Originally Published in: Suehs CM, Menzies-Gow A, Price D, Bleecker ER, Canonica GW, Gurnell M, Bourdin A; Oral Corticosteroids Tapering Delphi Expert Panel. Expert Consensus on the Tapering of Oral Corticosteroids for the Treatment of Asthma. A Delphi Study. Am J Respir Crit Care Med. 2021 Apr 1;203(7):871-881. DOI: 10.1164/rccm.202007-2721OC

Expert Consensus on the Tapering of Oral Corticosteroids for the Treatment of Asthma: a Delphi Study (100/100 characters)

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This article has an online data supplement, which is accessible from this issue's table of content online at www.atsjournals.org

Author Contributions: The study facilitator (C.M.S.) designed the study, developed the protocol and data collection tools, classified hundreds of raw brainstorming statements, organized survey logistics, collected and analyzed the data, and wrote the report. The steering committee (A.M.-G., D.P., E.R.B., G.W.C., M.G., and A.B.) provided initial recommendations of experts invited to enroll in the study and provided guidance to C.M.S. on study design, data collection, survey logistics, data analysis, and report writing. Expert panel members who contributed complete questionnaires to the study are listed in the online supplement. All authors participated in the

Funding: This study was funded by an unrestricted grant obtained through an investigator-driven submission to the AstraZeneca Cybergrant portal for educational programs. This research was conducted entirely independently of the funder, who had no role in the study design, data collection, analysis, or interpretation/write-up of the study report or manuscript. Medical writing support was funded via the unrestricted grant.

Running Head: Oral corticosteroid tapering Delphi consensus (45/50 characters)

Subject Category: Asthma**;** 1.11 Clinical Asthma

Word count: 4105

What is the current scientific knowledge on this subject?

Cumulative oral corticosteroid treatment for asthma is associated with costly and burdensome side effects and comorbidities. 'OCS stewardship' is advocated to protect patients from inappropriate OCS use and its consequences. The advent of effective OCS-sparing biological therapies also fosters new opportunities for tapering. Currently, evidence-based guidelines for OCS use, tapering, and associated comorbidity screening in asthma are lacking.

What does this study add to the field?

In the absence of clinical data to develop evidence-based guidelines, this modified Delphi consensus study brought together experts with relevant knowledge and clinical experience to generate a high-quality expert consensus statement on OCS use and tapering. The recommendations thus generated support minimizing OCS use in as much as possible. A cumulative yearly dose of 0.5 or 1g prednisolone equivalents would be indicative of poor asthma control. They also provide a first step towards development of an OCS tapering algorithm, as well as a minimum OCS adverse event screening list. Little consensus was achieved concerning the assessment and management of adrenal insufficiency, supporting a need for future related research in this specific domain. Finally, the experts strongly support shared decision making during OCS tapering.

Abstract

Rationale: There is a need to minimize oral corticosteroid use in patients with asthma to prevent their costly and burdensome adverse effects. Current guidelines do not provide recommendations for oral corticosteroid tapering in patients with asthma.

Objectives: To develop expert consensus on oral corticosteroid tapering among international experts.

Methods: A modified Delphi method was used to develop expert consensus statements relating to oral corticosteroid use, tapering, adverse effects, adrenal insufficiency, and patient-physician shared decision-making. Initial statements proposed by experts were categorized, filtered for repetition, and presented back to experts over three ranking rounds to obtain consensus (≥70% agreement).

Measurements and Main Results: 131 international experts participated in the study and 296 statements were ranked. Numerous recommendations and guidance regarding appropriate oral corticosteroid use were established. Experts agreed that oral corticosteroid tapering should be attempted in all patients with asthma receiving maintenance oral corticosteroid therapy, with personalization of tapering rhythm and speed. The importance of recognizing individual adverse effects was also established; however, a unified approach to the assessment of adrenal insufficiency was not reached. Shared decision-making was considered an important goal during the tapering process.

Conclusion: In this Delphi study expert consensus statements were generated on oral corticosteroid use, tapering, adverse effects screening, and shared decision-making, which may be used to inform clinical practice. Areas of non-consensus were identified, highlighting

uncertainty among the experts around some aspects of oral corticosteroid use in asthma, such as adrenal insufficiency, which underscores the need for further research in these domains.

Abstract word count: 247/250

Keywords (3–5): adrenal insufficiency, adverse effects, shared decision-making, biological treatments

Introduction

Asthma is a chronic inflammatory disease, characterized by reversible airway obstruction and airway hyperresponsiveness (1), which affects ~339 million individuals worldwide (2). Approximately 5–10% of the overall asthma population have severe asthma (3), defined as uncontrolled asthma despite adherence to maximal optimized therapy and treatment of contributory factors (4). Severe asthma is associated with greater asthma-related morbidity, increased healthcare costs, more frequent exacerbations, and greater oral corticosteroid (OCS) use compared with mild/moderate asthma (5–8).

Early use of OCS in emergency department asthma treatment reduces hospital admission rates (9), supporting its routine guideline-recommended use for asthma exacerbations (4). Indeed, during acute exacerbations OCS have been observed to provide rapid benefit (10). Nevertheless, such benefits may be dose- or duration-dependent, and the current guidance remains somewhat empirical. Long-term, low-dose OCS add-on therapy is restricted to Global Initiative for Asthma (GINA) Step 5 and positioned after trials of other more preferential add-on treatments (e.g. tiotropium and biologicals), with consideration of side effects (4). However, long-term OCS therapy continues to be widely used in severe asthma, with global usage estimated at 20–60% (11).

Recent studies across multiple therapy areas demonstrate that cumulative OCS use (including long-term and intermittent use) is associated with a dose- and duration-dependent risk of potentially serious adverse effects including osteoporosis, hypertension, diabetes mellitus, cataracts, fractures, obesity, and gastrointestinal disorders(6, 11–13). Risk of adverse effects is evident at relatively low cumulative and mean daily OCS doses (12). Furthermore, long-term OCS use is associated with increased risk of mortality, reduced quality of life, and increased healthcare resource utilization and costs (5, 6, 14–16).

The costly and burdensome adverse effects associated with OCS use have prompted international respiratory experts to call for a structured 'OCS stewardship' approach to protect patients from inappropriate OCS use and its consequences (16, 17). Tapering has been strengthened by the availability of effective OCS-sparing biological therapies; however, the process should still be approached with caution to prevent symptom recurrence and to avoid risking unrecognized adrenal insufficiency (12, 18). Reporting on successful OCS tapering protocols is most often indirect (i.e. the tapering algorithm is not the subject of study per se) and results in a diverse selection of study-specific algorithms (19–26), whose detail varies significantly between published studies. Current recommendations (4, 27) do not provide guidance on the choice of OCS tapering protocol or otherwise how to taper. From a clinical perspective, the lack of asthma-specific guidelines on OCS tapering and the systematic screening of adverse events represents a key barrier to reducing OCS use (16). In the absence of clinical data to develop evidence-based guidelines, this modified Delphi consensus study aimed to bring together experts with relevant knowledge and clinical experience to generate a high-quality expert consensus statement on OCS use and tapering.

Methods

Study Design

An international panel of experts participated in a four-round Delphi study to develop a systematic consensus on OCS tapering. The protocol was approved by the Institutional Review Board, University Hospital of Montpellier (reference number: 2019 IRB-MTP 04-12) and was registered on clinicaltrials.gov (NCT03934801). Surveys were administered anonymously to the expert panel using SurveyMonkey online software

(www.surveymonkey.co.uk). Statistical analyses were performed using the R programming environment version 3.6.1 (28).

Participants and Expert Recruitment

The study steering committee (ERB, AB, GWC, MG, AMG, DP) provided initial recommendations of experts (based on their professional/association networks) to be invited to enroll in the study and eligible/responding experts were asked to recommend additional experts in the field. Pulmonologists/respiratory disease specialists, allergists, endocrinologists, pediatricians, rheumatologists, and patient advocacy organization representatives were eligible for study enrollment. Clinicians were required to manage patients on a weekly basis and have clinical experience in managing disease following OCS tapering/withdrawal to ensure a high-level knowledge in OCS management. Patient advocacy organization representatives were required to represent an asthma patient advocacy group. Experts were excluded if they were currently, or due to be (in the following 12 months) employed by, or had ownership in a pharmaceutical company. Participants were encouraged to provide complete responses to all survey rounds and reminders were delivered daily.

Round 1: Expert Demographics and Brainstorming

Participants completed an electronically administered questionnaire to provide demographic information, including age, sex, qualifications, practice environment, specialty, years since training completion, time spent caring for patients treated with OCS, and number of patients seen per year. To initiate the brainstorming process, the questionnaire included open-ended questions to generate an initial list of statements pertaining to six categories: appropriate OCS use, OCS tapering, addressing adverse effects, adrenal insufficiency, patient-physician shared decision-making, and other aspects they felt to be important. Experts were informed that all

OCS dosages should be expressed as prednisone-equivalent dosages, as reported in GINA guidelines (4). Raw statements (which refer to adult patients unless otherwise indicated) were categorized, filtered to avoid repetition, and amended for clarity (if necessary) to generate a final list of statements for ranking. The demographics/brainstorming and ranking questionnaires are available on the Open Science Framework platform (https://osf.io/wrdbu/).

Rounds 2, 3, and 4: Ranking

The final list of statements was presented to experts for ranking using a pre-defined Likert scale ranging from 'strongly disagree' (–2 points) to 'strongly agree' (+2 points). Experts were also asked to select specific responses for treatment duration, threshold values, and assessment frequencies. A stopping rule was enforced for a given statement when ≥70% of experts indicated 'agree' or 'strongly agree' (positive consensus), or when ≥70% indicated 'disagree' or 'strongly disagree' (negative consensus) during any round. For statements requiring a specific response consensus was defined as 70% of experts providing an identical response. Items that achieved consensus were not re-presented in subsequent ranking rounds.

Results

Participants

Of the 363 experts invited to participate in this Delphi study, 169 were enrolled in the expert panel and 131 completed at least one of the four survey rounds (Figure 1A). Participant attrition rates during the ranking process were low; of the 108 experts who participated in the first ranking round, 96 proceeded to complete all three rounds of ranking (Figure 1B). Most experts were pulmonologists (73%) or allergists (18%); however, a wide range of specialties

were represented in the study. Demographics and professional characteristics of the expert panel are provided in Table 1.

Ranking Results

The initial brainstorming survey was completed over a 2-month period (April–May 2019) and three rounds of ranking surveys (rounds 2–4) were completed between 31 August and 26 September 2019. Ninety-one experts provided at least one brainstorming statement and 1447 statements were generated in total. Raw statements were categorized and filtered to avoid repetition resulting in a final list of 296 statements. The following sections summarize key points of consensus, but do not cover all 296 items presented to the experts. Full ranking results for all 296 statements are available in the online supplement (pp 1–21).

Section 1: Appropriate OCS Use for the Treatment of Asthma

Over 95% of experts agreed or strongly agreed with the following statement: '*In general, our goal should be not to use OCS. When nevertheless required, dose and duration should be minimized.'*

Short-term OCS use: Positive consensus was reached for five out of six statements regarding appropriate short-term OCS use (online supplement p 1; 1.2.a–f). Short-term OCS use (<15 days) was deemed appropriate in patients experiencing acute non-resolving or life-threatening exacerbations and in patients experiencing eosinophilic or allergic exacerbations. Experts also agreed that short-term OCS use was appropriate within an asthma management plan or to avoid hospitalization. No consensus was reached on whether short-term OCS use was appropriate to palliate unavailability of hospitalization services. Experts agreed that 5–7 days constitutes the usual maximal duration for a short course of OCS for treatment of an exacerbation and that the optimal dosage of a short course of OCS should be 0.5 mg/kg/day.

Items that remained controversial included whether dosages for short courses of OCS for treatment of an exacerbation should remain stable and whether the need for individual tailoring of OCS dose would render systematic application of 'ideal' doses unlikely.

Maintenance OCS use: Nine statements were proposed regarding appropriate use of OCS as a maintenance (long-term) treatment, with five statements reaching consensus (online supplement pp 1–2; 1.6.a–i). Maintenance OCS use was considered appropriate in patients with severe asthma experiencing inadequate control despite optimization of GINA Step 5 treatments, or when adverse effects that could not be managed by another treatment presented during a tapering attempt. Consensus was also reached on eight of 13 statements characterizing an adequate response to long-term OCS use (online supplement pp 2–3; 1.9.a–m). In situations where OCS maintenance treatment is appropriate, experts considered ≤5 mg/day to be an acceptable dose (Figure 2).

Maintenance OCS use remained controversial in the context of adrenal insufficiency and to reduce overall OCS exposure. There was no consensus on whether maintenance OCS use is appropriate based on a patient's T2 phenotype.

Over 90% of experts agreed or strongly agreed that the annual cumulative OCS dose should be monitored as a marker of asthma control. Over 75% of experts selected a threshold of 0.5 g or 1 g as the annual cumulative OCS dose indicative of poor control in ranking round 3 (Figure 3).

It was agreed that biological therapies are useful OCS-sparing agents, and patients should be systematically assessed for suitability for biological therapy. Daily OCS dose may represent a reliable marker for the evaluation of biological treatment response (online supplement p 5; 1.16.g; 1.17.a–c).

Section 2: OCS Tapering

Two general statements reached positive consensus in the first round of ranking: 1) '*Tapering (down to a minimal efficacious dose or complete weaning, if possible) should be attempted in all asthma patients receiving maintenance OCS therapy, regardless of comorbidities';* 2) '*The rhythm and speed of OCS tapering requires individualization for each patient.'*

Multiple statements reached positive consensus on when it may be appropriate to attempt OCS tapering, and when cautious slow attempts of tapering and complete OCS cessation are appropriate (Table 2). Tapering was deemed appropriate in multiple cases (online supplement p 5; 2.2.a–f) including: if the intensity or duration of OCS use is a cause for concern, if a patient exhibits OCS-related adverse effects or a lack of response to OCS, holds a reasonable likelihood of hypothalamic-pituitary-adrenal-axis recovery, or experiences improved asthma control following initiation of biological therapy. Tapering was also deemed appropriate in patients experiencing asthma control with OCS maintenance therapy for a minimum agreed-upon time; however, the duration of the minimum length of time remained controversial.

Tapering attempts were deemed inappropriate in patients with eosinophilic granulomatosis with polyangiitis or allergic bronchopulmonary aspergillosis that relapses during tapering (online supplement p 6; 2.4.b–c). Further statements that remained controversial included tapering in patients who demonstrated potentially harmful effects during previous tapering attempts and whether tapering should be attempted in patients with adrenal insufficiency (online supplement pp 5–6; 2.4.a,d).

Experts agreed that OCS tapering should incorporate some aspect of individualization and multiple factors were considered that may influence the rhythm and speed of OCS

tapering (online supplement p 6; 2.5.a–g); such factors included: duration of previous maintenance OCS treatment, history and future risk of adverse effects, and type of adverse effect present. Three statements that remained controversial concerned the speed of OCS tapering in patients with a fast/slow response to OCS, whether OCS tapering should be guided by biomarkers at each weaning step, and whether the speed of tapering should be dependent on the known rapidity of action of the OCS-sparing drug introduced.

Five statements concerning characteristics of an acceptable OCS tapering algorithm reached positive consensus, and three statements remained controversial (Table 3). Experts agreed that biologicals should play an important role in OCS tapering and that failure to achieve a ≥50% OCS dose reduction indicates failure of the biological and may warrant switching strategies (online supplement p 9; 2.11.c,e); furthermore, when writing prescriptions, the option to reduce dose should be considered (online supplement p 9; 2.12.c).

Section 3: Addressing OCS-Related Adverse Effects

All five general statements concerning adverse effects reached positive consensus in the first round of ranking (online supplement p 9; 3.1.a–e). Experts agreed that patients receiving OCS were at greater risk of adverse effects compared with patients receiving no OCS, and adverse effects should always be addressed, but should not preclude attempting to taper OCS to the lowest possible dose.

Experts reached positive consensus on two of three adverse effect subsets for whom OCS tapering should be a priority (online supplement pp 10–11; 3.4.a–c). A positive consensus was achieved in the first round of ranking for seven of ten elements that should be included in a minimum checklist for adverse effect screening in patients receiving OCS therapy, and three statements remained controversial (Table 4).

Section 4: Managing Adrenal Insufficiency

The majority of statements (44/55 [80%]) concerning adrenal insufficiency failed to reach consensus following three ranking rounds. Many statements that remained controversial concerned the sub-populations in which adrenal insufficiency should be assessed (online supplement pp 13–14; 4.3.a–f, 4.4.a–d). Experts agreed that adrenal insufficiency should be assessed in individuals on regular, long-term OCS therapy. Additionally, a positive consensus was almost reached (69% agreement) on statements indicating that adrenal insufficiency should be assessed in patients exceeding an OCS dose of >2 g per year or >four repeated OCS short courses per year.

Experts agreed that adrenal insufficiency is inadequately assessed (online supplement p 16; 4.11.a) and should be assessed regularly (online supplement p 121; 4.1.a) and when OCS tapering has failed in OCS-treated patients (online supplement p 14; 4.5.b). Experts also agreed that signs of adrenal insufficiency should be symptomatically treated as much as possible during the tapering process and should not be viewed as a reason to give up on tapering altogether (online supplement p 12; 4.1.b). Experts agreed that adrenal insufficiency should be assessed using fasting morning cortisol and in case of intermediate results, follow up with a (short) tetracosactide/cosyntropin (e.g. Synacthen®) test (online supplement p 15; 4.9.c). An additional general statement regarding whether hydrocortisone replacement is preferred to continued prednisolone almost reached positive consensus, with 65% of experts agreeing with the statement and 8% disagreeing; the remaining percentage remained neutral on the subject (online supplement p 12; 4.1.c).

Consensus was reached on the need for the treating respiratory physician to assess for adrenal insufficiency in patients with severe asthma, and that management of adrenal

insufficiency in patients with severe asthma should involve an endocrinologist or a multidisciplinary approach (online supplement p 20; 6.1.c,d).

Section 5: Patient-Physician Shared Decision-Making

Experts agreed that shared decision-making should be a systematic practice and self-management should be limited to individuals with good levels of comprehension (online supplement p 17; 5.1.a,d). Eight statements achieved positive consensus on the importance of shared decision-making (online supplement p 17; 5.2.a–h) and 14 statements reached positive consensus concerning the content to be included in the shared decision-making process (online supplement pp 17–18; 5.3.a–n).

Section 6: Miscellaneous

Experts agreed that primary care physicians prescribing at least three courses of OCS/year to a patient should consider specialist referral (online supplement p 20; 6.2.a). Experts also achieved positive consensus on 16/17 statements concerning future research of OCS tapering (online supplement pp 20-21; 6.3.a–q). The only subject that remained controversial concerning future work was the efficacy of internet-provided algorithms for delivering symptom-driven OCS tapering guidance to asthma patients.

Discussion

This Delphi study generated expert consensus and recommendations on numerous statements concerning appropriate OCS use, OCS tapering, adverse effects, patient-physician shared decision-making, and future research domains. Consensus was reached on general statements concerning adrenal insufficiency; however, beyond generalities, consensus was not reached.

Hence, improving the assessment of adrenal insufficiency was one of multiple domains identified as requiring future research.

To our knowledge, no existing asthma-specific guidelines are currently available to guide OCS tapering in clinical practice. Consensus stated that tapering should be attempted in all asthma patients receiving maintenance OCS therapy, regardless of comorbidities; however, speed and rhythm of tapering should be individualized. Furthermore, expert consensus was reached on characteristics of an acceptable OCS tapering algorithm (Table 3), which constitutes a first step towards the development of OCS tapering algorithms for use in clinical practice. These consensuses and related information are summarized in Figure 4.

Successful OCS tapering algorithms have been reported in the past (19–25, 29, 30), but vary greatly in content and reporting quality. Currently, the most detailed and recent OCS tapering algorithm is being tested in the eagerly awaited PONENTE study (26). Certain previous studies also demonstrate that prescribing treatment guided by eosinophil levels can improve control, whilst simultaneously resulting in some corticosteroid sparing (31–33). Current GINA guidelines suggest OCS dose adjustment may be supported by internet-based monitoring of symptom control and exhaled nitric oxide; however, the latter contributed little to algorithm decisions, in favor of ACQ scores (34). In the current study, only asthma control questionnaires reached positive consensus as a useful tool during OCS tapering. The need for laboratory tests or at-home lung function measurements may render many biomarker approaches impractical for patients and clinicians. In addition, GINA recommends gradually decreasing or stopping OCS in patients with a good response to biological therapies. Successful corticosteroid reduction following initiation of biological therapies, using pre-set tapering protocols, has been demonstrated in multiple studies (18). However, the latter are often short-term in nature with little focus on adrenal function assessments, and the full

potential of tapering was therefore not achieved/documented. As the use of biological therapies increases, studies evaluating OCS tapering regimens on a longer basis, which can be personalized based on factors such as baseline OCS dosage and level of asthma control, will become increasingly important (e.g. the PONENTE study) (26). The current consensus statement provides broader guidance on when and how to taper OCS in patients with asthma (Figure 4), regardless of whether a biological therapy has been initiated.

Regarding appropriate OCS use, experts felt that long-term use is not appropriate in situations where other treatment options are available. However, if no alternative treatment options are available, experts considered ≤5 mg/day to be an acceptable dose. This threshold is considerably lower than the definition in current GINA guidelines, which defines low-dose maintenance OCS as ≤7.5 mg/day (4) and may result from the way the question was designed to span the range of thresholds mentioned during the brain storming phase of the study. The reader should note that non-consensus fractions of experts are willing to use 10 mg/day doses and higher, suggesting that there is considerable non-guideline-conforming OCS usage in the field, even among experts. The low consensus threshold at 5mg may also reflect the increasing importance of biologics in the domain and the resulting opportunities for tapering down to the lowest efficacious dose possible or complete cessation. Regardless, the reader should also keep in mind that a 5mg/day OCS dose amounts to a cumulative dose exceeding 1.8 g/year.

In this study, when experts were asked to consider cumulative OCS doses, they voted that 0.5 or 1 g/year would be indicative of poor asthma control. This would correspond to approximately 3.5-7 months of maintenance treatment at 5 mg/day. A previous study by Price et al demonstrated that diabetes associated with OCS use emerged at lifetime cumulative systemic corticosteroid exposures of 0.5–<1 g, with most other adverse events emerging at

1.0 to <2.5 g (12). Furthermore, a 2020 study stated that a yearly cumulative OCS dose above 1 g should be considered unacceptable in severe asthma and indicates the need for specialist referral (35). Even a short term use, which amounts to a median of 20 mg per day for approximately 6-days in a large database study, is associated with an increase in sepsis, venous thromboembolism, and fracture in the next 30 days (36). These studies highlight the need for earlier specialist referral and earlier consideration of OCS-sparing strategies in patients receiving OCS.

Biological therapies were a common subject among the experts and the initiation of a successful biological therapy was the highest-ranked situation appropriate for initiating OCS tapering (Table 2). The reader should keep in mind that there are other important reasons for initiating tapering, such as side effects or non-response (Table 2). Key criteria for success of a biological therapy include maintenance of asthma control, reduction in exacerbations, and decrease in dose of OCS (27, 37). However, there is no clear guidance on the magnitude of OCS reduction that constitutes success or failure of a biological therapy. In this study, consensus stated that failure to achieve ≥50% reduction in OCS indicates failure of the biological therapy and may warrant a switch in strategy. The guidance provided here will support clinical decision-making.

Items included on the minimal checklist for adverse effect screening (Table 4) have been well documented in the literature among individuals receiving OCS. Early detection of adverse effects has been shown to be important in the treatment and management of OCS-related complications; the items on the checklist provide a basis for adverse effect screening in clinical practice (6, 11, 12, 38). This checklist further underlines the importance of adverse effect prevention measures, including calcium and vitamin D supplementation and

appropriate prescribing of bisphosphonates for osteoporosis, optimizing ICS dose and medication adherence. The latter may additionally allow further reduction in OCS dose.

Previous studies have shown that adrenal insufficiency is common among frequent users of OCS following tapering (39); however, lack of clear guidance for clinicians on how to manage adrenal insufficiency may hinder OCS reduction in patients with severe asthma (16). Experts agreed on the need to regularly assess for adrenal insufficiency, and that fasting morning cortisol tests may be used (followed up with a (short) tetracosactide/cosyntropin test in case of intermediate results). Experts also highlighted the need for a process to be in place for referral to an endocrinologist alongside further research and potential education in this domain. The majority of experts agreed use of hydrocortisone replacement therapy is preferential to continued prednisolone use to aid the tapering process in the case of adrenal insufficiency; however, consensus was not reached. The lack of consensus on this point is not surprising given that the optimal strategy for glucocorticoid replacement in patients with adrenal insufficiency remains controversial in the literature. In the UK, hydrocortisone is the first-line treatment in management of adrenal insufficiency, followed by prednisolone (40). Prednisolone is less expensive and some experts contend it may mimic the circadian rhythm more closely than the standard thrice-daily hydrocortisone therapy; however, prednisolone may also be associated with increased relative risk of cardiovascular disease (40–42). Results of ongoing head-to-head studies will improve understanding regarding this issue (43).

Shared decision-making in OCS tapering was viewed positively by the experts. The consensus was that although the OCS-tapering process should be primarily driven by the physician, patients should contribute to the decision-making process and be educated on OCS use and tapering. Patient's perceptions are frequently ambivalent towards OCS and how they navigated previous tapering attempts should be taken into account. This is in line with

emerging evidence showing that shared decision-making is becoming more common in asthma management and has been shown to improve patient adherence, outcomes, and satisfaction with care (44). Shared decision making tools/platforms to facilitate this process (e.g. 43, 44) require further development and validation for general asthma populations.

The strengths of this study include participation of 131 experts across a range of specialisms, ensuring that a wide breadth of knowledge and relevant expertise was represented among the expert panel. Results from this study also benefit from the anonymity of expert responses, alongside a clear, *a priori* definition of consensus criteria and controlled feedback. Importantly, a lack of participant attrition was observed throughout all three ranking rounds, increasing the validity of the consensus by avoiding suppression of minority opinions and minimizing potential for bias (47). A limitation of the study was the large number of raw statements that needed to be reduced and summarized; therefore, statements presented to experts were not fully representative of all the raw statements.

This Delphi consensus study provides expert consensus statements around OCS use and tapering, which may be used to inform clinical practice and optimize management of patients with severe asthma. The recommendations also provide a first step towards development of an OCS tapering algorithm and support the ongoing OCS stewardship effort by international respiratory experts to reduce the harm from inappropriate OCS use and its consequences. While consensus was generated on numerous statements, many remained controversial, highlighting the existing uncertainty, even among international experts, around certain aspects of OCS use in asthma, such as assessment and management of adrenal insufficiency. These findings underscore the need for further research to inform clinical practice and drive future evidence-based guideline development.

Acknowledgements

Expert panel members who contributed complete questionnaires to the study are listed in the online supplement. Medical writing support was provided by Neil Patel, M.Sc., and Liz Bolton, Ph.D. of Helios Medical Communications, Alderley Edge, Cheshire, United Kingdom.

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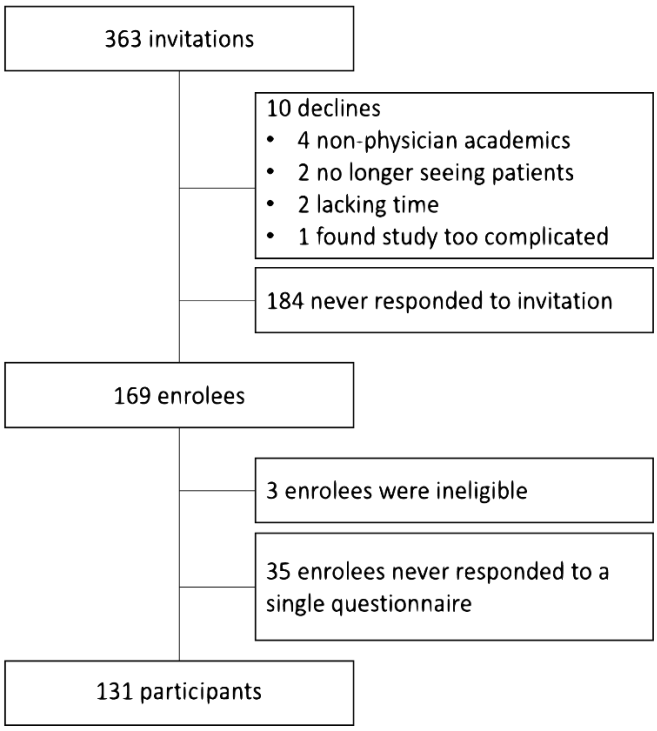
Figure legends

Figure 1. (*A*) Study flow diagram. (*B*) Expert participation in three statement-ranking rounds.

A



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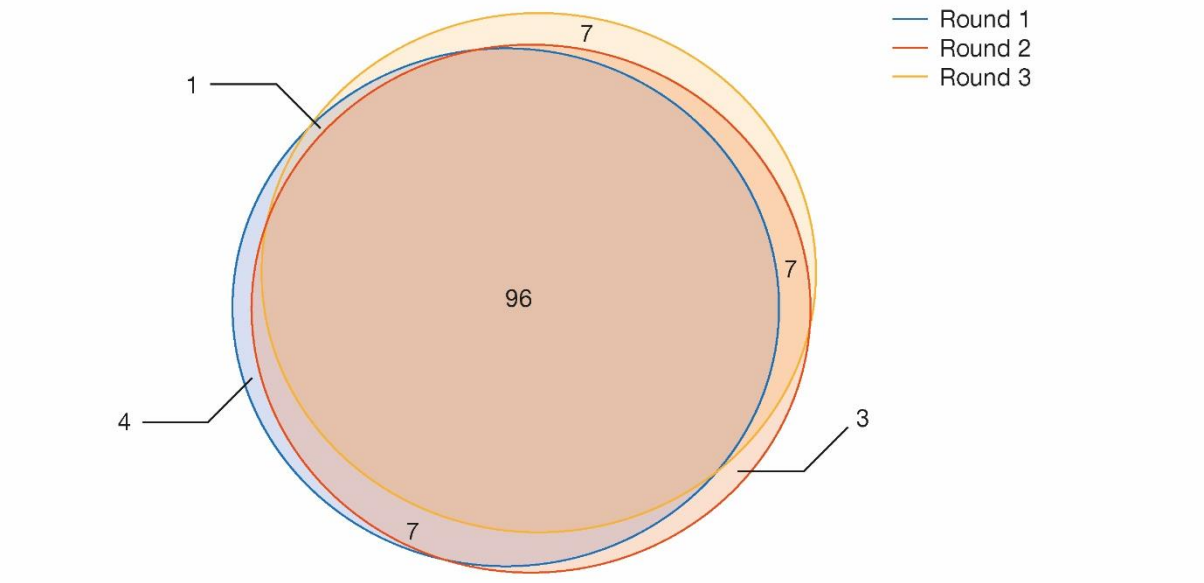


Figure 2**.** Percentage agreement among experts on acceptable doses for maintenance OCS treatment. OCS = oral corticosteroid.

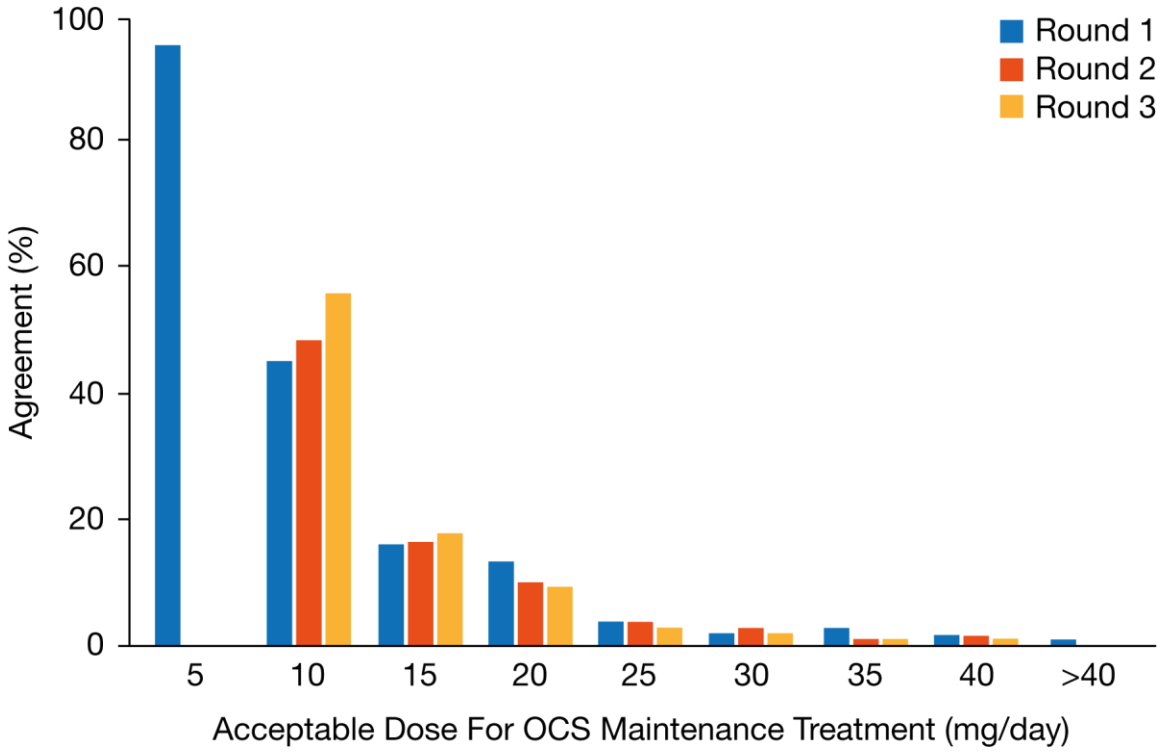


Figure 3**.** Percentage agreement among experts for threshold options indicating a yearly cumulative OCS dose that is suggestive of poor asthma control. NA = not applicable; OCS = oral corticosteroid.

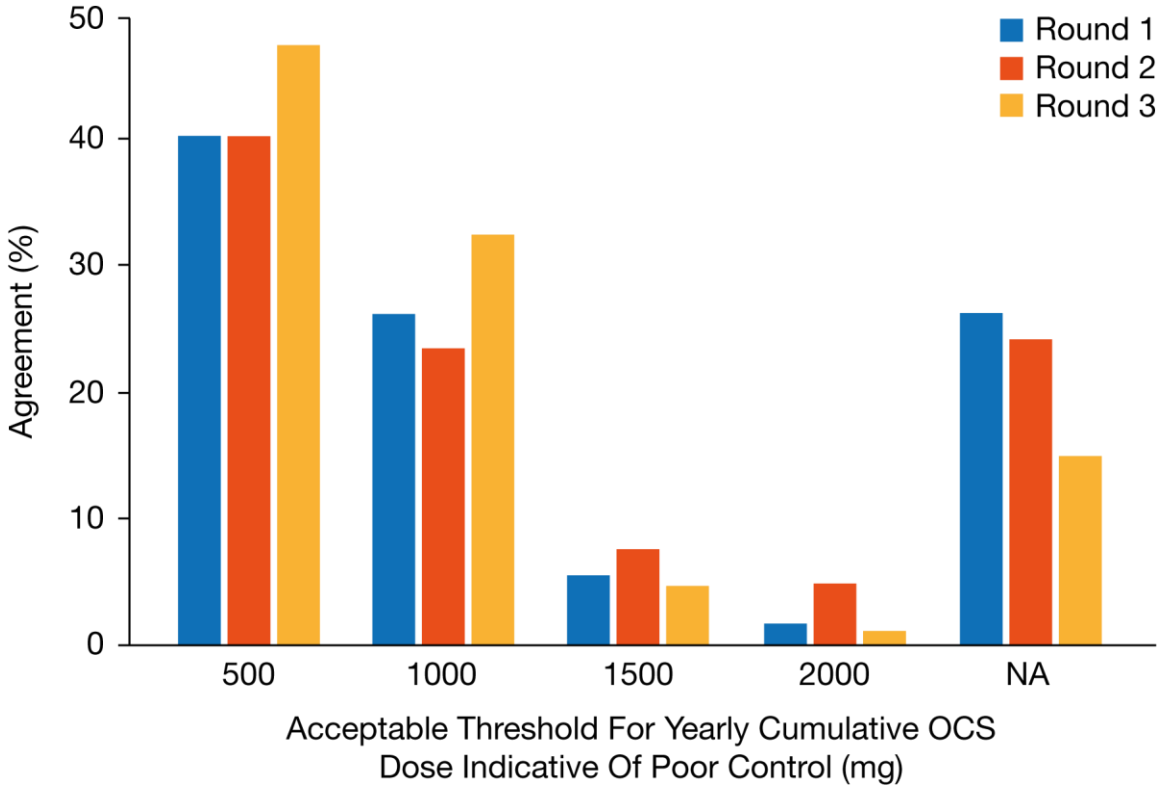
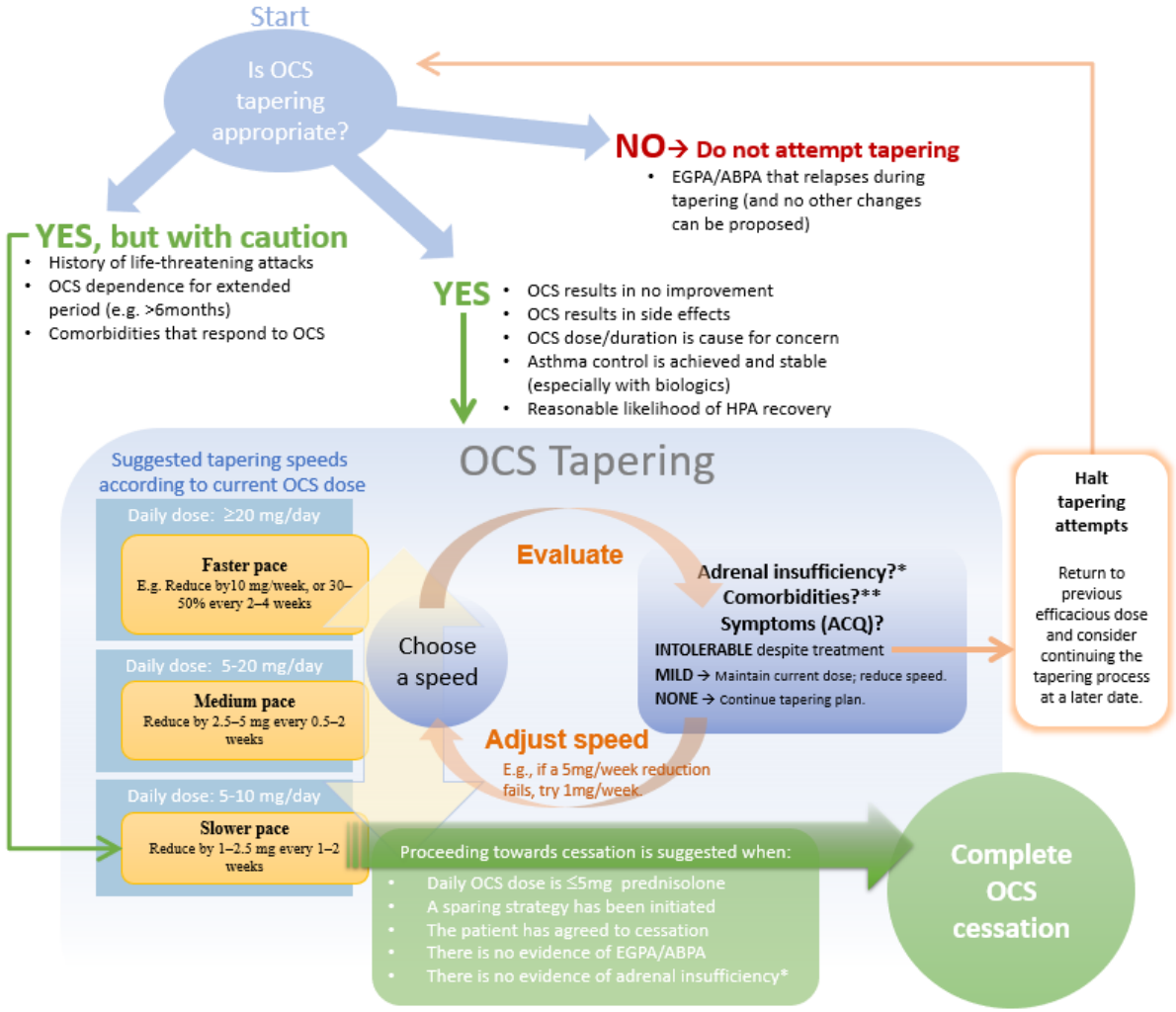


Figure 4. Graphic summary of consensus information on oral corticosteroid tapering.



*Adrenal insufficiency should be regularly assessed using fasting morning cortisol. In case of intermediate results, follow up with a (short) tetracosactide/cosyntropin test. Adrenal insufficiency management should be multidisciplinary, involving an endocrinologist.

**Comorbidity screening should include at least the following: glycemic control, bone density, blood pressure, cataracts and glaucoma, weight change, fracture risk score and

growth in pediatric populations. However, no consensus was achieved concerning the periodicity of comorbidity screening measures.

ABPA = allergic bronchopulmonary aspergillosis; ACQ = asthma control questionnaire; EGPA = eosinophilic granulomatosis with polyangiitis; HPA = hypothalamic–pituitary–adrenal axis; OCS = oral corticosteroids.

Table 1. Expert Panel Demographic Data

Variable	**Sample size (*n*)**	**Centrality**
Age	131	50.6 ± 9.64
Sex (female)	35/131	26.72%
Academic qualification	131	
MD (or equivalent)	129	98.47%
PhD	71	54.20%
Masters	8	6.11%
Practice environment	131	
University hospital	117	89.31%
Private practice	11	8.40%
Academic environment	37	28.24%
Patient care environment	13	9.92%
Medical practice environment	14	10.69%
Other	7	5.34%
Specialties	131	
Allergist	24	18.32%
Endocrinologist/Metabolic	8	6.11%
Pediatrician	1	0.76%

Patient advocacy organization representatives	2	1.53%
Pulmonologist/Respiratory disease specialist	95	72.52%
Rheumatologist	1	0.76%
Years since completion of training	131	19 (10 to 27)
Approximate % of work spent in caring for patients treated with OCS	131	15 (5 to 30)
How often tapering is attempted in OCS patients	131	
NA (patient advocacy organization representative)	2	1.53%
Occasionally	4	3.05%
Frequently	48	36.64%
Systematically	77	58.78
Participation in studies with aim of OCS tapering	80	61.07%
Concerning OCS		
Protocols, no.	131	2 (1 to 4)
Scientific articles, no.	131	2 (0 to 5)
Patients seen per year, no.	131	50 (25 to 100)
Concerning asthma		
Protocols, no.	131	10 (4 to 20)
Scientific articles, no.	131	30 (6 to 60)
Patients seen per year, no.	131	300 (100 to 500)

In all		
Protocols, no.	131	20 (10 to 40)
Scientific articles, no.	131	67 (25 to 132)
Patients seen per year, no.	131	600 (400 to 1200)

Definition of abbreviations: NA = not applicable; OCS = oral corticosteroid.

Table 2**.** Consensus Statements on OCS Tapering

	Strongly disagree, %	**Disagree, %**	**Neutral, %**	**Agree, %**	**Strongly agree, %**	**Weighted mean rank***
Proceeding towards a tapering attempt is particularly appropriate when:						
Biological treatment has been initiated and results in asthma control	0.00	0.95	0.95	25.71	72.38	1.70
The patient does not appear to respond to OCS treatment	0.00	0.95	0.95	35.24	62.86	1.60
A patient exhibits symptoms/comorbidities likely linked to OCS	0.00	1.90	2.86	41.90	53.33	1.47
Patients on maintenance OCS have gained control (for a minimum agreed-upon time)	0.00	0.00	3.81	59.05	37.14	1.33
The intensity or duration of OCS treatment gives reason for concern	0.00	0.00	3.81	59.05	37.14	1.33
There is reasonable likelihood of hypothalamic-pituitary-adrenal axis recovery	0.00	1.90	11.43	54.29	32.38	1.17

Tapering should not be attempted in patients who:						
Have EGPA that relapses during tapering (and no other changes can be proposed)	0.95	3.81	12.38	66.67	16.19	0.93
Have ABPA that relapses during tapering (and no other changes can be proposed)	0.00	9.52	19.05	61.90	9.52	0.71
Cautious slow tapering is particularly appropriate for patients who:						
Have had life-threatening attacks	0.95	3.81	3.81	60.00	31.43	1.17
Have been dependent on systemic steroids for an extended period (e.g. 6 months or more)	0.00	2.86	6.67	63.81	26.67	1.14
Have comorbidities that respond to OCS	0.00	3.81	9.52	70.48	16.19	0.99
Complete OCS cessation (weaning) can be implemented:						
Following a short course of OCS treatment that lasted for 5–7 days	0.95	1.90	1.90	44.76	50.48	1.42
Following a short course of OCS treatment if patients are on inhaled anti-inflammatory therapy	1.90	1.90	2.86	48.57	44.76	1.32

When a sparing strategy has been initiated	0.95	2.86	14.29	54.29	27.62	1.05
When there is no evidence of adrenal insufficiency	0.95	6.67	13.33	59.05	20.00	0.90
When the patient has agreed to cessation	1.90	4.76	20.00	50.48	22.86	0.88
When there is no evidence of EGPA or ABPA	0.00	7.62	19.05	56.19	17.14	0.83
When the OCS dose is ≤5 mg prednisolone	0.95	15.24	13.33	53.33	17.14	0.70

Definition of abbreviations: ABPA = allergic bronchopulmonary aspergillosis; EGPA, eosinophilic granulomatosis with polyangiitis; OCS = oral corticosteroid.

*Note that statements are ordered by mean rank score.

Table 3. Consensus Statements Concerning Development of an OCS Tapering Algorithm

Positive consensus	Controversial
• The initial tapering of high OCS doses (e.g. >20 mg/day) can proceed at a faster pace (e.g. –10 mg/week, or 30–50% reductions every 2–4 weeks) • OCS tapering should be gradual, with 2.5–5 mg steps every 0.5–2 weeks until an agreed-upon threshold is achieved (e.g. 5–10 mg/day), and then proceeds at a slower pace (1–2.5 mg every 1–2 weeks) • When a reduction in OCS by 5 mg weekly fails, a slower and lower dose reduction of 1 mg/week should be attempted • If mild symptoms occur, maintain the current dosage; they are likely to resolve as endogenous axis recovery occurs • If intolerable symptoms occur, return to the previous (efficacious) dose, and then later consider re-attempting tapering at a slower pace	• In general, the speed of tapering should not exceed a reduction of 5 mg/week • OCS tapering should incorporate every-other-day OCS reductions (especially prior to discontinuation) to allow recovery of the endogenous axis • OCS tapering should be gradual by reducing the OCS dose by 30–50% every 2–4 weeks

Definition of abbreviations: OCS = oral corticosteroid.

Table 4**.** Minimal Checklist for Adverse Effect Screening

Positive consensus	Controversial
• Growth (pediatric population) • Glycemic control • Bone density • Blood pressure • Cataracts and glaucoma • Weight change • Fracture risk score (e.g. FRAX)	• Cardiovascular risk score • Lipid panel • Fluid retention

Definition of abbreviations: FRAX = Fracture Risk Assessment Tool.

Adverse effects are not ordered/hierarchized, and should be given equal consideration.

Online Data Supplement:

Expert consensus on the tapering of oral corticosteroids for the treatment of asthma: a Delphi study

Carey M. Suehs, Andrew Menzies-Gow, David Price, Eugene R. Bleecker, Giorgio Walter Canonica, Mark Gurnell, Arnaud Bourdin on behalf of the Oral Corticosteroids Tapering Delphi Expert Panel*

Results from the three rounds of ranking in the OCS Tapering Delphi project (for items ranked with a five-point Likert scale). For each item, the round and sample size are given along with the percentage of experts that chose a given rank. Darker shades of green signify greater percentage consensus. The weighted mean rank and consensus category are given (positive = blue; negative = red; controversial = white).

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
In general, our goal should be to not use OCS. When nevertheless required, dose and duration should be minimized.	1 . 1 . a	1	108	2.78	0.93	0.93	19.44	75.93	1.65	Positive
Short-term (e.g. <15 days) OCS use is appropriate in asthma patients during acute, non-resolutive exacerbation.	1 . 2 . a	1	108	0	0.93	5.56	54.63	38.89	1.31	Positive
Short-term (e.g. <15 days) OCS use is appropriate in asthma patients during acute, life-threatening, exacerbation.	1 . 2 . b	1	108	0	0	0	22.22	77.78	1.78	Positive
Short-term (e.g. <15 days) OCS use is appropriate in asthma patients during eosinophilic or allergic exacerbation.	1 . 2 . c	1	108	0	3.7	12.04	46.3	37.96	1.19	Positive
Short-term (e.g. <15 days) OCS use is appropriate in asthma patients in the context of an asthma management plan.	1 . 2 . d	1	108	4.63	10.19	15.74	45.37	24.07	0.74	Controversial
		2	113	2.65	7.96	8.85	69.03	11.5	0.79	Positive
Short-term (e.g. <15 days) OCS use is appropriate in asthma patients to avoid hospitalization.	1 . 2 . e	1	108	2.78	11.11	10.19	48.15	27.78	0.87	Positive
Short-term (e.g. <15 days) OCS use is appropriate in asthma patients to palliate the unavailability of hospitalization services.	1 . 2 . f	1	108	19.44	34.26	24.07	19.44	2.78	-0.48	Controversial
		2	113	16.81	32.74	18.58	27.43	4.42	-0.3	Controversial
		3	111	14.41	32.43	22.52	22.52	8.11	-0.23	Controversial
Short-term (e.g. <15 days) OCS use is never appropriate in asthma patients.	1 . 2 . g	1	108	71.3	23.15	2.78	2.78	0	-1.63	Negative
As concerns dosages for short courses of OCS for the treatment of asthma exacerbations, individual tailoring is required to such an extent that the systematic application of "ideal" doses is unlikely.	1 . 5 . a	1	108	2.78	37.96	14.81	35.19	9.26	0.1	Controversial
		2	112	5.36	31.25	19.64	38.39	5.36	0.07	Controversial
		3	111	4.5	39.64	12.61	39.64	3.6	-0.02	Controversial
Dosages for short courses of OCS for the treatment of asthma exacerbations should remain stable.	1 . 5 . b	1	108	1.85	21.3	20.37	45.37	11.11	0.43	Controversial
		2	112	3.57	19.64	22.32	47.32	7.14	0.35	Controversial
		3	111	0.9	16.22	19.82	52.25	10.81	0.56	Controversial
Dosages for short courses of OCS for the treatment of asthma exacerbations should be progressively escalated.	1 . 5 . c	1	108	26.85	53.7	8.33	7.41	3.7	-0.93	Negative
Maintenance OCS therapy is appropriate (and does not require further improvement) in severe asthmatics who are well controlled with a low dose of OCS (e.g. 5 mg/day or less of prednisone).	1 . 6 . a	1	108	15.74	54.63	12.96	13.89	2.78	-0.67	Negative
Maintenance OCS therapy is appropriate (and does not require further improvement) in severe asthmatics with inadequate control despite optimization of alternative (Step 5).	1 . 6 . b	1	108	5.56	14.81	13.89	59.26	6.48	0.46	Controversial
		2	111	0.9	17.12	11.71	61.26	9.01	0.6	Positive
Maintenance OCS therapy is appropriate (and does not require further improvement) in severe asthmatics with poor inhaler compliance/technique.	1 . 6 . c	1	108	56.48	35.19	4.63	3.7	0	-1.44	Negative

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	108	30.56	38.89	24.07	6.48	0	-0.94	Controversial
Maintenance OCS therapy is appropriate (and does not require further improvement) in		2	111	9.01	45.05	29.73	14.41	1.8	-0.45	Controversial
severe asthmatics with low-T2 phenotypes.	1 . 6 . d	3	111	13.51	52.25	24.32	9.01	0.9	-0.68	Controversial
		1	108	18.52	29.63	19.44	31.48	0.93	-0.33	Controversial
Maintenance OCS therapy is appropriate (and does not require further improvement) in		2	111	6.31	36.94	24.32	30.63	1.8	-0.15	Controversial
severe asthmatics with high T2 phenotypes/eosinophils.	1 . 6 . e	3	111	13.51	36.04	24.32	24.32	1.8	-0.35	Controversial
Maintenance OCS therapy is appropriate (and does not require further improvement) in		1	108	3.7	22.22	30.56	36.11	7.41	0.21	Controversial
severe asthmatics when it results in an overall reduction in OCS exposure (i.e. the total		2	111	0.9	14.41	22.52	58.56	3.6	0.5	Controversial
mg of OCS exposure per year; e.g. 5 mg/day is a 33% reduction when compared to 10)	1 . 6 . f	3	111	3.6	15.32	18.02	58.56	4.5	0.45	Controversial
Maintenance OCS therapy is appropriate (and does not require further improvement) in		1	108	1.85	7.41	25	59.26	6.48	0.61	Controversial
severe asthmatics if when trying to taper OCS there is an adverse effect or comorbidity.	1 . 6 . g	2	111	0	8.11	18.02	69.37	4.5	0.7	Positive
		1	108	6.48	11.11	12.96	56.48	12.96	0.58	Controversial
Maintenance OCS therapy is appropriate (and does not require further improvement) in		2	111	3.6	12.61	18.02	52.25	13.51	0.59	Controversial
severe asthmatics with primary or secondary adrenal insufficiency.	1 . 6 . h	3	111	6.31	16.22	18.02	48.65	10.81	0.41	Controversial
Maintenance OCS therapy is never appropriate in severe asthmatics.	1 . 6 . i	1	108	27.78	43.52	15.74	10.19	2.78	-0.83	Negative
As concerns maintenance OCS therapy, individual tailoring is required to such an extent that the systematic application of "ideal" doses is unlikely.	1 . 8 . a	1	108	1.85	16.67	13.89	42.59	25	0.72	Controversial
As concerns maintenance OCS therapy, individual tailoring is required to such an extent that the systematic application of "ideal" doses is unlikely.	1 . 8 . a	2	111	0.9	17.12	9.91	56.76	15.32	0.68	Positive
		1	108	3.7	35.19	19.44	38.89	2.78	0.02	Controversial
An adequate response to long-term OCS in asthmatics can be characterized as:		2	110	5.45	29.09	26.36	37.27	1.82	0.01	Controversial
normalization of lung function.	1 . 9 . a	3	109	1.83	30.28	20.18	47.71	0	0.14	Controversial
		1	108	4.63	24.07	19.44	49.07	2.78	0.21	Controversial
An adequate response to long-term OCS in asthmatics can be characterized as:		2	110	0	30	30.91	38.18	0.91	0.1	Controversial
a stable peak flow during the last week of treatment.	1 . 9 . b	3	109	0.92	23.85	25.69	49.54	0	0.24	Controversial
		1	108	5.56	20.37	27.78	39.81	6.48	0.21	Controversial
An adequate response to long-term OCS in asthmatics can be characterized as:		2	110	3.64	25.45	25.45	43.64	1.82	0.15	Controversial
suppression of blood eosinophils/other T2 biomarkers.	1 . 9 . c	3	109	1.83	26.61	20.18	50.46	0.92	0.22	Controversial
An adequate response to long-term OCS in asthmatics can be characterized as: improvement in the Asthma Control Questionnaire score (MCID = 0.5) or the Asthma Control Test (ACT) (MCID = 5).	1 . 9 . d	1	108	0.93	6.48	7.41	72.22	12.96	0.9	Positive
An adequate response to long-term OCS in asthmatics can be characterized as: decreasing the exacerbation rate to <2/year.	1 . 9 . e	1	108	0.93	4.63	12.96	63.89	17.59	0.93	Positive
		1	108	0.93	24.07	32.41	37.04	5.56	0.22	Controversial
An adequate response to long-term OCS in asthmatics can be characterized as:		2	110	0.91	26.36	16.36	49.09	7.27	0.35	Controversial
decreasing the exacerbation rate by at least 30%.	1 . 9 . f	3	109	0	11.93	19.27	62.39	6.42	0.63	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
An adequate response to long-term OCS in asthmatics can be characterized as: decreasing the exacerbation rate by at least 50%.	1 . 9 . g	1	108	0	7.41	14.81	57.41	20.37	0.91	Positive
An adequate response to long-term OCS in asthmatics can be characterized as: decreasing hospitalizations for asthma to 0 per year.	1 . 9 . h	1	108	0.93	5.56	11.11	56.48	25.93	1.01	Positive
An adequate response to long-term OCS in asthmatics can be characterized as: a decreased need for rescue treatments.	1 . 9 . i	1	108	0.93	12.96	19.44	56.48	10.19	0.62	Controversial
		2	110	0.91	14.55	16.36	60.91	7.27	0.59	Controversial
		3	109	0.92	9.17	12.84	72.48	4.59	0.71	Positive
An adequate response to long-term OCS in asthmatics can be characterized as: when a clinical improvement is obtained that outweighs risks/harms.	1 . 9 . j	1	108	0	3.7	12.96	60.19	23.15	1.03	Positive
An adequate response to long-term OCS in asthmatics can be characterized as: improvement in asthma-related daily limitations/quality of life.	1 . 9 . k	1	108	1.85	6.48	14.81	70.37	6.48	0.73	Positive
An adequate response to long-term OCS in asthmatics can be characterized as: improvement in symptoms related to chronic sinusitis/nasal polyps.	1 . 9 . l	1	108	2.78	19.44	33.33	41.67	2.78	0.22	Controversial
		2	110	0.91	18.18	33.64	45.45	1.82	0.29	Controversial
		3	109	0.92	16.51	29.36	52.29	0.92	0.36	Controversial
An adequate response to long-term OCS in asthmatics can be characterized as: return to work (which would have been impossible without OCS).	1 . 9 . m	1	108	0.93	2.78	16.67	68.52	11.11	0.86	Positive
OCS may be used as a temporary measure in patients having recurrent eosinophilic asthma exacerbations whilst completing severe asthma assessments.	1 . 10 . a	1	108	1.85	8.33	13.89	62.96	12.96	0.77	Positive
The yearly cumulative dose of OCS should be monitored as a marker of asthma control.	1 . 10 . b	1	108	0	2.78	6.48	63.89	26.85	1.15	Positive
OCS therapy can be used to estimate the best obtainable improvement of asthma symptoms.	1 . 10 . c	1	108	0	17.59	25.93	48.15	8.33	0.47	Controversial
		2	108	1.85	17.59	22.22	54.63	3.7	0.41	Controversial
		3	109	0.92	22.02	11.93	59.63	5.5	0.47	Controversial
Short-term, prophylactic OCS use is appropriate in asthma patients when early signs/symptoms of significant exacerbation appear, if the patient is adherent with proper use of daily asthma therapy.	1 . 10 . d	1	108	4.63	30.56	20.37	42.59	1.85	0.06	Controversial
		2	108	4.63	27.78	22.22	42.59	2.78	0.11	Controversial
		3	109	4.59	30.28	15.6	47.71	1.83	0.12	Controversial
OCS can also be considered in patients with fixed airflow obstruction which becomes reversible on OCS (infrequent).	1 . 10 . e	1	108	4.63	24.07	35.19	34.26	1.85	0.05	Controversial
		2	108	1.85	26.85	29.63	40.74	0.93	0.12	Controversial
		3	109	2.75	21.1	31.19	44.04	0.92	0.19	Controversial
Asthma patients who have a second exacerbation within 6 weeks of a short "burst" prednisone-treated exacerbation should have a longer, tapering course of prednisone.	1 . 11 . a	1	108	2.78	21.3	33.33	39.81	2.78	0.19	Controversial
		2	108	2.78	28.7	18.52	46.3	3.7	0.19	Controversial
		3	109	1.83	18.35	23.85	53.21	2.75	0.37	Controversial
In adults and adolescents receiving maintenance OCS for asthma, the dose should be at least doubled to define an exacerbation.	1 . 11 . b	1	108	2.78	20.37	18.52	52.78	5.56	0.38	Controversial
		2	108	0.93	19.44	26.85	46.3	6.48	0.38	Controversial
		3	109	2.75	11.93	16.51	62.39	6.42	0.58	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	108	1.85	14.81	19.44	53.7	10.19	0.56	Controversial
Patients hospitalized for asthma exacerbation and treated with systemic corticosteroids should be		2	108	0.93	22.22	18.52	51.85	6.48	0.41	Controversial
prescribed a short course (for example 5 days) of OCS upon discharge from the hospital.	1 . 11 . c	3	109	0	18.35	20.18	51.38	10.09	0.53	Controversial
		1	108	5.56	25	26.85	33.33	9.26	0.16	Controversial
		2	108	6.48	34.26	29.63	24.07	5.56	-0.12	Controversial
Prednisolone assays should be used in standard practice to verify OCS adherence.	1 . 12 . a	3	109	5.5	35.78	22.94	29.36	6.42	-0.05	Controversial
		1	108	11.11	30.56	42.59	15.74	0	-0.37	Controversial
		2	108	13.89	32.41	36.11	16.67	0.93	-0.42	Controversial
A 9AM cortisol test is sufficient for determining if a patient is OCS compliant.	1 . 12 . b	3	109	11.93	37.61	29.36	20.18	0.92	-0.39	Controversial
		1	108	0.93	13.89	17.59	36.11	31.48	0.83	Controversial
Long-acting or methylprednisolone injections are not necessary.	1 . 13 . a	2	108	0	13.89	15.74	47.22	23.15	0.8	Positive
Patients receiving frequent methylprednisolone injections for asthma treatment or exacerbations are at the same or similar risk of suffering side effects from steroids and developing adrenal insufficiency as those receiving OCS.	1 . 13 . b	1	108	2.78	14.81	7.41	35.19	39.81	0.94	Positive
Long-acting or methylprednisolone injections are not superior to orally administered glucocorticoids.	1 . 13 . c	1	108	0	6.48	13.89	52.78	26.85	1	Positive
Chronic OCS treatment of asthma in the pediatric age should be a rare exception.	1 . 14 . a	1	108	0	0	14.81	29.63	55.56	1.41	Positive
OCS can lead to several systemic side-effects and growth deficits in pediatric patients.	1 . 14 . b	1	108	0	0	11.11	25	63.89	1.53	Positive
		1	108	25.93	35.19	29.63	9.26	0	-0.78	Controversial
		2	108	14.81	41.67	29.63	12.96	0.93	-0.56	Controversial
Methotrexate is a useful steroid-sparing agent in asthma.	1 . 16 . a	3	109	14.68	48.62	26.61	8.26	1.83	-0.66	Controversial
		1	108	25.93	37.04	31.48	5.56	0	-0.83	Controversial
		2	108	16.67	50.93	25.93	5.56	0.93	-0.77	Controversial
Azathioprine is a useful steroid-sparing agent in asthma.	1 . 16 . b	3	109	15.6	56.88	21.1	6.42	0	-0.82	Negative
		1	108	25	35.19	33.33	6.48	0	-0.79	Controversial
		2	108	16.67	39.81	38.89	3.7	0.93	-0.68	Controversial
Mycophenolat mofetil is a useful steroid-sparing agent in asthma.	1 . 16 . c	3	109	14.68	47.71	33.94	3.67	0	-0.73	Controversial
		1	108	5.56	25.93	31.48	36.11	0.93	0.01	Controversial
		2	108	2.78	27.78	30.56	37.04	1.85	0.07	Controversial
Azithromycin is a useful steroid-sparing agent in asthma.	1 . 16 . d	3	109	2.75	26.61	32.11	35.78	2.75	0.09	Controversial
		1	108	1.85	23.15	20.37	42.59	12.04	0.4	Controversial
		2	108	3.7	23.15	24.07	39.81	9.26	0.28	Controversial
The most useful OCS-sparing strategy is high-dose inhaled steroid in asthma.	1 . 16 . e	3	109	1.83	13.76	24.77	51.38	8.26	0.5	Controversial
		1	108	6.48	24.07	45.37	20.37	3.7	-0.09	Controversial
		2	108	3.7	21.3	41.67	31.48	1.85	0.06	Controversial
Bronchial thermoplasty is a useful steroid-sparing strategy in asthma.	1 . 16 . f	3	109	3.67	25.69	43.12	26.61	0.92	-0.05	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Biologicals, such as IL5 and IL4Ra targeting drugs, are useful sparing agents in asthma.	1 . 16 . g	1	108	0.93	0	3.7	19.44	75.93	1.69	Positive
There is a need for OCS-sparing agents.	1 . 16 . h	1	108	0	0	1.85	39.81	58.33	1.56	Positive
Patients on maintenance OCS for severe asthma should be systematically assessed for suitability of biologicals.	1 . 17 . a	1	108	0	0	1.85	18.52	79.63	1.78	Positive
OCS may be used as a provisional strategy for difficult to control, eosinophilic/T2 asthma until an effective biological treatment is available for the patient.	1 . 17 . b	1	108	1.85	2.78	9.26	67.59	18.52	0.98	Positive
The daily dose of OCS treatment may represent a reliable marker for the evaluation of biological treatment response.	1 . 17 . c	1	108	0.93	7.41	12.04	49.07	30.56	1.01	Positive
		1	108	8.33	50	13.89	19.44	8.33	-0.31	Controversial
Patients should not have extra OCS at home because the risk of self treatment becoming		2	107	9.35	50.47	10.28	23.36	6.54	-0.33	Controversial
a habit is too high.	1 . 18 . a	3	109	11.93	44.95	13.76	22.02	7.34	-0.32	Controversial
If OCS is to be used, preparations with lower adrenal suppression should be chosen at the lowest effective dose administered in the morning.	1 . 18 . b	1	108	0.93	0.93	14.81	58.33	25	1.06	Positive
Establishing equivalence between ICS and OCS in children and in adults (systemic distribution of ICS) is of major importance.	1 . 18 . c	1	108	0	4.63	23.15	52.78	19.44	0.87	Positive
Tapering (down to a minimal efficacious dose or complete weaning if possible) should be attempted in all asthma patients receiving maintenance OCS therapy, regardless of comorbidities.	2 . 1 . a	1	105	0	1.9	1.9	37.14	59.05	1.53	Positive
The rhythm and speed of OCS tapering requires individualization for each patient.	2 . 1 . b	1	105	0	1.9	2.86	54.29	40.95	1.34	Positive
Proceeding towards a tapering attempt is particularly appropriate when: patients on maintenance OCS have gained control (for a minimum, agreed-upon time).	2 . 2 . a	1	105	0	0	3.81	59.05	37.14	1.33	Positive
Proceeding towards a tapering attempt is particularly appropriate when: biological treatment has been initiated and results in asthma control.	2 . 2 . b	1	105	0	0.95	0.95	25.71	72.38	1.7	Positive
Proceeding towards a tapering attempt is particularly appropriate when: a patient exhibits symptoms/comorbidities likely linked to OCS.	2 . 2 . c	1	105	0	1.9	2.86	41.9	53.33	1.47	Positive
Proceeding towards a tapering attempt is particularly appropriate when: there is a reasonable likelihood of hypothalamic-pituitary-adrenal axis recovery.	2 . 2 . d	1	105	0	1.9	11.43	54.29	32.38	1.17	Positive
Proceeding towards a tapering attempt is particularly appropriate when: the intensity or duration of OCS treatment gives reason for concern.	2 . 2 . e	1	105	0	0	3.81	59.05	37.14	1.33	Positive
Proceeding towards a tapering attempt is particularly appropriate when: the patient does not appear to respond to OCS treatment.	2 . 2 . f	1	105	0	0.95	0.95	35.24	62.86	1.6	Positive
Tapering OCS should NOT be attempted in patients who: have demonstrated potentially		1	105	1.9	18.1	18.1	56.19	5.71	0.46	Controversial
harmful outcomes during previous weaning attempts (and all available medications have		2	106	0.94	17.92	22.64	51.89	6.6	0.45	Controversial
been appropriately initiated/tested).	2 . 4 . a	3	109	0.92	22.94	13.76	59.63	2.75	0.4	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Tapering OCS should NOT be attempted in patients who: have EGPA that relapses during tapering (and no other changes can be proposed).	2 . 4 . b	1	105	0.95	3.81	12.38	66.67	16.19	0.93	Positive
Tapering OCS should NOT be attempted in patients who: have ABPA that relapses during tapering (and no other changes can be proposed).	2 . 4 . c	1	105	0	9.52	19.05	61.9	9.52	0.71	Positive
Tapering OCS should NOT be attempted in patients who: have proven primary or secondary adrenal insufficiency.	2 . 4 . d	1	105	4.76	11.43	22.86	52.38	8.57	0.49	Controversial
		2	106	5.66	21.7	17.92	47.17	7.55	0.29	Controversial
		3	109	4.59	29.36	18.35	42.2	5.5	0.15	Controversial
Tapering OCS should NOT be attempted in patients who: have uncontrolled asthma.	2 . 4 . e	1	105	3.81	17.14	20	47.62	11.43	0.46	Controversial
		2	106	1.89	20.75	14.15	55.66	7.55	0.46	Controversial
		3	109	0	21.1	13.76	55.96	9.17	0.53	Controversial
Tapering OCS should NOT be attempted in patients who: have uncontrolled T2 high inflammation.	2 . 4 . f	1	105	5.71	24.76	27.62	32.38	9.52	0.15	Controversial
		2	106	4.72	27.36	29.25	30.19	8.49	0.1	Controversial
		3	109	1.83	28.44	25.69	40.37	3.67	0.16	Controversial
OCS tapering should be faster in patients who have been on maintenance OCS for shorter periods (less than 6 months for example).	2 . 5 . a	1	105	0	17.14	12.38	56.19	14.29	0.68	Positive
OCS tapering should be slower in patients who had a slow response to OCS (and vice-versa).	2 . 5 . b	1	105	0.95	30.48	31.43	34.29	2.86	0.08	Controversial
		2	106	2.83	34.91	29.25	31.13	1.89	-0.06	Controversial
		3	108	0.93	37.96	29.63	31.48	0	-0.08	Controversial
The speed of OCS tapering depends on the known rapidity of action of the sparing drug introduced.	2 . 5 . c	1	105	0	18.1	23.81	44.76	13.33	0.53	Controversial
		2	106	0.94	10.38	19.81	61.32	7.55	0.64	Controversial
		3	108	0	17.59	20.37	54.63	7.41	0.52	Controversial
The speed of OCS tapering depends on the history of and future risk for adverse events.	2 . 5 . d	1	105	0	5.71	10.48	70.48	13.33	0.91	Positive
The speed of OCS tapering depends on the type of comorbidity present (for EGPA, for example, tapering plans proposed in RCTs are used).	2 . 5 . e	1	105	0	1.9	13.33	66.67	18.1	1.01	Positive
OCS tapering should be based on patient collaboration and experience with side effects.	2 . 5 . f	1	105	0	1.9	13.33	62.86	21.9	1.05	Positive
OCS tapering should be guided by biomarkers at each weaning step.	2 . 5 . g	1	105	0.95	28.57	36.19	32.38	1.9	0.06	Controversial
		2	106	1.89	37.74	30.19	28.3	1.89	-0.09	Controversial
		3	108	0.93	50	21.3	25.93	1.85	-0.22	Controversial
OCS tapering should be gradual, by reducing the OCS dose by 30–50% every 24 weeks.	2 . 6 . a	1	105	0.95	28.57	29.52	40	0.95	0.11	Controversial
		2	106	1.89	27.36	20.75	48.11	1.89	0.21	Controversial
		3	107	0	19.63	12.15	67.29	0.93	0.5	Controversial
OCS tapering should be gradual, with 2.5–5 mg steps every 0.5–2 weeks until an agreed-upon threshold is achieved (e.g. 5–10 mg/day), and then proceeds at a slower pace (1–2.5 mg every 1–2 weeks).	2 . 6 . b	1	105	0	3.81	13.33	72.38	10.48	0.9	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	105	0	26.67	24.76	39.05	9.52	0.31	Controversial
		2	106	1.89	23.58	17.92	50.94	5.66	0.35	Controversial
In general, the speed of tapering should not exceed a reduction of 5 mg per week.	2 . 6 . c	3	107	0	30.84	14.95	48.6	5.61	0.29	Controversial
		1	105	0.95	16.19	19.05	55.24	8.57	0.54	Controversial
The initial tapering of high OCS doses (e.g. >20 mg per day) can proceed at a faster pace		2	106	0	13.21	16.98	66.98	2.83	0.59	Controversial
(e.g. -10 mg per week, or 30–50% reductions every 2–4 weeks).	2 . 6 . d	3	107	1.87	8.41	14.95	70.09	4.67	0.67	Positive
When a reduction in OCS by 5 mg weekly fails, a slower and lower dose reduction of 1 mg per week should be attempted.	2 . 6 . e	1	105	0	5.71	12.38	72.38	9.52	0.86	Positive
		1	105	1.9	16.19	27.62	44.76	9.52	0.44	Controversial
OCS tapering should incorporate every-other-day OCS reductions (especially prior to		2	106	2.83	19.81	28.3	46.23	2.83	0.26	Controversial
discontinuation) to allow recovery of the endogenous axis.	2 . 6 . f	3	107	2.8	15.89	26.17	50.47	4.67	0.38	Controversial
If intolerable symptoms occur, return to the previous (efficacious) dose, and then later consider re-attempting tapering at a slower pace.	2 . 6 . g	1	105	0	0	3.81	75.24	20.95	1.17	Positive
		1	105	0	6.67	23.81	69.71	3.81	0.67	Controversial
If mild symptoms occur, maintain the current dosage; they are likely to resolve as		2	106	0.94	7.55	23.58	66.04	1.89	0.6	Controversial
endogenous axis recovery occurs.	2 . 6 . h	3	107	0	7.48	19.63	69.16	3.74	0.69	Positive
		1	105	2.86	28.57	43.81	24.76	0	-0.1	Controversial
		2	106	1.89	44.34	28.3	23.58	1.89	-0.21	Controversial
A tapering trial should end when: biomarkers trend toward abnormal.	2 . 7 . a	3	107	1.87	44.86	23.36	28.97	0.93	-0.18	Controversial
A tapering trial should end when: symptoms trend toward loss of control (retain lowest dose that maintains clinical benefit).	2 . 7 . b	1	105	0	5.71	2.86	81.9	9.52	0.95	Positive
		1	105	4.76	40.95	25.71	24.76	3.81	-0.18	Controversial
		2	106	5.66	43.4	29.25	18.87	2.83	-0.3	Controversial
A tapering trial should end when: the patient is not motivated to continue.	2 . 7 . c	3	107	1.87	43.93	24.3	28.04	1.87	-0.16	Controversial
		1	105	3.81	30.48	35.24	25.71	4.76	-0.03	Controversial
		2	106	2.83	32.08	23.58	39.62	1.89	0.06	Controversial
Peak expiratory flow is a useful biomarker during OCS tapering.	2 . 8 . a	3	106	0.94	33.02	16.04	49.06	0.94	0.16	Controversial
		1	105	1.9	23.81	22.86	44.76	6.67	0.3	Controversial
		2	106	0	26.42	22.64	46.23	4.72	0.29	Controversial
Forced expiratory volume in 1 second (spirometry) is a useful biomarker during OCS tapering.	2 . 8 . b	3	106	0.94	26.42	16.98	50.94	4.72	0.32	Controversial
		1	105	0	11.43	29.52	53.33	5.71	0.53	Controversial
		2	106	0	15.09	20.75	55.66	8.49	0.58	Controversial
Fraction exhaled nitric oxide is a useful biomarker during OCS tapering.	2 . 8 . c	3	106	0.94	14.15	24.53	54.72	5.66	0.5	Controversial
		1	105	0	13.33	27.62	50.48	8.57	0.54	Controversial
		2	106	1.89	18.87	24.53	48.11	6.6	0.39	Controversial
Peripheral eosinophils are a useful biomarker during OCS tapering.	2 . 8 . d	3	106	0	15.09	23.58	55.66	5.66	0.52	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	105	2.86	20	32.38	35.24	9.52	0.29	Controversial
		2	106	6.6	21.7	23.58	42.45	5.66	0.19	Controversial
Sputum eosinophils are a useful biomarker during OCS tapering.	2 . 8 . e	3	106	5.66	19.81	32.08	38.68	3.77	0.15	Controversial
		1	105	15.24	34.29	37.14	11.43	1.9	-0.5	Controversial
Bronchoalveolar lavage fluid (BAL) eosinophils are a useful biomarker during OCS		2	106	14.15	44.34	28.3	12.26	0.94	-0.58	Controversial
tapering.	2 . 8 . f	3	106	16.98	43.4	27.36	10.38	1.89	-0.63	Controversial
Asthma control questionnaires (ACT, ACQ) are a useful biomarker during OCS tapering.	2 . 8 . g	1	105	0.95	4.76	12.38	61.9	20	0.95	Positive
		1	105	2.86	12.38	20.95	54.29	9.52	0.55	Controversial
		2	106	4.72	19.81	25.47	44.34	5.66	0.26	Controversial
Adrenal insufficiency assessments are a useful biomarker during OCS tapering.	2 . 8 . h	3	106	4.72	22.64	22.64	45.28	4.72	0.23	Controversial
		1	105	24.76	31.43	24.76	15.24	3.81	-0.58	Controversial
		2	106	21.7	36.79	22.64	16.04	2.83	-0.58	Controversial
Biomarker guidance is useless or too troublesome during OCS tapering.	2 . 8 . i	3	106	11.32	51.89	21.7	13.21	1.89	-0.58	Controversial
Cautious, slow tapering is particularly appropriate for patients who: have comorbidities that respond to OCS.	2 . 9 . a	1	105	0	3.81	9.52	70.48	16.19	0.99	Positive
Cautious, slow tapering is particularly appropriate for patients who: have had life-threatening attacks.	2 . 9 . b	1	105	0.95	3.81	3.81	60	31.43	1.17	Positive
Cautious, slow tapering is particularly appropriate for patients who: have been dependent on systemic steroids for an extended period of time (e.g. 6 months or more).	2 . 9 . c	1	105	0	2.86	6.67	63.81	26.67	1.14	Positive
Complete OCS cessation (weaning) can be implemented: when the OCS dose is less than or equal to 5 mg prednisolone.	2 . 10 . a	1	105	0.95	15.24	13.33	53.33	17.14	0.7	Positive
Complete OCS cessation (weaning) can be implemented: following a short course of OCS treatment that lasted for 5–7 days.	2 . 10 . b	1	105	0.95	1.9	1.9	44.76	50.48	1.42	Positive
Complete OCS cessation (weaning) can be implemented: following a short course of OCS treatment if patients are on inhaled anti inflammatory therapy.	2 . 10 . c	1	105	1.9	1.9	2.86	48.57	44.76	1.32	Positive
		1	105	0	18.1	27.62	41.9	12.38	0.49	Controversial
Complete OCS cessation (weaning) can be implemented: when no severe exacerbations		2	106	1.89	22.64	16.98	51.89	6.6	0.39	Controversial
have occurred during the last 4 weeks.	2 . 10 . d	3	106	0.94	22.64	15.09	58.49	2.83	0.4	Controversial
Complete OCS cessation (weaning) can be implemented: when there is no evidence of adrenal insufficiency.	2 . 10 . e	1	105	0.95	6.67	13.33	59.05	20	0.9	Positive
Complete OCS cessation (weaning) can be implemented: when there is no evidence of EGPA or ABPA.	2 . 10 . f	1	105	0	7.62	19.05	56.19	17.14	0.83	Positive
Complete OCS cessation (weaning) can be implemented: when a sparing strategy has been initiated.	2 . 10 . g	1	105	0.95	2.86	14.29	54.29	27.62	1.05	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Complete OCS cessation (weaning) can be implemented: when the patient has agreed to cessation.	2 . 10 . h	1	105	1.9	4.76	20	50.48	22.86	0.88	Positive
		1	105	0	14.29	34.29	44.76	6.67	0.44	Controversial
		2	106	0	16.98	19.81	50.94	12.26	0.58	Controversial
Pulmonary rehabilitation can be helpful before OCS tapering to improve physical activity and decrease dyspnea. It can facilitate OCS tapering.	2 . 11 . a	3	106	1.89	11.32	20.75	53.77	12.26	0.63	Controversial
OCS tapering should be re-attempted every time a new biological treatment for eosinophilic asthma patients becomes available.	2 . 11 . b	1	105	0	2.86	7.62	57.14	32.38	1.19	Positive
Biological therapies have become an essential support for OCS tapering.	2 . 11 . c	1	105	0.95	0.95	4.76	29.52	63.81	1.54	Positive
Following the initiation of a biological therapy, if weaning is not achieved within 12 months, consider switching to a different biological.	2 . 11 . d	1	105	0	5.71	10.48	57.14	26.67	1.05	Positive
Not achieving a >50% reduction in OCS dose (or a tolerable daily dose) is a failure for a given biological therapy that may mandate switching strategies.	2 . 11 . e	1	105	0	5.71	20	59.05	15.24	0.84	Positive
		1	105	1.9	15.24	39.05	38.1	5.71	0.3	Controversial
		2	106	0	13.21	29.25	50.94	6.6	0.51	Controversial
Thermoplasty needs to be considered when OCS tapering fails and no other alternative is indicated (biologicals etc).	2 . 11 . f	3	106	0.94	10.38	34.91	44.34	9.43	0.51	Controversial
Poor adherence and inhaler technique should be actively sought and managed to facilitate OCS tapering.	2 . 12 . a	1	105	0	0.95	0.95	32.38	65.71	1.63	Positive
		1	105	0.95	23.81	16.19	44.76	14.29	0.48	Controversial
		2	106	4.72	27.36	7.55	51.89	8.49	0.32	Controversial
Monitoring during OCS tapering can be based on symptoms in almost all patients.	2 . 12 . b	3	106	0.94	23.58	14.15	55.66	5.66	0.42	Controversial
OCS should be used at a minimum dose, so whenever writing a prescription for OCS, the option of reducing the dose should always be considered.	2 . 12 . c	1	105	0	2.86	7.62	58.1	31.43	1.18	Positive
Comorbidities should be addressed at all times (not just during tapering).	3 . 1 . a	1	103	0	0	1.94	42.72	55.34	1.53	Positive
Asthma patients receiving OCS therapy are at a higher risk of complications compared to those without OCS exposure.	3 . 1 . b	1	103	0	0	2.91	29.13	67.96	1.65	Positive
OCS tapering becomes a primary outcome/goal of asthma management when a patient is affected by OCS-related comorbidities.	3 . 1 . c	1	103	0	2.91	4.85	28.16	64.08	1.53	Positive
The evaluation of comorbidities is mandatory prior to tapering OCS.	3 . 1 . d	1	103	0	3.88	7.77	53.4	34.95	1.19	Positive
In general, the presence of comorbidities should not preclude attempting to taper down to the lowest efficacious dose or complete withdrawal (if possible).	3 . 1 . e	1	103	0.97	1.94	0.97	60.19	35.92	1.28	Positive
Comorbidities to address prior to or when initiating tapering: those that require or respond well to OCS treatment (immune diseases, vasculitis, adrenal suppression, etc)	3 . 2 . a	1	103	0	0.97	2.91	55.34	40.78	1.36	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Comorbidities to address prior to or when initiating tapering: respiratory comorbidities or those that may cause (or mimic) asthma (rhinosinusitis, nasal polyposis, GERD, bronchiectasis, vocal cord dysfunction, inducible laryngeal obstruction, dysfunctional breathing, etc).	3 . 2 . b	1	103	0	3.88	4.85	60.19	31.07	1.18	Positive
Comorbidities to address prior to or when initiating tapering: chronic non-communicable diseases often exacerbated by (or even caused by) OCS use (hyperglycemia/diabetes, metabolic disease, cardiovascular diseases, high blood pressure, glaucoma, cataract, osteoporosis, etc).	3 . 2 . c	1	103	0	1.94	6.8	54.37	36.89	1.26	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: glycemic control/HbA1c.	3 . 3 . a	1	103	0	0.97	0.97	54.37	43.69	1.41	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: blood pressure.	3 . 3 . b	1	103	0	0.97	6.8	58.25	33.98	1.25	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: fluid retention.	3 . 3 . c	1	103	0	7.77	27.18	54.37	10.68	0.68	Controversial
		2	106	1.89	24.53	21.7	51.89	0	0.24	Controversial
		3	106	1.89	18.87	26.42	50.94	1.89	0.32	Controversial
The minimum checklist for comorbidity screening in the OCS-treated population should include: cardiovascular risk score (e.g. CHADS2).	3 . 3 . d	1	103	0	6.8	25.24	47.57	20.39	0.82	Controversial
		2	106	1.89	24.53	27.36	44.34	1.89	0.2	Controversial
		3	106	2.83	21.7	25.47	45.28	4.72	0.27	Controversial
The minimum checklist for comorbidity screening in the OCS-treated population should include: lipid panel.	3 . 3 . e	1	103	0	7.77	29.13	48.54	14.56	0.7	Controversial
		2	106	0.94	23.58	24.53	50	0.94	0.26	Controversial
		3	106	2.83	25.47	22.64	47.17	1.89	0.2	Controversial
The minimum checklist for comorbidity screening in the OCS-treated population should include: fracture risk score (e.g. FRAX).	3 . 3 . f	1	103	0	0	17.48	50.49	32.04	1.15	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: bone density.	3 . 3 . g	1	103	0	0	4.85	49.51	45.63	1.41	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: cataracts and glaucoma.	3 . 3 . h	1	103	0	2.91	10.68	50.49	35.92	1.19	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: growth (pediatric population).	3 . 3 . i	1	103	0	0	3.88	42.72	53.4	1.5	Positive
The minimum checklist for comorbidity screening in the OCS-treated population should include: weight change.	3 . 3 . j	1	103	0	0.97	6.8	65.05	27.18	1.18	Positive
Comorbidity subsets for whom OCS tapering is a priority: those with evidence of a clinically significant OCS adverse effect.	3 . 4 . a	1	103	0	0	0.97	38.83	60.19	1.59	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Comorbidity subsets for whom OCS tapering is a priority: those with chronic non-communicable diseases often exacerbated by (or even caused by) OCS use (glucose metabolism, metabolic disease, cardiovascular diseases, high blood pressure, glaucoma, cataract, osteoporosis, etc).	3 . 4 . b	1	103	0	0	0.97	45.63	53.4	1.52	Positive
		1	103	0	5.83	25.24	48.54	20.39	0.83	Controversial
		2	106	0.94	17.92	26.42	48.11	6.6	0.42	Controversial
Comorbidity subsets for whom OCS tapering is a priority: those with a non-T2 phenotype.	3 . 4 . c	3	105	0.95	15.24	21.9	54.29	7.62	0.52	Controversial
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility...	3 . 4 . d	1	103	0	0	10.68	63.11	26.21	1.16	Positive
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility... such as age (youth).	3 . 4 . e	1	103	0	0	10.68	50.49	38.83	1.28	Positive
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility... such as age (elderly).	3 . 4 . f	1	103	0	3.88	16.5	54.37	25.24	1.01	Positive
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility... such as post-menopausal women.	3 . 4 . g	1	103	0	8.74	19.42	51.46	20.39	0.83	Positive
		1	103	0	8.74	32.04	45.63	13.59	0.64	Controversial
		2	106	0.94	14.15	16.98	61.32	6.6	0.58	Controversial
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility... such as gender (female).	3 . 4 . h	3	105	0	8.57	25.71	60	5.71	0.63	Controversial
		1	103	0	11.65	30.1	47.57	10.68	0.57	Controversial
		2	106	0.94	15.09	27.36	52.83	3.77	0.43	Controversial
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility... such as vitamin D deficiency.	3 . 4 . i	3	105	0.95	8.57	34.29	53.33	2.86	0.49	Controversial
Comorbidity subsets for whom OCS tapering is a priority: those with important risk factors associated with increased OCS-susceptibility... such as known PDGF-D gene polymorphism.		1	103	0	7.77	61.17	23.3	7.77	0.31	Controversial
		2	106	1.89	13.21	54.72	27.36	2.83	0.16	Controversial
	3 . 4 . j	3	105	0.95	8.57	62.86	23.81	3.81	0.21	Controversial
		1	103	0.97	35.92	32.04	25.24	5.83	-0.01	Controversial
		2	106	7.55	51.89	15.09	18.87	6.6	-0.35	Controversial
Obese patients should have a polysomnography test prior to tapering.	3 . 6 . a	3	105	1.9	60	22.86	11.43	3.81	-0.45	Controversial
Obesity should be aggressively managed with dietary advice and, where suitable and safe, consideration of bariatric surgery.	3 . 6 . b	1	103	0	0.97	6.8	63.11	29.13	1.2	Positive
		1	103	0	15.53	29.13	50.49	4.85	0.45	Controversial
		2	106	2.83	25.47	24.53	42.45	4.72	0.21	Controversial
The risk of triggering a bipolar disorder in predisposed patients on continuous OCS treatment should be discussed with a psychiatrist.	3 . 7 . a	3	105	1.9	24.76	23.81	45.71	3.81	0.25	Controversial
OCS addiction requires assessment of patient psychological profiles.	3 . 7 . b	1	103	0	7.77	21.36	63.11	7.77	0.71	Positive
		1	103	5.83	36.89	31.07	25.24	0.97	-0.21	Controversial
		2	106	4.72	45.28	16.98	31.13	1.89	-0.2	Controversial
All patients over 65 years with severe asthma Step 5 and cardiac failure, should begin tapering only in case of stable cardiac disease.	3 . 8 . a	3	105	4.76	38.1	20.95	33.33	2.86	-0.09	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
In OCS patients with cardiovascular diseases, a coronarography should be performed even if the patient has no symptoms.	3 . 8 . b	1	103	11.65	49.51	28.16	9.71	0.97	-0.61	Controversial
In OCS patients with cardiovascular diseases, a coronarography should be performed even if the patient has no symptoms.	3 . 8 . b	2	106	17.92	56.6	16.98	8.49	0	-0.84	Negative
Patients >75 years of age with uncontrolled, Step 4–5 asthma and cardiac disease should have a cardiology evaluation prior to tapering.	3 . 8 . c	1	103	4.85	38.83	26.21	26.21	3.88	-0.15	Controversial
		2	106	4.72	33.02	23.58	34.91	3.77	0	Controversial
		3	105	5.71	45.71	17.14	27.62	3.81	-0.22	Controversial
For GINA Step 5 patients, fungal disease must be ruled out in the first weeks of OCS treatment.	3 . 9 . a	1	103	0	17.48	33.01	45.63	3.88	0.36	Controversial
		2	106	0	23.58	25.47	41.51	9.43	0.37	Controversial
		3	105	0.95	20	21.9	51.43	5.71	0.41	Controversial
OCS tapering should occur prior to cataract surgery.	3 . 9 . b	1	103	0.97	25.24	29.13	42.72	1.94	0.19	Controversial
		2	106	0.94	26.42	36.79	33.02	2.83	0.1	Controversial
		3	105	0	20	41.9	34.29	3.81	0.22	Controversial
In patients with EGPA, tapering must be performed in collaboration with a rheumatologist.	3 . 9 . c	1	103	3.88	21.36	21.36	48.54	4.85	0.29	Controversial
		2	106	4.72	22.64	23.58	41.51	7.55	0.25	Controversial
		3	105	2.86	25.71	20.95	44.76	5.71	0.25	Controversial
For patients treated with DDAVP (desmopressin), sodium levels should be monitored during tapering to avoid significant hyponatremia.	3 . 9 . d	1	103	0	2.91	46.6	44.66	5.83	0.53	Controversial
		2	106	0	4.72	46.23	43.4	5.66	0.5	Controversial
		3	105	0	4.76	50.48	41.9	2.86	0.43	Controversial
ACOS/COPD rule-out should be performed for patients with a history of tobacco use or biomass exposure.	3 . 9 . e	1	103	0.97	15.53	20.39	57.28	5.83	0.51	Controversial
		2	106	3.77	19.81	19.81	51.89	4.72	0.34	Controversial
		3	105	1.9	21.9	8.57	60	7.62	0.5	Controversial
The cost of OCS side effects should be more properly invested in more effective treatments such as biologicals.	3 . 9 . f	1	103	0	0.97	10.68	50.49	37.86	1.25	Positive
OCS tapering may be necessary for assessing the possibility of EGPA or other systemic vasculitis.	3 . 9 . g	1	103	1.94	3.88	22.33	65.05	6.8	0.71	Positive
Adrenal insufficiency among OCS-treated asthma patients should be regularly assessed.	4 . 1 . a	1	101	1.98	11.88	12.87	57.43	15.84	0.73	Positive
In as much as possible during the tapering process, troublesome signs (such as aches and pains) of adrenal insufficiency should be symptomatically treated and not viewed as a reason to give up on tapering altogether.	4 . 1 . b	1	101	0.99	8.91	14.85	62.38	12.87	0.77	Positive
In case of adrenal insufficiency during tapering, hydrocortisone replacement is preferred to continued prednisolone, and may ease the tapering process.	4 . 1 . c	1	101	1.98	3.96	28.71	46.53	18.81	0.76	Controversial
		2	106	1.89	7.55	27.36	50	13.21	0.65	Controversial
		3	105	1.9	5.71	27.62	55.24	9.52	0.65	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Adrenal insufficiency should be assessed: systematically when the daily dose of OCS is tapered down to an agreed-upon threshold...	4 . 2 . a	1	101	1.98	9.9	12.87	55.45	19.8	0.81	Positive
Adrenal insufficiency should be assessed: systematically when the daily dose of OCS is tapered down to an agreed-upon threshold... such as 3 mg/day.	4 . 2 . b	1	101	4.95	31.68	35.64	18.81	8.91	-0.05	Controversial
		2	105	2.86	34.29	27.62	28.57	6.67	0.02	Controversial
		3	105	4.76	33.33	24.76	33.33	3.81	-0.02	Controversial
Adrenal insufficiency should be assessed: systematically when the daily dose of OCS is tapered down to an agreed-upon threshold... such as 5 mg/day.	4 . 2 . c	1	101	3.96	12.87	24.75	46.53	11.88	0.5	Controversial
		2	105	1.9	18.1	15.24	52.38	12.38	0.55	Controversial
		3	105	3.81	13.33	19.05	54.29	9.52	0.52	Controversial
Adrenal insufficiency should be assessed: systematically when the daily dose of OCS is tapered down to an agreed-upon threshold... such as 7.5 mg/day.	4 . 2 . d	1	101	3.96	31.68	33.66	22.77	7.92	-0.01	Controversial
		2	105	4.76	34.29	36.19	18.1	6.67	-0.12	Controversial
		3	105	5.71	36.19	24.76	27.62	5.71	-0.09	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations...	4 . 3 . a	1	101	3.96	17.82	19.8	55.45	2.97	0.36	Controversial
		2	105	3.81	22.86	11.43	51.43	10.48	0.42	Controversial
		3	105	3.81	21.9	10.48	58.1	5.71	0.4	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those on regular, long-term OCS therapy.	4 . 3 . b	1	101	0.99	4.95	9.9	62.38	21.78	0.99	Positive
Adrenal insufficiency should be assessed only in selected sub-populations... such as those exceeding a cumulative yearly dose of 500 mg OCS.	4 . 3 . c	1	101	1.98	23.76	37.62	32.67	3.96	0.13	Controversial
		2	105	2.86	36.19	25.71	30.48	4.76	-0.02	Controversial
		3	105	0	39.05	32.38	26.67	1.9	-0.09	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those exceeding a cumulative yearly dose of 1 g OCS.	4 . 3 . d	1	101	1.98	19.8	26.73	38.61	12.87	0.41	Controversial
		2	105	1.9	25.71	24.76	39.05	8.57	0.27	Controversial
		3	105	0	20	30.48	43.81	5.71	0.35	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those exceeding a cumulative yearly dose of 2 g OCS.	4 . 3 . e	1	101	1.98	13.86	20.79	41.58	21.78	0.67	Controversial
		2	105	0.95	17.14	19.05	44.76	18.1	0.62	Controversial
		3	105	0	16.19	19.05	48.57	16.19	0.65	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those exceeding a cumulative yearly dose of >2 g OCS.	4 . 3 . f	1	101	1.98	8.91	21.78	39.6	27.72	0.82	Controversial
		2	105	0.95	13.33	17.14	45.71	22.86	0.76	Controversial
		3	105	0.95	14.29	16.19	47.62	20.95	0.73	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those who have had two repeated short courses of OCS in a given year.	4 . 4 . a	1	101	8.91	53.47	28.71	8.91	0	-0.62	Controversial
		2	105	11.43	55.24	26.67	5.71	0.95	-0.7	Controversial
		3	105	7.62	60.95	19.05	12.38	0	-0.64	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those who have had three repeated short courses of OCS in a given year.	4 . 4 . b	1	101	6.93	46.53	28.71	16.83	0.99	-0.42	Controversial
		2	105	10.48	40	28.57	18.1	2.86	-0.37	Controversial
		3	105	5.71	48.57	21.9	22.86	0.95	-0.35	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those who have had four repeated short courses of OCS in a given year.	4 . 4 . c	1	101	5.94	28.71	26.73	29.7	8.91	0.07	Controversial
		2	105	3.81	28.57	18.1	41.9	7.62	0.21	Controversial
		3	105	3.81	28.57	20.95	40.95	5.71	0.16	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	101	2.97	12.87	20.79	43.56	19.8	0.64	Controversial
Adrenal insufficiency should be assessed only in selected sub-populations... such as those		2	105	1.9	12.38	16.19	48.57	20.95	0.74	Controversial
who have had >4 repeated short courses of OCS in a given year.	4 . 4 . d	3	105	1.9	13.33	15.24	54.29	15.24	0.68	Controversial
Adrenal insufficiency should be assessed when signs/symptoms of adrenal insufficiency appear.	4 . 5 . a	1	101	0.99	6.93	5.94	43.56	42.57	1.2	Positive
Adrenal insufficiency should be assessed when OCS tapering trials are unsuccessful.	4 . 5 . b	1	101	0	14.85	10.89	52.48	21.78	0.81	Positive
		1	101	1.98	21.78	55.45	18.81	1.98	-0.03	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		2	105	0.95	28.57	50.48	16.19	3.81	-0.07	Controversial
doses of hydrocortisone with the following characteristics: 0.25 mg/kg/d.	4 . 6 . a	3	105	1.9	32.38	42.86	20.95	1.9	-0.11	Controversial
		1	101	3.96	21.78	43.56	29.7	0.99	0.02	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		2	105	3.81	29.52	48.57	16.19	1.9	-0.17	Controversial
doses of hydrocortisone with the following characteristics: 0.50 mg/kg/d.	4 . 6 . b	3	105	1.9	26.67	43.81	26.67	0.95	-0.02	Controversial
		1	101	0.99	21.78	32.67	38.61	5.94	0.27	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		2	105	2.86	16.19	41.9	31.43	7.62	0.25	Controversial
doses of hydrocortisone with the following characteristics: 15–20 mg/day	4 . 6 . c	3	105	1.9	17.14	43.81	31.43	5.71	0.22	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		1	101	4.95	18.81	46.53	28.71	0.99	0.02	Controversial
doses of hydrocortisone with the following characteristics: 30 mg/day in men and 20 mg/day		2	105	4.76	24.76	44.76	23.81	1.9	-0.07	Controversial
in women.	4 . 6 . d	3	105	2.86	25.71	41.9	26.67	2.86	0.01	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological										
doses of hydrocortisone with the following characteristics: doubling in cases of stress/sick days.	4 . 6 . e	1	101	0.99	5.94	16.83	56.44	19.8	0.88	Positive
		1	101	4.95	32.67	33.66	24.75	3.96	-0.1	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		2	105	6.67	36.19	27.62	23.81	5.71	-0.14	Controversial
doses of hydrocortisone with the following characteristics: one intake per day.	4 . 6 . f	3	105	9.52	39.05	26.67	21.9	2.86	-0.3	Controversial
		1	101	2.97	23.76	31.68	36.63	4.95	0.17	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		2	105	1.9	23.81	36.19	31.43	6.67	0.17	Controversial
doses of hydrocortisone with the following characteristics: two intakes per day.	4 . 6 . g	3	105	2.86	14.29	32.38	45.71	4.76	0.35	Controversial
		1	101	4.95	40.59	31.68	17.82	4.95	-0.23	Controversial
In case of adrenal insufficiency during tapering, OCS should be switched to physiological		2	105	2.86	41.9	32.38	19.05	3.81	-0.21	Controversial
doses of hydrocortisone with the following characteristics: three intakes per day.	4 . 6 . h	3	105	6.67	34.29	33.33	22.86	2.86	-0.19	Controversial
		1	101	5.94	19.8	29.7	41.58	2.97	0.16	Controversial
		2	105	6.67	21.9	25.71	41.9	3.81	0.14	Controversial
Hydrocortisone is not obligatory; OCS can be maintained at 2–4 mg once daily (starting at 4 mg)	4 . 7 . a	3	105	3.81	22.86	29.52	40	3.81	0.17	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	101	7.92	19.8	21.78	48.51	1.98	0.17	Controversial
		2	105	7.62	18.1	23.81	46.67	3.81	0.21	Controversial
Hydrocortisone is not obligatory; OCS can be maintained at 5 mg once daily.	4 . 7 . b	3	105	4.76	17.14	25.71	49.52	2.86	0.29	Controversial
		1	101	13.86	29.7	29.7	25.74	0.99	-0.3	Controversial
		2	105	11.43	42.86	26.67	17.14	1.9	-0.45	Controversial
Hydrocortisone is not obligatory; OCS can be maintained at 7.5 mg once daily.	4 . 7 . c	3	105	10.48	37.14	26.67	23.81	1.9	-0.3	Controversial
		1	101	2.97	12.87	38.61	37.62	7.92	0.35	Controversial
		2	105	1.9	28.57	30.48	34.29	4.76	0.11	Controversial
Switching to hydrocortisone should be performed: as soon as adrenal insufficiency is diagnosed.	4 . 8 . a	3	105	3.81	23.81	25.71	42.86	3.81	0.19	Controversial
		1	101	3.96	7.92	26.73	55.45	5.94	0.51	Controversial
Switching to hydrocortisone should be performed: when the patient has been weaned		2	105	2.86	10.48	29.52	53.33	3.81	0.45	Controversial
down to 5 mg OCS (and signs of adrenal insufficiency are present).	4 . 8 . b	3	105	2.86	10.48	23.81	61.9	0.95	0.48	Controversial
		1	101	5.94	50.5	32.67	10.89	0	-0.51	Controversial
Switching to hydrocortisone should be performed: when the patient has been weaned		2	105	5.71	47.62	33.33	8.57	4.76	-0.41	Controversial
down to 5 mg OCS (regardless of adrenal insufficiency assessments).	4 . 8 . c	3	105	7.62	46.67	24.76	20	0.95	-0.4	Controversial
		1	101	3.96	24.75	35.64	27.72	7.92	0.11	Controversial
Switching to hydrocortisone should be performed: when the patient has been weaned		2	105	3.81	35.24	32.38	23.81	4.76	-0.1	Controversial
down to 7 mg OCS (and signs of adrenal insufficiency are present).	4 . 8 . d	3	105	5.71	35.24	23.81	33.33	1.9	-0.1	Controversial
		1	101	6.93	55.45	31.68	2.97	2.97	-0.6	Controversial
Switching to hydrocortisone should be performed: when the patient has been weaned		2	105	6.67	50.48	34.29	4.76	3.81	-0.51	Controversial
down to 7 mg OCS (regardless of adrenal insufficiency assessments).	4 . 8 . e	3	105	9.52	54.29	24.76	9.52	1.9	-0.6	Controversial
		1	101	8.91	36.63	31.68	18.81	3.96	-0.28	Controversial
		2	105	10.48	29.52	31.43	20.95	7.62	-0.14	Controversial
Switching to hydrocortisone is not obligatory/important when managing adrenal insufficiency.	4 . 8 . f	3	105	15.24	30.48	33.33	16.19	4.76	-0.35	Controversial
		1	101	3.96	44.55	27.72	21.78	1.98	-0.27	Controversial
		2	105	7.62	42.86	22.86	23.81	2.86	-0.29	Controversial
Adrenal insufficiency should be assessed: using only a fasting morning cortisol.	4 . 9 . a	3	105	4.76	46.67	21.9	23.81	2.86	-0.27	Controversial
		1	101	0.99	32.67	35.64	24.75	5.94	0.02	Controversial
		2	105	4.76	34.29	28.57	25.71	6.67	-0.05	Controversial
Adrenal insufficiency should be assessed: using only a (short) Synacthen test.	4 . 9 . b	3	105	1.9	40.95	24.76	29.52	2.86	-0.1	Controversial
Adrenal insufficiency should be assessed: using fasting morning cortisol, and in case of intermediate results, follow up with a (short) Synacthen test.	4 . 9 . c	1	101	0.99	6.93	19.8	55.45	16.83	0.8	Positive
		1	101	0	6.93	31.68	54.46	6.93	0.61	Controversial
Adrenal insufficiency assessments should be interpreted with caution; current laboratory		2	105	2.86	13.33	29.52	47.62	6.67	0.42	Controversial
tests require improvement in terms of sensitivity and specificity.	4 . 9 . d	3	105	0	13.33	25.71	54.29	6.67	0.54	Controversial
Adrenal insufficiency should be assessed: never; patients should be systematically substituted during tapering irrespective of any test.	4 . 9 . e	1	101	17.82	56.44	22.77	2.97	0	-0.89	Negative

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Adrenal insufficiency should be assessed: never; patients should be substituted during tapering only according to signs/symptoms.	4 . 9 . f	1	101	20.79	50.5	19.8	7.92	0.99	-0.82	Negative
Adrenal insufficiency is insufficiently assessed or under-recognized.	4 . 11 . a	1	101	0.99	1.98	15.84	54.46	26.73	1.04	Positive
Steroid withdrawal syndrome (symptoms of glucocorticoid deficiency in the setting of a proven normal hypothalamic-pituitary-adrenal axis) occurs more often than adrenal insufficiency.	4 . 11 . b	1	101	0	2.97	38.61	51.49	6.93	0.62	Controversial
		2	105	0	10.48	31.43	50.48	7.62	0.55	Controversial
		3	105	0	7.62	29.52	57.14	5.71	0.61	Controversial
Administration of exogenous glucocorticoids even in small doses for only a few days leads to a measurable suppression of the hypothalamic-pituitary-adrenal axis.	4 . 11 . c	1	101	0.99	15.84	24.75	53.47	4.95	0.46	Controversial
		2	105	1.9	24.76	22.86	44.76	5.71	0.28	Controversial
		3	105	0.95	17.14	28.57	49.52	3.81	0.38	Controversial
OCS treatment may not suppress the hypothalamic-pituitary-adrenal axis at all, or it may cause central suppression and adrenal gland atrophy of varying degrees.	4 . 11 . d	1	101	0.99	13.86	29.7	49.5	5.94	0.46	Controversial
		2	105	1.9	10.48	33.33	45.71	8.57	0.49	Controversial
		3	105	0.95	6.67	34.29	52.38	5.71	0.55	Controversial
A correct OCS tapering regime does not require frequent assessments of adrenal insufficiency.	4 . 12 . a	1	101	2.97	31.68	18.81	43.56	2.97	0.12	Controversial
		2	105	9.52	32.38	19.05	35.24	3.81	-0.09	Controversial
		3	105	4.76	27.62	20	43.81	3.81	0.14	Controversial
Reduce the dose of glucocorticoid replacement to the minimum dose possible. This should be judged on hydrocortisone day curves (if on hydrocortisone), or prednisolone day curves/8- hour prednisolone levels.	4 . 12 . b	1	101	2.97	19.8	49.5	26.73	0.99	0.03	Controversial
		2	105	3.81	22.86	51.43	20.95	0.95	-0.08	Controversial
		3	105	1.9	25.71	48.57	22.86	0.95	-0.05	Controversial
If systemic effects (e.g. arthritis pain) occur during OCS tapering, patients are advised to slow down the tapering pace because the complaints will disappear after some time.	4 . 12 . c	1	101	0	11.88	24.75	59.41	3.96	0.55	Controversial
		2	105	0.95	10.48	22.86	59.05	6.67	0.6	Controversial
		3	105	0	10.48	24.76	61.9	2.86	0.57	Controversial
If adrenal insufficiency occurs during tapering, first increase OCS, and then later re-attempt tapering at a slower pace.	4 . 12 . d	1	101	2.97	13.86	19.8	57.43	5.94	0.5	Controversial
If adrenal insufficiency occurs during tapering, first increase OCS, and then later re-attempt tapering at a slower pace.	4 . 12 . d	2	105	2.86	9.52	15.24	65.71	6.67	0.64	Positive
When symptoms occur, stop further tapering until they resolve (this can take weeks/months), and then continue.	4 . 12 . e	1	101	0	19.8	23.76	55.45	0.99	0.38	Controversial
		2	105	1.9	23.81	16.19	56.19	1.9	0.32	Controversial
		3	105	0.95	15.24	24.76	55.24	3.81	0.46	Controversial
An undetectable eosinophil count may be a sign of glucocorticoid excess.	4 . 13 . a	1	101	4.95	41.58	22.77	28.71	1.98	-0.19	Controversial
		2	105	8.57	29.52	26.67	33.33	1.9	-0.1	Controversial
		3	105	6.67	31.43	22.86	38.1	0.95	-0.05	Controversial
The interpretation of short Synacthen test results should take into account the effect of inhaled glucocorticoids.	4 . 13 . b	1	101	0.99	21.78	32.67	37.62	6.93	0.28	Controversial
		2	105	0	24.76	29.52	37.14	8.57	0.3	Controversial
		3	105	0	19.05	35.24	40.95	4.76	0.31	Controversial
Patients who fail their first short Synacthen test with a 30-min cortisol of <350 nmol/L or 12 g/dL, should be counselled that there is a 50% chance of lifelong replacement therapy.	4 . 13 . c	1	101	2.97	14.85	63.37	18.81	0	-0.02	Controversial
		2	105	0.95	12.38	60.95	22.86	2.86	0.14	Controversial
		3	105	0.95	14.29	60	23.81	0.95	0.1	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
		1	101	2.97	15.84	62.38	17.82	0.99	-0.02	Controversial
Patients with a subsequent morning cortisol of <200 nmol/L should be informed that		2	105	0.95	17.14	64.76	15.24	1.9	0	Controversial
there is a >90% chance that they will need lifelong steroids.	4 . 13 . d	3	105	1.9	11.43	60.95	24.76	0.95	0.11	Controversial
Patient-physician shared decision-making for OCS tapering should be a systematic practice.	5 . 1 . a	1	101	0	1.98	4.95	52.48	40.59	1.32	Positive
		1	101	8.91	39.6	8.91	38.61	3.96	-0.11	Controversial
		2	105	13.33	39.05	9.52	32.38	5.71	-0.22	Controversial
In most cases, the decision to taper OCS treatment is not shared, but taken alone by the clinician.	5 . 1 . b	3	105	6.67	50.48	11.43	26.67	4.76	-0.28	Controversial
		1	101	1.98	25.74	10.89	38.61	22.77	0.54	Controversial
		2	105	2.86	31.43	13.33	35.24	17.14	0.32	Controversial
The self-management of OCS treatments should be discouraged.	5 . 1 . c	3	105	1.9	33.33	14.29	40.95	9.52	0.23	Controversial
The self-management of OCS tapering should be limited to patients with a good level of comprehension.	5 . 1 . d	1	101	1.98	14.85	11.88	57.43	13.86	0.66	Positive
Patient-physician shared decision-making for OCS tapering is important because: it educates the patient on the benefits/risks associated with OCS use.	5 . 2 . a	1	101	0	0	0.99	58.42	40.59	1.4	Positive
Patient-physician shared decision-making for OCS tapering is important because: it allows the patients to understand the purpose of OCS tapering.	5 . 2 . b	1	101	0	0	0	66.34	33.66	1.34	Positive
Patient-physician shared decision-making for OCS tapering is important because: it provides necessary support and guidance to the patient.	5 . 2 . c	1	101	0	0	3.96	65.35	30.69	1.27	Positive
Patient-physician shared decision-making for OCS tapering is important because: it can increase the chances of success; improve outcomes.	5 . 2 . d	1	101	0	1.98	1.98	61.39	34.65	1.29	Positive
Patient-physician shared decision-making for OCS tapering is important because: ambivalent attitudes towards tapering are frequent.	5 . 2 . e	1	101	0	6.93	13.86	59.41	19.8	0.92	Positive
Patient-physician shared decision-making for OCS tapering is important because: "aches and pains" during OCS withdrawal can occur, and planning how to manage them is likely to improve withdrawal progress.	5 . 2 . f	1	101	0.99	0.99	3.96	62.38	31.68	1.23	Positive
Patient-physician shared decision-making for OCS tapering is important because: patient engagement/empowerment in the process can optimize the outcome.	5 . 2 . g	1	101	0	0	1.98	62.38	35.64	1.34	Positive
Patient-physician shared decision-making for OCS tapering is important because: patients are often expected to self-medicate at home.	5 . 2 . h	1	101	1.98	4.95	15.84	63.37	13.86	0.82	Positive
Patient-physician shared decision-making should include: a decision aid including full disclosure of short- and long-term exacerbation/adverse events profile.	5 . 3 . a	1	101	0	1.98	11.88	66.34	19.8	1.04	Positive
Patient-physician shared decision-making should include: patient education on the benefits/risks associated with OCS use.	5 . 3 . b	1	101	0	0	0	65.35	34.65	1.35	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Patient-physician shared decision-making should include: the benefits/risks associated with OCS tapering and why it is important.	5 . 3 . c	1	101	0	0	0	56.44	43.56	1.44	Positive
Patient-physician shared decision-making should include: the dangers of abrupt tapering /OCS discontinuation.	5 . 3 . d	1	101	0	0	0	56.44	43.56	1.44	Positive
Patient-physician shared decision-making should include: the patient's thoughts (concerns, fears, hopes, expectations) and preferences.	5 . 3 . e	1	101	0	0	3.96	60.4	35.64	1.32	Positive
Patient-physician shared decision-making should include: symptoms that may occur due to weaning, how to recognize and manage them (including adrenal insufficiency).	5 . 3 . f	1	101	0	0.99	0.99	60.4	37.62	1.35	Positive
Patient-physician shared decision-making should include: multidisciplinary work (for example, collaboration between respiratory, endocrinology, and rheumatology experts).	5 . 3 . g	1	101	0.99	3.96	12.87	49.5	32.67	1.09	Positive
Patient-physician shared decision-making should include: a joint evaluation of the patient's global health status and/or quality of life.	5 . 3 . h	1	101	0	3.96	11.88	66.34	17.82	0.98	Positive
Patient-physician shared decision-making should include: using biomarkers for monitoring and individualization of the action plan.	5 . 3 . i	1	101	0.99	10.89	26.73	53.47	7.92	0.56	Controversial
		2	105	0.95	12.38	16.19	60.95	9.52	0.66	Positive
Patient-physician shared decision-making should include: steroid-sparing strategies and their benefits/risks.	5 . 3 . j	1	101	0	0.99	5.94	61.39	31.68	1.24	Positive
Patient-physician shared decision-making should include: clear, agreed-upon protocols/action plan on how tapering will be carried out and what to expect.	5 . 3 . k	1	101	0	0.99	4.95	62.38	31.68	1.25	Positive
Patient-physician shared decision-making should include: a warning regarding the consequences of not following the action plan.	5 . 3 . l	1	101	0.99	2.97	7.92	70.3	17.82	1.01	Positive
Patient-physician shared decision-making should include: a means of contacting the doctor/team so the patient can reach out and get support.	5 . 3 . m	1	101	0	0.99	3.96	59.41	35.64	1.3	Positive
Patient-physician shared decision-making should include: discussion with both patients and their families/caregivers.	5 . 3 . n	1	101	0	1.98	11.88	59.41	26.73	1.11	Positive
Advice for OCS self-managers: if possible, do not opt for regular OCS use.	5 . 4 . a	1	101	0	1.98	7.92	51.49	38.61	1.27	Positive
Advice for OCS self-managers: the lowest active dose of OCS for the shortest duration is preferable.	5 . 4 . b	1	101	0	0	1.98	53.47	44.55	1.43	Positive
Advice for OCS self-managers: closely monitor symptoms while tapering, including those of adrenal insufficiency.	5 . 4 . c	1	101	0	0	5.94	59.41	34.65	1.29	Positive
Advice for OCS self-managers: help the process of OCS tapering by overcoming minor discomfort related to it.	5 . 4 . d	1	101	0.99	0	3.96	67.33	27.72	1.21	Positive
Advice for OCS self-managers: respect your doctor's recommendations in as much as possible, and contact him/her (or team) when there is a problem.	5 . 4 . e	1	101	0	0.99	3.96	63.37	31.68	1.26	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Advice for OCS self-managers: increase the OCS dose to the previous dose if a weaning step causes (intolerable) symptoms.	5 . 4 . f	1	101	0	3.96	10.89	54.46	30.69	1.12	Positive
Advice for OCS self-managers: never use a dose lower than the agreed-up threshold (e.g. 7.5 mg) without substitution.	5 . 4 . g	1	101	0.99	10.89	22.77	44.55	20.79	0.73	Controversial
		2	105	4.76	23.81	29.52	35.24	6.67	0.15	Controversial
		3	105	0.95	33.33	23.81	37.14	4.76	0.11	Controversial
Advice for OCS self-managers: always make dosage changes under medical supervision.	5 . 4 . h	1	101	0	10.89	15.84	52.48	20.79	0.83	Positive
Physicians should drive the decision-making when it comes to OCS tapering.	5 . 5 . a	1	101	0	8.91	12.87	59.41	18.81	0.88	Positive
Physicians should limit prescriptions to ensure that tapering is occurring.	5 . 5 . b	1	101	1.98	10.89	21.78	56.44	8.91	0.59	Controversial
		2	105	0.95	27.62	17.14	48.57	5.71	0.3	Controversial
		3	105	1.9	19.05	21.9	56.19	0.95	0.35	Controversial
The self-management of OCS treatments should be discouraged.	5 . 5 . c	1	101	1.98	23.76	26.73	29.7	17.82	0.38	Controversial
		2	105	2.86	30.48	14.29	41.9	10.48	0.27	Controversial
		3	105	1.9	39.05	12.38	39.05	7.62	0.11	Controversial
Forewarning patients of "aches and pains" during OCS withdrawal is likely to impede withdrawal progress.	5 . 5 . d	1	101	4.95	41.58	10.89	35.64	6.93	-0.02	Controversial
		2	105	3.81	47.62	15.24	30.48	2.86	-0.19	Controversial
		3	105	2.86	49.52	11.43	33.33	2.86	-0.16	Controversial
When OCS tapering decisions are not taken mutually, this can lead to medical malpractice and litigation.	5 . 5 . e	1	101	0	9.9	24.75	55.45	9.9	0.65	Controversial
		2	105	0.95	7.62	25.71	59.05	6.67	0.63	Controversial
		3	105	0	8.57	27.62	58.1	5.71	0.61	Controversial
In some cases, you might need to have a consent form signed before patients start OCS treatment.	5 . 5 . f	1	101	3.96	24.75	35.64	31.68	3.96	0.07	Controversial
		2	105	9.52	41.9	15.24	32.38	0.95	-0.27	Controversial
		3	105	6.67	36.19	23.81	30.48	2.86	-0.13	Controversial
Many times, patients feel their safety depends on OCS and it takes a lot of effort to convince them to taper.	5 . 5 . g	1	101	0	9.9	19.8	55.45	14.85	0.75	Positive
The majority of patients want to reduce their OCS use and will actively participate in doing so.	5 . 5 . h	1	101	0	2.97	10.89	62.38	23.76	1.07	Positive
OCS tapering can be successful even if the patient doesn't think it will work.	5 . 5 . i	1	101	0.99	4.95	16.83	62.38	14.85	0.85	Positive
It is better to allow patients to control their own prednisolone doses to control symptoms than to give high dose bursts for exacerbations.	5 . 5 . j	1	101	4.95	36.63	26.73	25.74	5.94	-0.09	Controversial
		2	105	4.76	40.95	29.52	23.81	0.95	-0.25	Controversial
		3	105	2.86	45.71	26.67	22.86	1.9	-0.25	Controversial
The patient generally has full confidence in his/her doctor and experiences tapering as a success on his/her illness.	5 . 5 . k	1	101	0	13.86	35.64	43.56	6.93	0.44	Controversial
		2	105	0	10.48	35.24	52.38	1.9	0.46	Controversial
		3	105	0	14.29	30.48	48.57	6.67	0.48	Controversial
The patient is usually the major player and follows an action plan with an easy contact with the multidisciplinary team.	5 . 5 . l	1	101	0.99	12.87	30.69	46.53	8.91	0.5	Controversial
		2	105	0.95	10.48	26.67	56.19	5.71	0.55	Controversial
		3	105	1.9	15.24	20.95	57.14	4.76	0.48	Controversial

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
Physicians should be trained on how to coach patients during the tapering process.	5 . 5 . m	1	101	0	0	8.91	72.28	18.81	1.1	Positive
Patients should be educated with standard material (generated and endorsed e.g. by ERS) about the OCS therapy.	5 . 5 . n	1	101	0	0.99	6.93	75.25	16.83	1.08	Positive
		1	101	1.98	20.79	15.84	51.49	9.9	0.47	Controversial
Shared decision-making is made difficult by the level of individualization and adaptation		2	105	1.9	32.38	22.86	40	2.86	0.1	Controversial
required during OCS tapering.	5 . 5 . o	3	105	0.95	38.1	20.95	38.1	1.9	0.02	Controversial
Shared decision-making is dependent on the willingness and ability of both sides to interact.	5 . 5 . p	1	101	0	0	3.96	69.31	26.73	1.23	Positive
Patients are suffering a lot and a strong patient-doctor relationship is required to achieve a safe, optimum outcome from OCS tapering.	5 . 5 . q	1	101	0.99	0	13.86	53.47	31.68	1.15	Positive
All OCS-treated asthma patients should be referred to an expert center able to propose multidisciplinary assessment and access to innovations.	6 . 1 . a	1	101	0	1.98	5.94	38.61	53.47	1.44	Positive
Maintenance OCS for severe asthma should only be considered after evaluation by a severe asthma specialist (the definition of this specialist may vary from region to region).	6 . 1 . b	1	101	0	2.97	4.95	32.67	59.41	1.49	Positive
The respiratory physician treating severe asthma patients must assess for adrenal insufficiency.	6 . 1 . c	1	101	0.99	6.93	13.86	49.5	28.71	0.98	Positive
Adrenal insufficiency management in patients with severe asthma should involve an endocrinologist/multidisciplinary approach.	6 . 1 . d	1	101	0	3.96	23.76	38.61	33.66	1.02	Positive
Primary care physicians prescribing more than three courses of OCS to a patient with asthma in 1 year should consider a referral to a specialist.	6 . 2 . a	1	101	0	0.99	0	27.72	71.29	1.69	Positive
The primary care physician should be part of the multidisciplinary team.	6 . 2 . b	1	101	0	3.96	16.83	55.45	23.76	0.99	Positive
		1	101	6.93	28.71	6.93	36.63	20.79	0.36	Controversial
		2	105	10.48	28.57	8.57	33.33	19.05	0.22	Controversial
OCS use in asthma should also be discouraged at the primary care level.	6 . 2 . c	3	105	7.62	29.52	9.52	34.29	19.05	0.28	Controversial
The following is an important subject of future research: improving the delivery of asthma care.	6 . 3 . a	1	101	0	0.99	5.94	54.46	38.61	1.31	Positive
The following is an important subject of future research: integration and dissemination of how to use predictive biomarkers in clinical practice.	6 . 3 . b	1	101	0	2.97	8.91	57.43	30.69	1.16	Positive
The following is an important subject of future research: improving the use of biological treatments in asthma.	6 . 3 . c	1	101	0	0	4.95	38.61	56.44	1.51	Positive
The following is an important subject of future research: while striving to obtain a balance between over and under-treatment with OCS, patients often experience adverse quality of life. How best to manage this requires future research.	6 . 3 . d	1	101	0	0	19.8	55.45	24.75	1.05	Positive

Statement	Number	Round	Sample size	Strongly disagree, %	Disagree, %	Neutral, %	Agree, %	Strongly agree, %	Weighted mean rank	Consensus
The following is an important subject of future research: whether hydrocortisone supplementation is less harmful than prednisone should be established.	6 . 3 . e	1	101	0.99	2.97	15.84	50.5	29.7	1.05	Positive
The following is an important subject of future research: The impact of shared decision-making on important outcomes.	6 . 3 . f	1	101	0	0.99	20.79	52.48	25.74	1.03	Positive
The following is an important subject of future research: OCS tapering regime algorithms and optimization.	6 . 3 . g	1	101	0.99	0.99	5.94	50.5	41.58	1.31	Positive
The following is an important subject of future research: real-life, cost-benefit/effectiveness evaluations for steroid-sparing strategies taking into account side-effects and comorbidities, quality of life, and the societal costs of maintenance OCS.	6 . 3 . h	1	101	0	0	6.93	40.59	52.48	1.46	Positive
The following is an important subject of future research: direct comparisons between biologicals, especially anti-IL-5.	6 . 3 . i	1	101	0.99	0.99	10.89	38.61	48.51	1.33	Positive
The following is an important subject of future research: strategic ways to reduce OCS use for the overall at-risk populations.	6 . 3 . j	1	101	0	0.99	2.97	58.42	37.62	1.33	Positive
The following is an important subject of future research: methods for determining OCS starting doses.	6 . 3 . k	1	101	0	7.92	17.82	55.45	18.81	0.85	Positive
The following is an important subject of future research: the role of the endocrinologist and when referral should occur.	6 . 3 . l	1	101	0	4.95	11.88	64.36	18.81	0.97	Positive
The following is an important subject of future research: improving the assessment of adrenal insufficiency.	6 . 3 . m	1	101	0.99	0	7.92	54.46	36.63	1.26	Positive
The following is an important subject of future research: the efficacy of internet-provided algorithms for delivering symptom-driven OCS tapering guidance to asthma patients.	6 . 3 . n	1	101	0.99	9.9	22.77	47.52	18.81	0.73	Controversial
		2	105	0	13.33	22.86	50.48	13.33	0.64	Controversial
		3	105	0	11.43	20.95	59.05	8.57	0.65	Controversial
The following is an important subject of future research: how should OCS tapering be addressed in countries where there is limited access to biological treatments?	6 . 3 . o	1	101	0	2.97	8.91	58.42	29.7	1.15	Positive
The following is an important subject of future research: what aspect/phenotype of asthma is being treated by OCS that the currently available biological therapies are not treating?	6 . 3 . p	1	101	0	0.99	7.92	42.57	48.51	1.39	Positive
The following is an important subject of future research: in the context of successful OCS weaning subsequent to the initiation of a biological, what kind of follow-up should be proposed?	6 . 3 . q	1	101	0	1.98	15.84	56.44	25.74	1.06	Positive

ABPA = allergic bronchopulmonary aspergillosis; ACOS = Asthma-COPD overlap syndrome; ACQ = Asthma Control Questionnaire; ACT = Asthma Control Test; BAL = bronchoalveolar lavage fluid; COPD = chronic obstructive pulmonary disease; DDAVP = desmopressin; EGPA = eosinophilic granulomatosis with polyangiitis; ERS = European Respiratory Society; FRAX = Fracture Risk Assessment Tool; GERD = gastroesophageal reflux disease; GINA = Global Initiative for Asthma; HbA1c = hemoglobin A1c; ICS = inhaled corticosteroid; IL = interleukin; MCID = minimal clinically important difference; OCS = oral corticosteroid; PDGF-D = platelet-derived growth factor D

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