



# Metformin Use and Asthma Outcomes among Patients with Concurrent Asthma and Diabetes

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## Outline

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- Background
- Methods
- Results
- Discussion
- Conclusion



# Title

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ORIGINAL ARTICLE

## Metformin use and asthma outcomes among patients with concurrent asthma and diabetes

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## Background

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- Asthma and diabetes are both prevalent chronic diseases
- Diabetes is a common comorbid condition among adult patients with asthma.<sup>1,2</sup>
- Patients with concurrent asthma and diabetes had poorer glycemic control and quality-adjusted life expectancy.<sup>3</sup>



1. Adams RJ, Wilson DH, Taylor AW, Daly A, Tursan d'Espaignet E, Dal Grande E, Ruffin RE. Coexistent chronic conditions and asthma quality of life: a population-based study. *Chest* 2006; 129: 285–91.  
2. Caughey GE, Vitty AJ, Gilbert AL, Roughhead EE. Prevalence of comorbidity of chronic diseases in Australia. *BMC Public Health* 2008; 8: 221–33.  
3. Black MH, Anderson A, Bell RA, Dabelea D, Pihoker C, Saydah S, Seid M, Standford DA, Watzfelder B, Marcovina SM et al. Prevalence of asthma and its association with glycemic control among youth with diabetes. *Pediatrics* 2011; 128: e839–47.

# Background

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- Metformin
  - Recent animal studies anti-inflammatory effect of metformin can reduce airway inflammation.<sup>1,2</sup>
  - Metformin a first-line treatment for patients with diabetes
  - Whether metformin use could reduce airway inflammation among patients with asthma?



1 Calixto MC, Lintomen L, Andre DM, Leiria LO, Ferreira D, Lellis- Santos C, Anhe GF, Bordin S, Landgraf RG, Antunes E. Metformin attenuates the exacerbation of the allergic eosinophilic inflammation in high fat-diet-induced obesity in mice. *PLoS One* 2013; 8 e76786.  
2 Park CS, Bang BR, KwonHS, Moon KA, KimTB, Lee KY, Moon HB, Cho YS. Metformin reduces airway inflammation and remodeling via activation of AMP-activated protein kinase. *Biochem. Pharmacol.* 2012; 84: 1660–70.

# Aims

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- Study purpose:
  - To evaluate the association between the use of metformin and asthma-related outcomes among patients with concurrent asthma and diabetes.
- Hypothesis:
  - Metformin users were associated with a lower risk of asthma-related hospitalization, ER visit, and exacerbation



## Methods

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- Data source: National Health Insurance Research Database (NHIRD), 2001-2011
- Design: a retrospective cohort study
- Inclusion/exclusion criteria
  - Aged  $\geq 18$
  - Asthma (ICD-9-CM: 493.x) and diabetes (250.x) (both must occur before the index date)
  - Enrollment period: 2002-2008
  - Index date: the date of the first metformin prescription
  - Follow up for 3 years



## Methods

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- Exclusion criteria
  - Use metformin before the index date
  - COPD (ICD-9CM: 491.xx, 492.xx or 496.xx), any respiratory tract cancer (161, 161.x, 162, 163, 163.x, 231, 231.x), or bronchiectasis (494.xx)
  - Patients were also excluded if they had an asthma-related hospitalization or emergency room visit during the pre-index period.



# Methods

## Healthcare resource utilization

Ambulatory Care Expenditures by Visits (CD)  
 Inpatient Expenditures by Admissions (DD)  
 Expenditures for Prescriptions Dispensed (GD)

## Beneficiary information

Registry for Beneficiaries (ID)



## Other datasets

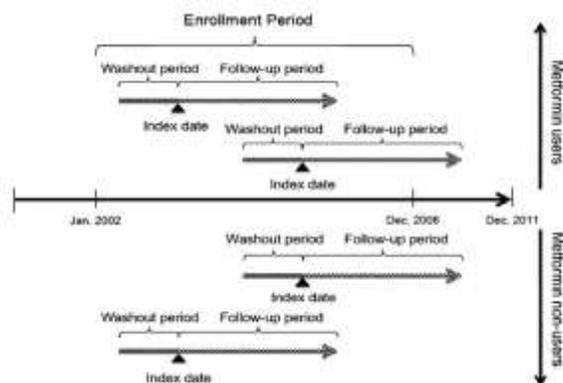
Details of inpatient orders (DO)  
 Details of prescriptions dispensed at contracted pharmacies (GO)



Data source: Taiwan Ministry of Health and Welfare, Department of Statistics

# Methods

- Inclusion/exclusion criteria



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## Methods

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- Outcomes (dependent variable)
  - Asthma related hospitalization
  - Asthma related ER visits
  - Asthma exacerbation
    - A systemic corticosteroid + asthma-related hospital admission
    - A systemic corticosteroid + an emergency room visit
- Exposure (independent variable)
  - Metformin use



## Methods

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- Covariates:
  - Charlson comorbidity index (CCI)
  - Cardiovascular diseases, dyslipidemia, metabolic syndrome end stage renal disease, heart failure or chronic liver disease.
  - Asthma medications
  - Diabetes medications



## Methods

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- Statistical analysis
  - The Student's t-test and chi-square test were used to compare differences in means of continuous variables and percentage
  - Multivariable logistic regression models were used to estimate adjusted odds ratios (ORs)
  - SAS 9.3 (SAS Institute, Cary, NC, USA)



## Results

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- Asthma related hospitalization
  - OR: 0.21, 95% CI: 0.07–0.63
- Asthma related ER visits
  - OR: 0.62, 95%: 0.26–1.44
- Asthma exacerbation
  - OR: 0.39, 95%: 0.19–0.79



## Discussion

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- Main finding
  - Metformin users were associated with a lower risk of asthma-related hospitalization and an asthma exacerbation than metformin non-users among patients with concurrent asthma and diabetes.
- Advantages
  - Metformin may be associated with a reduced risk of airway inflammation, which was reported in previous animal studies
  - Disease diagnosis and medication records
  - Asthma exacerbation



## Challenges (Limitations)

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- Smoking, exercise, diets, allergens, infections, air pollution, etc.
- Socioeconomic status: education, income
- BMI (obesity)
- Medication taken
- Severity of asthma



## Conclusion

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- In summary, metformin use is potentially associated with improvements in asthma control among patients with concurrent asthma and diabetes.
- From a clinical perspective, metformin can become a priority selection among patients with diabetes and asthma.



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Thank you!

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