fill: trt 2

2nd fill: trt 3

Overlap

Day 0

7 days gap

2nd fill: trt 3

Day 60

Day 120

Day 127

Day 210

Day 55

**Figure 3** An illustration of exposure records

Figure 3 illustrates examples of patients who had asthma treatment changed overtime. Patient#A got 3 fills. The first fill was for treatment step 2 from day 0 to day 60. The second fill was for treatment step 3 from day 55 to day 120 with 7 days gap after the second fill. The last fill was also for treatment step 3 from day 127 to day 210. As our definition that we will record the gap of >14 days as treatment step 0, thus there is no treatment step 0 for patient#A. So, the records for patient#A should be as follows.

|  |  |  |  |
| --- | --- | --- | --- |
| **pat\_id** | **trt\_step** | **start\_date** | **stop\_date** |
| A | 2 | 0 | 54 |
| A | 3 | 55 | 210 |

Patient#B have got 3 fills. The second fill was for treatment step 2 from day 55 to day 120 with 40 days gap after the second fill. We will use carry forward approach by counting it as day 0 – day 125. The last fill was also for treatment step 2 from day 165 to day 210. As our definition that we will record the gap of >14 days as treatment step 0, thus there is one treatment step 0 for patient#B. So, the records for patient#B should be as follow.

|  |  |  |  |
| --- | --- | --- | --- |
| **pat\_id** | **trt\_step** | **start\_date** | **stop\_date** |
| B | 2 | 0 | 125 |
| B | 0 | 126 | 164 |
| B | 2 | 165 | 210 |

**Outcomes:**

1. Asthma-related hospitalization
2. Asthma-related emergency department visit
3. Asthma-related outpatient exacerbation
4. Outpatient visit for lower respiratory tract infection treated with antibiotics

(See codes and definition in excel)

For patients who have at least one event, we would like to have data on type of event in numeric format and number of days after the index date in numeric format. For those patients with at least one event, only the event category that are observed need to be included i.e. patients who have hospitalization and outpatient exacerbation would only have event 1 and 3 included in the outcome file.

For patient who do NOT have any events during the follow-up time, we would like to include them and have event = 0 and date = missing.

**Note;** if one of agents satisfies appropriate use, we define that it’s appropriate.