OCS Use in Asthma Is Associated With Adverse Events[1,2]

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OCS use for asthma can be

Short-term/burst[2]

days

Long-term/maintenance[2]

months

- While an OCS burst may be necessary during an exacerbation, ≥2 OCS bursts per year may indicate poor asthma control[2]
- GINA states that maintenance OCS should be a last resort due to associated **adverse effects (AEs)**[2]

>90% of severe asthma patients with regular OCS use have ≥1 AE[3-6*]

- Osteoporosis
- Fractures
- Cataracts
- Glaucoma
- CVD
- Stroke
- Infection
- Anxiety
- Depression
- Obesity
- Type 2 diabetes
- Sleep disturbance

Risk of AEs increases with increasing cumulative dose[7,8]

Maintenance OCS use in severe asthma is common globally[9-15]

8%–31% of severe asthma patients use maintenance OCS **globally**[9-15]

~10% of severe asthma patients use maintenance OCS **in the USA** in a single year[15]

There is a need for increased vigilance in OCS use[1,2,5,16,17]

How can OCS overuse be reduced?

*Severe asthma patients with regular OCS use defined as Global Initiative for Asthma (GINA) treatment Step 5, with 4 or more prescriptions/year of oral corticosteroids.[3]
Non-asthma controls also experienced AEs, but significantly fewer individuals in the control group experienced AEs compared to those with severe asthma and frequent OCS use.[3]
AE, adverse effect; **CVD**, cardiovascular disease; **OCS**, oral corticosteroid.

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Risk of AEs Increases With Increasing Cumulative Dose[1,2]

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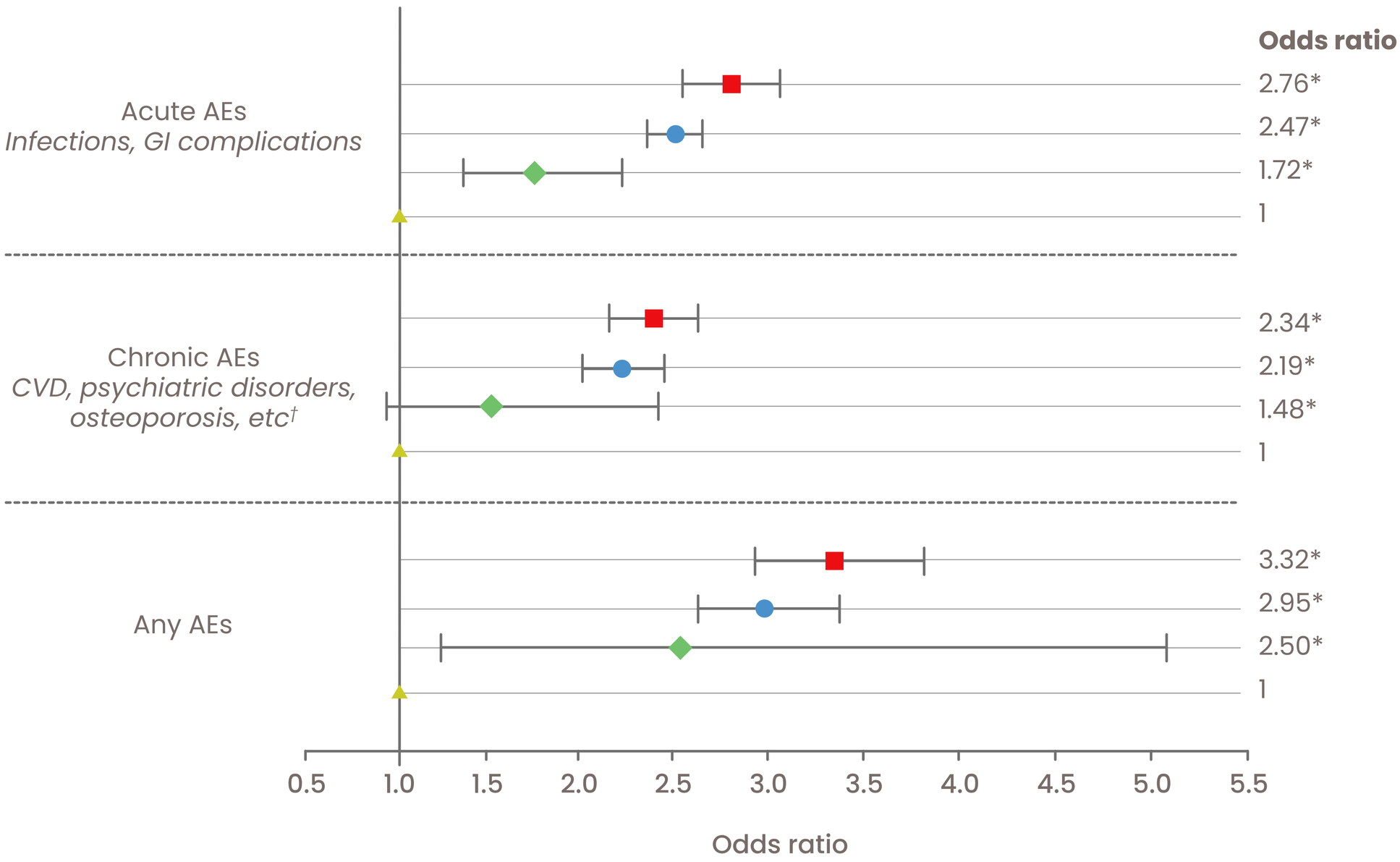
Maintenance OCS is associated with acute and chronic AEs at any dose[1,2]

Maintenance OCS dose in preceding 6 months:

- OCS dose >10 mg/day (high)
- OCS dose 5-10 mg/day (medium)
- OCS dose <5 mg/day (low)
- No OCS



In children with severe asthma, maintenance OCS is also linked with dose-dependent growth delay[3]

Even short-term OCS use is associated with AEs[4-6]

Cumulative lifetime OCS use increases risk of AEs[7]

Concerns about OCS use from the experts

*$P<0.05$. †Chronic complications included cardiovascular, metabolic, bone- and muscle-related, psychiatric, ocular, skin-related, adrenal, and other (bladder cancer, epistaxis, and non-Hodgkin's lymphoma) conditions.[1] ‡3-30 days of OCS use. Durations of short bursts are commonly 5-10 days.[4-6] §4 OCS courses at the usual dose for treating asthma exacerbation are equivalent to ~1 g of OCS exposure.[8]
AE, adverse effect; **CVD**, cardiovascular disease; **GI**, gastrointestinal; **OCS**, oral corticosteroid.

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Risk of AEs Increases With Increasing Cumulative Dose[1,2]

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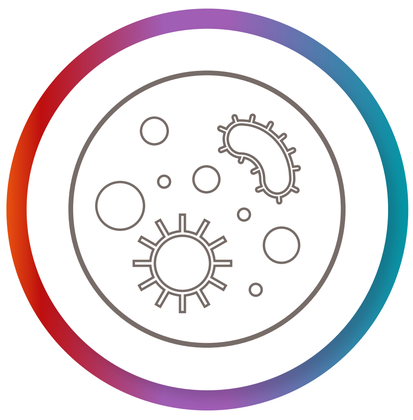
Maintenance OCS is associated with acute and chronic AEs at any dose[1,2]

Even short-term OCS use is associated with AEs[4-6]

1-2 OCS bursts

may increase risk of sepsis, fracture, and mood disorders[4-6‡]



Sepsis

Fracture

Mood disorders

Cumulative lifetime OCS use increases risk of AEs[7]

Concerns about OCS use from the experts

*$P<0.05$. †Chronic complications included cardiovascular, metabolic, bone- and muscle-related, psychiatric, ocular, skin-related, adrenal, and other (bladder cancer, epistaxis, and non-Hodgkin's lymphoma) conditions.[1] ‡3-30 days of OCS use. Durations of short bursts are commonly 5-10 days.[4-6] §4 OCS courses at the usual dose for treating asthma exacerbation are equivalent to ~1 g of OCS exposure.[8]
AE, adverse effect; **CVD**, cardiovascular disease; **GI**, gastrointestinal; **OCS**, oral corticosteroid.

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Risk of AEs Increases With Increasing Cumulative Dose[1,2]

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Maintenance OCS is associated with acute and chronic AEs at any dose[1,2]

Even short-term OCS use is associated with AEs[4-6]

Cumulative lifetime OCS use increases risk of AEs[7]

30% increased risk of

- Osteoporosis
- Type 2 diabetes
- GI ulcers/bleed
- Hypertension
- Cataracts
- Fracture
- Obesity

for each year with ≥4 OCS prescriptions[7,8§]

Concerns about OCS use from the experts

*$P<0.05$. †Chronic complications included cardiovascular, metabolic, bone- and muscle-related, psychiatric, ocular, skin-related, adrenal, and other (bladder cancer, epistaxis, and non-Hodgkin's lymphoma) conditions.[1] ‡3-30 days of OCS use. Durations of short bursts are commonly 5-10 days.[4-6] §4 OCS courses at the usual dose for treating asthma exacerbation are equivalent to ~1 g of OCS exposure.[8]
AE, adverse effect; **CVD**, cardiovascular disease; **GI**, gastrointestinal; **OCS**, oral corticosteroid.

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Risk of AEs Increases With Increasing Cumulative Dose[1,2]

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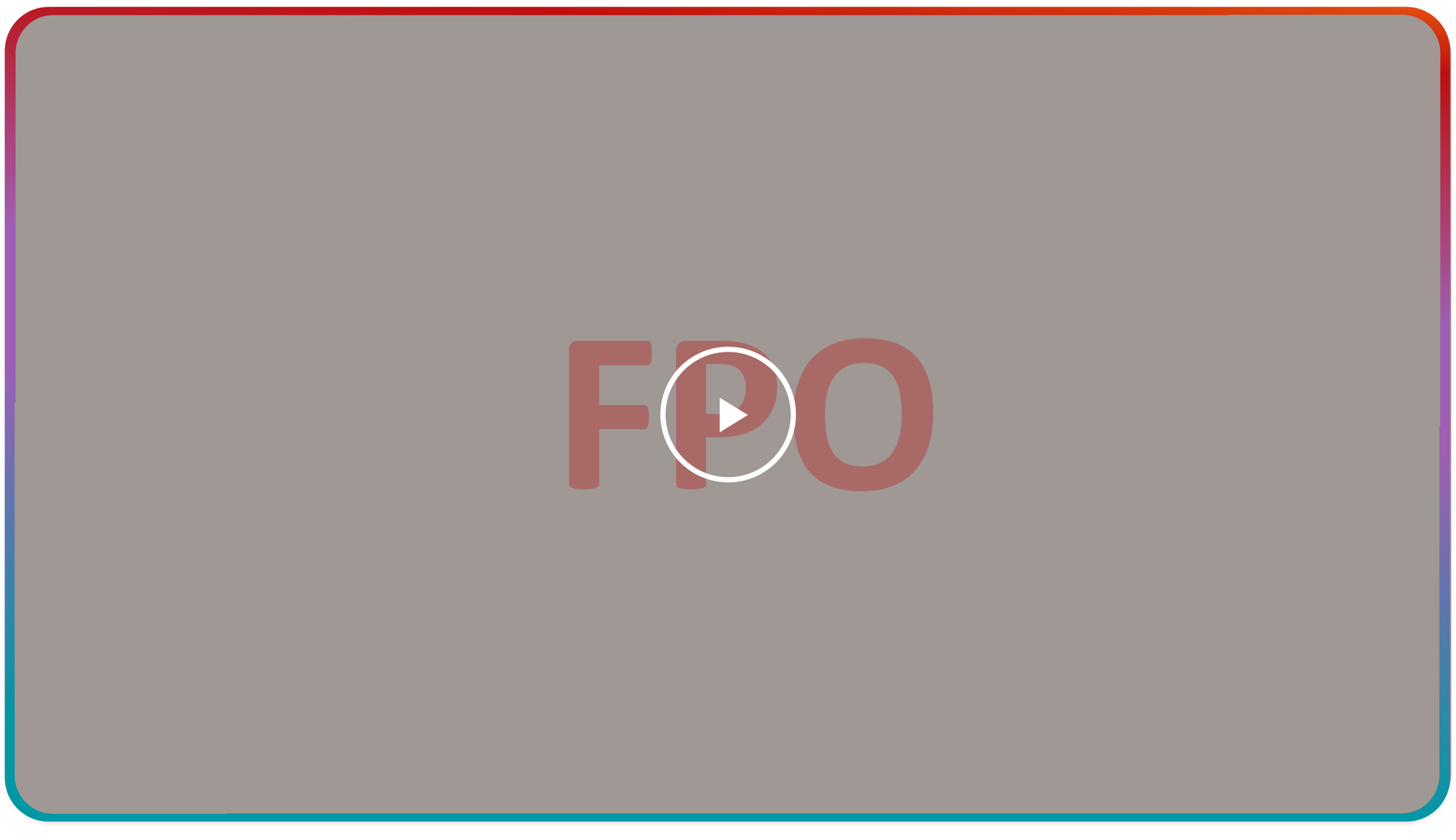
Maintenance OCS is associated with acute and chronic AEs at any dose[1,2]

Even short-term OCS use is associated with AEs[4-6]

Cumulative lifetime OCS use increases risk of AEs[7]

Concerns about OCS use from the experts

Dr. Michael Wechsler and Prof. Alberto Papi discuss short- and long-term risks of OCS use



*$P<0.05$. †Chronic complications included cardiovascular, metabolic, bone- and muscle-related, psychiatric, ocular, skin-related, adrenal, and other (bladder cancer, epistaxis, and non-Hodgkin's lymphoma) conditions.[1] ‡3-30 days of OCS use. Durations of short bursts are commonly 5-10 days.[4-6] §4 OCS courses at the usual dose for treating asthma exacerbation are equivalent to ~1 g of OCS exposure.[8]
AE, adverse effect; **CVD**, cardiovascular disease; **GI**, gastrointestinal; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

% severe asthma patients on maintenance OCS

Population details

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

CHINA[6]

% severe asthma patients on maintenance OCS

10%–13%

Population details

Severe asthma: Uncontrolled symptoms defined according to GINA guidelines and/or frequent exacerbations (>2 per year) despite high-dose inhaled corticosteroids (≥1000 µg fluticasone propionate per day or equivalent dose)
Maintenance OCS: Daily OCS use reported during study (no dose specified)

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

US[1]

% severe asthma patients on maintenance OCS

~10%

Population details

Severe asthma: GINA step 4-5 patients
Maintenance OCS: ≥5 mg/day prednisone or equivalent for ≥90 days; annual maintenance OCS prevalence reported

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

BELGIUM[9-11]

% severe asthma patients on maintenance OCS

21%

Population details

Severe asthma: Asthma that requires treatment with high-dose inhaled corticosteroid treatment plus a second control medication (and/or systemic corticosteroids) for ≥12 months and/or treatment with continuous or near-continuous (50% of year) oral corticosteroids and/or requirement for

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

CANADA[7]

% severe asthma patients on maintenance OCS

8%

Population details

Severe asthma: Asthma that requires treatment with high-dose inhaled corticosteroid treatment plus a second control medication (and/or systemic corticosteroids) for ≥12 months
Maintenance OCS: ≥5 mg/day for ≥6 months; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

FRANCE[2]

% severe asthma patients on maintenance OCS

12%

Population details

Severe asthma: GINA step 4-5 patients
Maintenance OCS: ≥5 mg/day prednisone or equivalent for ≥90 days; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

GERMANY[2]

% severe asthma patients on maintenance OCS

13%–15%

Population details

Severe asthma: GINA step 4-5 patients
Maintenance OCS: ≥5 mg/day prednisone or equivalent for ≥90 days; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

JAPAN[12]

% severe asthma patients on maintenance OCS

31%

Population details

Severe asthma: Patients with ≥240-day prescription of high-dose ICS and ≥190-day prescription of 1 or more controller medications during a 12-month observation period
Maintenance OCS: Continuously prescribed a daily dose of 5 mg prednisone equivalent; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

ITALY[2]

% severe asthma patients on maintenance OCS

12%

Population details

Severe asthma: GINA 4-5 patients
Maintenance OCS: ≥5 mg/day prednisone or equivalent for ≥90 days; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

NETHERLANDS[4]

% severe asthma patients on maintenance OCS

30%

Population details

Severe asthma: GINA step 4–5 patients
Maintenance OCS: ≥420 mg prednisone in 12 months; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

PORTUGAL[3]

% severe asthma patients on maintenance OCS

24%

Population details

Severe asthma: GINA step 3-5 patients
Maintenance OCS: Average dose 12.6 mg prednisolone/day/year; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

SOUTH KOREA[5]

% severe asthma patients on maintenance OCS

22%

Population details

Severe asthma: Asthma that is not well-controlled after GINA step 4-5 or well-controlled asthma after GINA step 4-5 with a history of >1 unscheduled visit or 3 administrations of systemic corticosteroids in a given year or a near-fatal asthma attack, or have worsening symptoms when the OCS or ICS dose is reduced to 25%

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

UK[2]

% severe asthma patients on maintenance OCS

15%

Population details

Severe asthma: GINA step 4-5 patients
Maintenance OCS: ≥5 mg/day prednisone or equivalent for ≥90 days; assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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Maintenance OCS Use in Severe Asthma Is Common Globally

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Country

SPAIN[8]

% severe asthma patients on maintenance OCS

22%

Population details

Severe asthma: Asthma that requires treatment with high-dose inhaled corticosteroid treatment plus a second control medication (and/or systemic corticosteroid) for ≥12 months)
Maintenance OCS: Use of systemic OCS for at least 3 months (no dose given); assessed over a 12-month period

GINA, Global Initiative for Asthma; **ICS**, inhaled corticosteroid; **OCS**, oral corticosteroid.

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OCS Stewardship: A collaborative effort to reduce OCS use[1]

Oral Corticosteroid Stewardship Statement[2]

> **It is time to protect patients with asthma from potential overexposure to OCS—and to recognize OCS overuse for what it often is: a treatment plan failure**
>
> – Allergy & Asthma Network
> November 2018

OCS Stewardship Statement endorsed by:

- Allergy & Asthma Network
- American Lung Association
- Association of Asthma Educators
- Alliance for Patient Access
- Asthma and Allergy Foundation of America
- CHEST Foundation
- American College of Allergy, Asthma, and Immunology

> So far, **cumulative risk of systemic corticosteroids use** in acute exacerbations of asthma has not been properly valued
>
> –The ROSA Project, a Nationwide Portuguese Consensus[3]

> Patients who have used **2 or more courses of OCS and/or… maintenance OCS therapy** over the past 12 months…should be referred to a specialist
>
> –Canadian Delphi Consensus Study[4]

> **OCS tapering should be attempted in all patients** with asthma receiving maintenance OCS therapy
>
> –International Expert Consensus on the Tapering of Oral Corticosteroids for the Treatment of Asthma[5]

> **OCS dose** and asthma attack risk **can be substantially reduced**
>
> – European Respiratory Society/American Thoracic Society[6]

> Indiscriminate use of burst and maintenance OCS therapy is common, posing a **risk of irreversible harm** affecting multiple organ systems
>
> – Thoracic Society of Australia and New Zealand[7]

OCS, oral corticosteroid.

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OCS Stewardship Is Achievable Through OCS-Sparing Strategies

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How can OCS overuse be minimized?[1,2]

- Optimize asthma management, including primary prevention of exacerbations
- Perform periodic asthma evaluations with each patient
- Consider a multidisciplinary approach to manage coexisting diseases (eg, atopic dermatitis)
- Explore shared decision-making between patients and physicians
- Monitor AEs closely with consideration to OCS dose, duration, and associated comorbidities

AE, adverse effect; **OCS**, oral corticosteroid.

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OCS Use in Severe Asthma Is Often Associated With Adverse Effects

Oral corticosteroid (OCS) use for asthma can be

short-term[1]
days

long-term/maintenance[1]
months

While a short course ("burst") of OCS may be necessary during asthma exacerbations, GINA states that maintenance OCS should be a last resort due to associated **adverse effects (AEs)**[1]

Short-term OCS use is associated with several AEs[1-5]*

increased risk of:

- Infection
- Fracture
- Mood disorders
- Sleep disturbance

≥2 OCS bursts per year may indicate poor asthma control[1,5]

Maintenance OCS use in asthma patients is associated with multiple AEs at any dose[1,4-10]

- CVD Stroke
- Infection
- Type 2 diabetes
- Sleep disturbance
- Osteoporosis Fractures
- Cataracts Glaucoma
- Anxiety Depression
- Obesity

In children, maintenance OCS may also be associated with dose-dependent delay in linear growth[11]

Cumulative exposure to OCS can increase the risk of AEs over time[12,13]

30% increased risk of AEs† for each year with ≥4 OCS prescriptions[12,13‡]

Oral corticosteroids can play an important role in asthma management. Consult local asthma management guidelines for additional details.

*Short-term use defined as 3-30 days of OCS use, or 1-2 OCS bursts. Durations of short bursts are commonly 5-10 days.[2-4] †AEs include osteoporosis, hypertension, obesity, type 2 diabetes, cataracts, GI ulcers/bleeds, and fracture.[12] ‡4 OCS courses at the usual dose for treating asthma exacerbation are equivalent to ~1 g of OCS exposure.[13]

AE, adverse effect; CVD, cardiovascular disease; GI, gastrointestinal; GINA, Global Initiative for Asthma; OCS, oral corticosteroid.

1. Global Initiative for Asthma (GINA). Global strategy for asthma management and prevention. Updated 2023. Accessed August 2, 2023. https://ginasthma.org/reports/. 2. Waljee AK, et al. *Brit Med J*. 2017;357:j1415. 3. Price D, et al. *Eur Respir Rev*. 2020;29(155):190151. 4. Chung LP, et al. *Respirology*. 2020;25(2):161-172. 5. Suehs CM, et al. *Am J Respir Crit Care Med*. 2021;203(7):871-881. 6. Dalal AA, et al. *J Manag Care Spec Pharm*. 2016;22(7):833-847. 7. Volmer T, et al. *Eur Respir J*. 2018;52(4):1800703. 8. Sweeney J, et al. *Thorax*. 2016;71(4):339-346. 9. Bleecker ER, et al. *World Allergy Organ J*. 2022;15(12):100726. 10. Corlateanu A, et al. *Asthma Res Pract*. 2021;7(1):3. 11. Zhang L, et al. *J Pediatr (Rio J)*. 2019;95:S10-S22. 12. Sullivan PW, et al. *J Allergy Clin Immunol*. 2018;141(1):110-116.e7. 13. Price DB, , et al. *J Asthma Allergy*. 2018;11:193-204.

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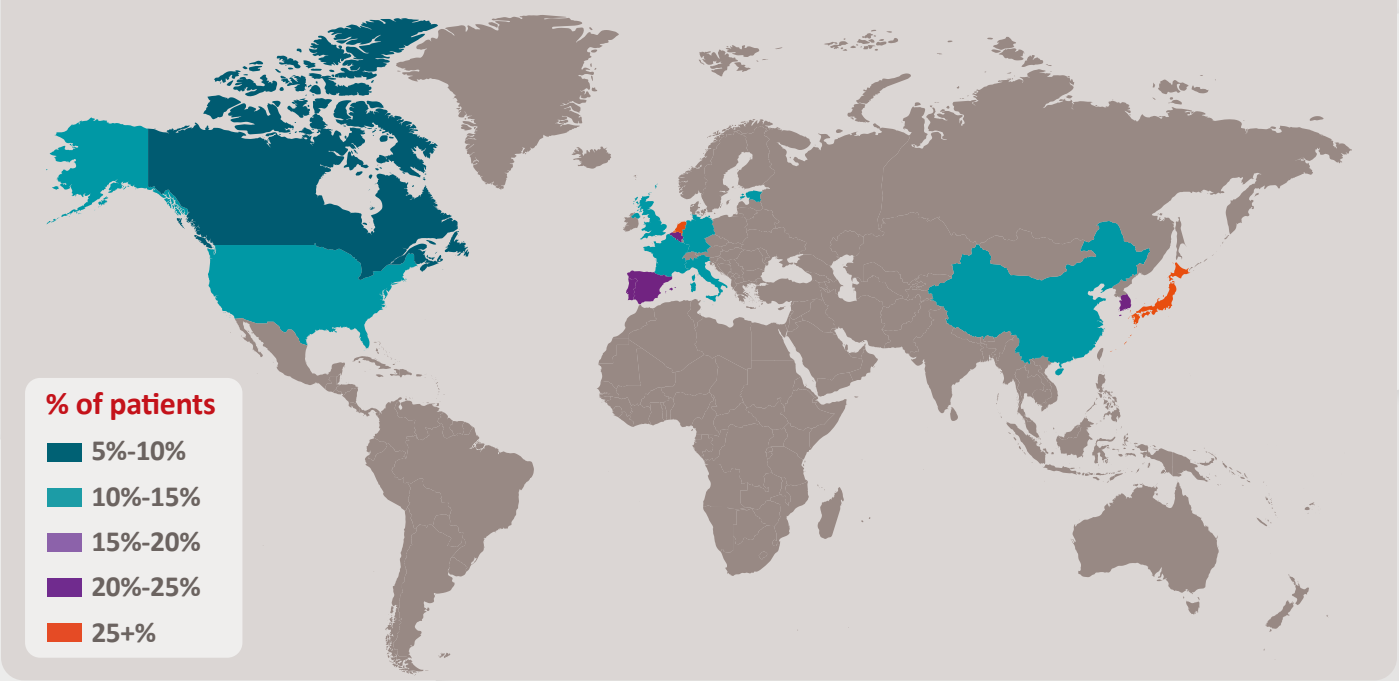
There Is an International Call for OCS Stewardship: A Collaborative Effort to Reduce OCS Use[1-3]

~8%-31% of severe asthma patients use maintenance OCS globally[4-14]*



How Can OCS Stewardship Be Achieved?[1,15,16]

- **Optimize asthma management**, including primary prevention of exacerbations, and step-up therapy as needed
- **Perform periodic asthma reviews** with each patient, including lung function assessment
- **Rely on local** or **international guidelines** and recommendations for asthma management (eg, GINA)
- **Consider a multidisciplinary approach** to manage coexisting diseases
- **Explore shared decision-making** between patients and physician
- **Monitor AEs closely** with consideration to OCS dose, duration, and comorbidities

Oral corticosteroids can play an important role in asthma management. Consult local asthma management guidelines for additional details.

*Severe asthma and maintenance OCS definitions differ between studies. See references for complete details.

AEs, adverse effects; GINA, Global Initiative for Asthma; OCS, oral corticosteroid.

1. Bleecker ER, et al. *World Allergy Organ J*. 2022;15(12):100726. 2. Asthma and Allergy Foundation of America. Oral corticosteroid stewardship statement 2018. Accessed July 24, 2023. https://allergyasthmanetwork.org/wp-content/uploads/2020/07/oral-corticosteroid-stewardship-statement.pdf. 3. Suehs CM, et al. *Am J Respir Crit Care Med*. 2021;203(7):871-881. 4. Tran TN, et al. *J Allergy Clin Immunol Pract*. 2021;9(1):338-346. 5. Tran TN, et al. *Eur Respir J*. 2020;55(6): 1902363. 6. Romão M, et al. *J Asthma Allergy*. 2022;15:1579-1592. 7. Eger K, et al. *Respiration*. 2022;101(2):116-121. 8. Lee JH, et al. *Allergy Asthma Immunol Res*. 2022;14(4):412-423. 9. Zhang Q, et al. *Clin Transl Med*. 2022;12(2):e710. 10. Sadatsafavi M, et al. *Respir Res*. 2021;22(1):103. 11. Pérez de Llano L, et al. *Respir Med*. 2019;151:49-54. 12. Graff S, et al. Respir Res. 2020;21(1):214. 13. Chung LP, et al. *Respirology*. 2020;25(2):161-172. 14. Sato K, et al. *Pulm Ther*. 2020;6(2):247-260. 15. Haughney J, et al. *Adv Ther*. 2023;40(6):2577-2594. 16. Global Initiative for Asthma (GINA). Global strategy for asthma management and prevention. Updated 2023. Accessed August 2, 2023. https://ginasthma.org/reports/.

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