Accepted: 18 December 2017

DOI: 10.1111/all.13397

POSITION PAPER

WILEY Allergy EUROPEAN JOURNAL OF ALLERGY AND CLINICAL IMMUNOLOGY EAACI

The EAACI/GA²LEN/EDF/WAO guideline for the definition, classification, diagnosis and management of urticaria

T. Zuberbier[1] | W. Aberer[2] | R. Asero[3] | A. H. Abdul Latiff[4] | D. Baker[5] | B. Ballmer-Weber[6] | J. A. Bernstein[7] | C. Bindslev-Jensen[8] | Z. Brzoza[9] | R. Buense Bedrikow[10] | G. W. Canonica[11] | M. K. Church[1] | T. Craig[12] | I. V. Danilycheva[13] | C. Dressler[14] | L. F. Ensina[15] | A. Giménez-Arnau[16] | K. Godse[17] | M. Gonçalo[18] | C. Grattan[19] | J. Hebert[20] | M. Hide[21] | A. Kaplan[22] | A. Kapp[23] | C. H. Katelaris[24] | E. Kocatürk[25] | K. Kulthanan[26] | D. Larenas-Linnemann[27] | T. A. Leslie[28] | M. Magerl[1] | P. Mathelier-Fusade[29] | R. Y. Meshkova[30] | M. Metz[1] | A. Nast[14] | E. Nettis[31] | H. Oude-Elberink[32] | S. Rosumeck[14] | S. S. Saini[33] | M. Sánchez-Borges[34] | P. Schmid-Grendelmeier[6] | P. Staubach[35] | G. Sussman[36] | E. Toubi[37] | G. A. Vena[38] | C. Vestergaard[39] | B. Wedi[23] | R. N. Werner[14] | Z. Zhao[40] | M. Maurer[1] | Endorsed by the following societies: AAAAI, AAD, AAIITO, ACAAI, AEDV, APAAACI, ASBAI, ASCIA, BAD, BSACI, CDA, CMICA, CSACI, DDG, DDS, DGAKI, DSA, DST, EAACI, EIAS, EDF, EMBRN, ESCD, GA²LEN, IAACI, IADVL, JDA, NVvA, MSAI, ÖGDV, PSA, RAACI, SBD, SFD, SGAI, SGDV, SIAAIC, SIDeMaST, SPDV, TSD, UNBB, UNEV and WAO*

[1]Charité—Universitätsmedizin Berlin, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Department of Dermatology and Allergy, Allergy-Centre-Charité, Berlin, Germany

[2]Department of Dermatology, Medical University of Graz, Graz, Austria

[3]Department of Allergology, Clinica San Carlo, Paderno Dugnano, MI, Italy

[4]Allergy& Immunology Centre, Pantai Hospital Kuala Lumpur, Kuala Lumpur, Malaysia

[5]Baker Allergy Asthma and Dermatology Clinic, Portland, OR, USA

[6]Allergy Unit, Department of Dermatology, University Hospital, Zürich, Switzerland

[7]University of Cincinnati Physicians Immunology Research Center, Cincinnati, OH, USA

[8]Department of Dermatology and Allergy Centre, Odense University Hospital and University of Southern Denmark, Odense, Denmark

Abbreviations: AAS, angioedema activity score; ACE, angiotensin-converting enzyme; AE-QoL, angioedema quality of life questionnaire; AGREE, appraisal of guidelines research and evaluation; AOSD, adult-onset Still's disease; ARIA, allergic rhinitis and its impact on asthma; ASST, autologous serum skin test; BAT, basophil activation test; CAPS, cryopyrin-associated periodic symptoms; CIndU, chronic inducible urticaria; CNS, central nervous system; CSU, chronic spontaneous urticaria; CU, chronic urticaria; CU-Q2oL, chronic urticaria quality of life questionnaire; CYP, cytochrome P; EAACI, European academy of allergology and clinical immunology; EDF, European dermatology forum; EtD, evidence-to-decisions; FCAS, familial cold auto-inflammatory syndrome; GA²LEN, global asthma and allergy European network; GDT, guideline development tool; GRADE, grading of recommendations assessment, development and evaluation; HAE, hereditary angioedema; HIDS, hyper-IgD syndrome; IVIG (also IGIV), intravenous immunoglobulins; MWS, Muckle-Wells syndrome; NOMID, neonatal-onset multisystem inflammatory disease; NSAID, nonsteroidal anti-inflammatory drugs; PAF, platelet-activating factor; PET, positron-emission tomography; PICO, technique used in evidence-based medicine, acronym stands for patient/problem/population, intervention, comparison/control/comparator, outcome; REM, rapid eye movement; sgAH, 2nd-generation antihistamine; sJIA, systemic-onset juvenile idiopathic arthritis; TRAPS, tumour necrosis factor receptor alpha-associated periodic syndrome; UAS, urticaria activity score; UCT, urticaria control test; UEMS, European union of medical specialists; UV, ultraviolet; WAO, World Allergy Organization; WHO, World Health Organization.

*Society expansions and limitations in endorsement (AAAAI) are available in acknowledgements.

Important: As this is a global guideline, no comment is given regarding the licensing of the drugs mentioned for the treatment of urticaria. It is in the duty of the treating physician to adhere to the relevant local regulations.

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[9]Department of Internal Diseases, Allergology and Clinical Immunology in Katowice, Medical University of Silesia, Katowice, Poland

[10]Santa Casa de Sao Paulo School of Medical Sciences, Sao Paulo, Brazil

[11]Personalized Medicine Asthma and Allergy Clinic-Humanitas University & Research Hospital, Milano, Italy

[12]Department of Medicine and Pediatrics, Penn State University, Hershey Medical Center, Hershey, PA, USA

[13]National Research Center—Institute of Immunology Federal Medical-Biological Agency of Russia, Moscow, Russia

[14]Charité—Universitätsmedizin Berlin, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Division of Evidence Based Medicine, Department of Dermatology, Berlin, Germany

[15]Federal University of Sao Paulo, Sao Paulo, Brazil

[16]Hospital del Mar, IMIM, Universitat Autònoma Barcelona, Barcelona, Spain

[17]Department of Dermatology, Dr. D. Y. Patil Medical College & Hospital, Nerul, Navi Mumbai, India

[18]Clinic of Dermatology, Faculty of Medicine and University Hospital, Coimbra, Portugal

[19]St John's' Institute of Dermatology, Guy's' and St. Thomas' Hospital, NHS Foundation Trust, London, UK

[20]Service d'allergie, Centre Hospitalier Université Laval/Centre Hospitalier Universitaire de Québec, Québec, QC, Canada

[21]Department of Dermatology, Institute of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan

[22]Department of Medicine, Division of Pulmonary and Critical Care Medicine, Allergy and Clinical Immunology, Medical University of South Carolina, Charleston, SC, USA

[23]Department of Dermatology and Allergy, Hannover Medical School, Hannover, Germany

[24]Campbelltown Hospital and Western Sydney University, Sydney, Australia

[25]Department of Dermatology, Okmeydani Training and Research Hospital, Istanbul, Turkey

[26]Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

[27]Hospital Médica Sur, Mexico City, Mexico

[28]Royal Free Hospital, London, UK

[29]Department of Dermatology and Allergy, University Hospital of Tenon, Paris, France

[30]Department of Clinical Immunology and Allergy, Smolensk State Medical University, Smolensk, Russia

[31]Scuola e Cattedra di Allergologia e Immunologia Clinica, Dipartimento dell'Emergenza e dei Trapianti d'Organo, Università di Bari, Bari, Italy

[32]University of Groningen, Groningen, The Netherlands

[33]Johns Hopkins Asthma and Allergy Center, Baltimore, MD, USA

[34]Allergy and Clinical Immunology Department, Centro Médico-Docente La Trinidad, Caracas, Venezuela

[35]Department of Dermatology, University Medical Center Mainz, Mainz, Germany

[36]Division of Allergy and Clinical Immunology, University of Toronto, Toronto, ON, Canada

[37]Bnai-Zion Medical Center, Faculty of Medicine, Technion, Haifa, Israel

[38]Dermatology and Venereology Private Practice, Bari and Barletta, Italy

[39]Department of Dermatology and Venereology, Aarhus University Hospital, Aarhus, Denmark

[40]Department of Dermatology and Venereology, Peking University, First Hospital, Beijing, China

Correspondence
Torsten Zuberbier, Department of Dermatology and Allergy, Allergie-Centrum-Charité, Charité—Universitätsmedizin Berlin, Berlin, Germany.
Email: torsten.zuberbier@charite.de

Please see methods of the executive summary Dressler et al. Executive summary of the methods report for 'The EAACI/GA2 LEN/EDF/WAO Guideline for the Definition, Classification, Diagnosis and Management of Urticaria. The 2017 Revision and Update'. https://www.ncbi.nlm.nih.gov/pubmed/29336489 Allergy. 2018 May;73(5):1145–1146. https://doi.org/10.1111/all.13414.

Abstract

This evidence- and consensus-based guideline was developed following the methods recommended by Cochrane and the Grading of Recommendations Assessment, Development and Evaluation (GRADE) working group. The conference was held on 1 December 2016. It is a joint initiative of the Dermatology Section of the European Academy of Allergology and Clinical Immunology (EAACI), the EU-founded network of excellence, the Global Allergy and Asthma European Network (GA^{2}LEN), the European Dermatology Forum (EDF) and the World Allergy Organization (WAO) with the participation of 48 delegates of 42 national and international societies. This guideline was acknowledged and accepted by the European Union of Medical Specialists (UEMS). Urticaria is a frequent, mast cell-driven disease, presenting with wheals, angioedema, or both. The lifetime prevalence for acute urticaria is approximately 20%. Chronic spontaneous urticaria and other chronic forms of urticaria are disabling, impair quality of life and affect performance at work and school. This guideline covers the definition and classification of urticaria, taking into account the recent progress in identifying its

causes, eliciting factors and pathomechanisms. In addition, it outlines evidence-based diagnostic and therapeutic approaches for the different subtypes of urticaria.

KEYWORDS
angioedema, consensus, evidence-based, hives, wheal

1 | INTRODUCTION

This evidence- and consensus-based guideline was developed following the methods recommended by Cochrane and the Grading of Recommendations Assessment, Development and Evaluation (GRADE) working group. A structured consensus process was used to discuss and agree upon recommendations. The conference was held on 1 December 2016 in Berlin, Germany.

It is a joint initiative of Dermatology Section of the European Academy of Allergology and Clinical Immunology (EAACI), the EU-founded network of excellence, the Global Allergy and Asthma European Network (GA²LEN), the European Dermatology Forum (EDF), and the World Allergy Organization (WAO), all of which provided funding for the development of this updated and revised version of the EAACI/GA²LEN/EDF/WAO Guideline on urticaria.[1–4] There was no funding from other sources.

This revision and update of the guidelines were developed by 44 urticaria experts from 25 countries, all of which are delegates of national and/or international medical societies (Table 1). All of the societies involved endorse this guideline and have supported its development by covering the travel expenses for the participation of their delegate(s) in the consensus conference. The development of this revision and update of the guideline were supported by a team of methodologists led by Alexander Nast and included the contributions of the participants of the consensus conference (see Table 1).

The wide diversity and number of different urticaria subtypes that have been identified reflect, at least in part, our increasing understanding of the causes and eliciting factors of urticaria as well as the molecular and cellular mechanisms involved in its pathogenesis. The aim of this guideline is to provide a definition and classification of urticaria, thereby facilitating the interpretation of divergent data from different centres and areas of the world regarding underlying causes, eliciting factors, burden to patients and society, and therapeutic responsiveness of subtypes of urticaria. Furthermore, this guideline provides recommendations for diagnostic and therapeutic approaches in common subtypes of urticaria. This guideline is a global guideline and takes into consideration that causative factors in patients, medical systems and access to diagnosis and treatment vary in different countries.

2 | METHODS

The detailed methods used to develop this revision and update of the EAACI/GA²LEN/EDF/WAO guideline on urticaria are published as separate methods report, including all GRADE tables.[5]

In summary, this updated and revised guideline takes into account the Appraisal of Guidelines Research and Evaluation (AGREE II) Instrument[6] and the methods suggested by the GRADE working group. The literature review was conducted using the methods given in the Cochrane Handbook for Systematic Reviews of Interventions.[7]

Experts from 42 societies were nominated to be involved in the development of the guideline. First, key questions and relevant outcomes were selected and rated by the experts using an online survey tool.[8] Twenty-three key questions were chosen by 30 members of the expert panel.

Subsequently, we developed a literature review protocol, which specified our literature search strategy, researchable questions (PICO), eligibility criteria, outcomes as chosen by the experts, the risk of bias assessment, and strategies for data transformation, synthesis and evaluation.

The systematic literature search was conducted on 1 June 2016 and yielded 8090 hits. Two independent reviewers evaluated the literature and extracted eligible data. After 2 screening phases, 65 studies were determined to fulfil the inclusion criteria. Wherever possible, we calculated effect measures with confidence intervals and performed meta-analyses using Review Manager.[9] We assessed the quality of the evidence following GRADE using GRADEpro Guideline Development Tool (GDT).[10,11] Five criteria (namely, risk of bias, inconsistency, indirectness, imprecision and publication bias) were evaluated for each outcome resulting in an overall assessment of quality of evidence (Table 2). Effect measures such as risk ratios express the size of an effect, and the quality rating expresses how much trust one can have in a result.

Subsequently modified evidence-to-decisions (EtD) frameworks were created to help the experts make a judgement on the size of the desirable and the undesirable effect, the balance of the 2, and to provide an overview of quality. The evidence assessment yielded 31 GRADE evidence profiles/evidence-to-decision frameworks. A recommendation for each evidence-based key question was drafted using standardized wording (Table 3).

In a preconference online voting round, all GRADE tables EtD frameworks and draft recommendations were presented and voted on. Of the 41 invited participants (expert panel), 30 completed the survey (response rate 73%). The results were either fed back to the expert panel or integrated into the EtD frameworks. All EtD frameworks and draft recommendations were made available to the participants before the consensus conference.

TABLE 1 Guideline development group members

First name	Last name	Delegate of/affiliation
Alexander	Nast	Division of Evidence-Based Medicine, Department of Dermatology and Allergy, Charité-Universitätsmedizin Berlin; Berlin, Germany
Corinna	Dressler	
Stefanie	Rosumeck	
Ricardo N	Werner	
Werner	Aberer	ÖGDV
Amir Hamzah	Abdul Latiff	MSAI
Riccardo	Asero	AAIITO
Diane	Baker	AAD
Barbara	Ballmer-Weber	SGAI
Jonathan A.	Bernstein	AAAAI
Carsten	Bindslev-Jensen	DSA, EAACI
Zenon	Brzoza	PSA
Roberta	Buense Bedrikow	SBD
Walter	Canonica	WAO, SIAAIC
Martin	Church	GA²LEN
Timothy	Craig	ACAAI
Inna Vladimirovna	Danilycheva	RAACI
Luis Felipe	Ensina	ASBAI
Ana	Giménez-Arnau	EAACI, AEDV
Kiran	Godse	IADVL
Margarida	Gonçalo	SPDV
Clive	Grattan	BSACI, EAACI
Jaques	Hebert	CSACI
Michihiro	Hide	JDA
Allen	Kaplan	WAO
Alexander	Kapp	DDG
Constance	Katelaris	ASCIA, APAAACI
Emek	Kocatürk	TSD
Kanokvalai	Kulthanan	DST (joined expert panel in October 2016)
Désirée	Larenas-Linnemann	CMICA
Tabi Anika	Leslie	BAD
Markus	Magerl	UNBB
Pascale	Mathelier-Fusade	SFD, GUS (Groupe Urticarie de la Société francaise de dermatologie) which is one of the subgroups of the SFD
Marcus	Maurer	EAACI
Raisa Yakovlevna	Meshkova	RAACI
Martin	Metz	EMBRN
Hanneke	Oude-Elberink	NvvA
Sarbjit	Saini	AAAAI, WAO
Mario	Sánchez-Borges	WAO
Peter	Schmid-Grendelmeier	SSDV
Petra	Staubach	UNEV
Gordon	Sussman	CSACI
Elias	Toubi	IAACI
Gino Antonio	Vena	SIDeMaST
Christian	Vestergaard	DDS

(Continues)

TABLE 1 (Continued)

First name	Last name	Delegate of/affiliation
Bettina	Wedi	DGAKI
Zuotao	Zhao	CDA
Torsten	Zuberbier	EDF, GA²LEN

TABLE 2 Summary of the GRADE approach to assessing the quality of evidence by outcome[167]

High (++++)	We are very confident that the true effect lies close to that of the estimate of effect.
Moderate (+++)	We are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low (++)	Our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Very low (+)	We have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

TABLE 3 Standardized wording and symbols were used to formulate the recommendations

Type of recommendation	Wording	Symbols	Implications
Strong recommendation for the intervention	"We recommend . . ."	↑↑	We believe that all or almost all informed people would make that choice. Clinicians will have to spend less time on the process of decision making and may devote that time to overcome barriers to implementation and adherence. In most clinical situations, the recommendation may be adopted as a policy
Conditional recommendation for the intervention	"We suggest . . ."	↑	We believe that most informed people would make that choice, but a substantial number would not. Clinicians and healthcare providers will need to devote more time on the process of shared decision making. Policymakers will have to involve many stakeholders and policymaking requires substantial debate
Conditional recommendation for either the intervention of the comparison	"We cannot make a recommendation with respect to . . ."	0	At the moment, a recommendation in favour or against an intervention cannot be made due to certain reasons (eg, no evidence data available, conflicting outcomes)
Conditional recommendation against the intervention	"We suggest against . . ."	↓	We believe that most informed people would make a choice against that intervention, but a substantial number would not
Strong recommendation against the intervention	"We recommend against . . ."	↓↓	We believe that all or almost all informed people would make a choice against that intervention. This recommendation can be adopted as a policy in most clinical situations

During the conference, all recommendations were voted on by over 250 participants, all of whom had to submit a declaration that they were (i) a specialist seeing urticaria patients and (ii) gave a declaration of conflict of interest. A nominal group technique was used to come to an agreement on the different recommendations.[12] The consensus conference followed a structured approach: presentation of the evidence and draft recommendation, open discussion, initial voting or collection of alternative wording and final voting, if necessary. Participants eligible for voting had received one green and one red card, either of which they held up when voting for or against a suggested recommendation. Voting results were documented. Strong consensus was defined as >90% agreement, and 70-89% was documented as consensus. All recommendations passed with a 75% agreement. An internal and an external review took place.

All consented recommendations are highlighted in grey, and it is indicated whether these are based on expert opinion (based on consensus) or evidence and expert opinion (based on evidence and consensus).

3 | DEFINITION

3.1 | Definition

Urticaria is a condition characterized by the development of wheals (hives), angioedema or both. Urticaria needs to be differentiated from other medical conditions where wheals, angioedema or both can occur, for example anaphylaxis, auto-inflammatory syndromes, urticarial vasculitis or bradykinin-mediated angioedema including hereditary angioedema (HAE).

Definition
Urticaria is a condition characterized by the development of wheals (hives), angioedema or both.

(A). wheal in patients with urticaria has 3 typical features:

1. a central swelling of variable size, almost invariably surrounded by reflex erythema,

2. an itching or sometimes burning sensation,
3. a fleeting nature, with the skin returning to its normal appearance, usually within 30 minutes to 24 hours.

(B). Angioedema in urticaria patients is characterized by:

1. a sudden, pronounced erythematous or skin coloured swelling of the lower dermis and subcutis or mucous membranes,
2. sometimes pain, rather than itch.
3. a resolution slower than that of wheals (can take up to 72 hours).

3.2 | Classification of urticaria on the basis of its duration and the relevance of eliciting factors

The spectrum of clinical manifestations of different urticaria subtypes is very wide. Additionally, 2 or more different subtypes of urticaria can coexist in any given patient.

Acute spontaneous urticaria is defined as the occurrence of spontaneous wheals, angioedema or both for less than 6 weeks.

How should urticaria be classified?		
We recommend that urticaria is classified based on its duration as acute (≤ 6 weeks) or chronic (>6 weeks). We recommend that urticaria is classified as spontaneous (no specific eliciting factor involved) or inducible (specific eliciting factor involved). (consensus-based)	↑↑	>90% consensus

Table 4 presents a classification of chronic urticaria (CU) subtypes for clinical use. This classification has been maintained from the previous guideline by consensus (>90%) urticarial vasculitis, maculopapular cutaneous mastocytosis (formerly called urticaria pigmentosa), auto-inflammatory syndromes (eg, cryopyrin-associated periodic syndromes or Schnitzler's syndrome), nonmast cell mediator-mediated angioedema (eg, bradykinin-mediated angioedema) and other diseases such as syndromes that can manifest with wheals and/or angioedema are not considered to be subtypes of urticaria, due to their distinctly different pathophysiologic mechanisms (Table 5).

TABLE 4 Recommended classification of chronic urticaria

Chronic urticaria subtypes	
Chronic Spontaneous Urticaria (CSU)	**Inducible Urticaria**
Spontaneous appearance of wheals, angioedema or both for > 6 weeks due to known[a] or unknown causes	Symptomatic dermographism[b] Cold urticaria[c] Delayed pressure urticaria[d] Solar urticaria Heat urticaria[e] Vibratory angioedema Cholinergic urticaria Contact urticaria Aquagenic urticaria

[a]For example, autoreactivity, that is the presence of mast cell-activating auto-antibodies.
[b]Also called *urticaria factitia* or dermographic urticaria.
[c]Also called cold contact urticaria.
[d]Also called pressure urticaria.
[e]Also called heat contact urticaria.

TABLE 5 Diseases related to urticaria for historical reasons, and syndromes that present with hives and/or angioedema

- Maculopapular cutaneous mastocytosis (urticaria pigmentosa)
- Urticarial vasculitis
- Bradykinin-mediated angioedema (eg, HAE)
- Exercise-induced anaphylaxis
- Cryopyrin-associated periodic syndromes (CAPS; urticarial rash, recurrent fever attacks, arthralgia or arthritis, eye inflammation, fatigue and headaches), that is familial cold auto-inflammatory syndrome (FCAS), Muckle-Wells syndrome (MWS) or neonatal-onset multisystem inflammatory disease (NOMID).
- Schnitzler's syndrome (recurrent urticarial rash and monoclonal gammopathy, recurrent fever attacks, bone and muscle pain, arthralgia or arthritis and lymphadenopathy)
- Gleich's syndrome (episodic angioedema with eosinophilia)
- Well's syndrome (granulomatous dermatitis with eosinophilia/eosinophilic cellulitis)
- Bullous pemphigoid (prebullous stage)

These diseases and syndromes are related to urticaria (1) because they can present with wheals, angioedema or both and/or (2) because of historical reasons.

Should we maintain the current guideline classification of chronic urticaria?		
We recommend that the current guideline classification of chronic urticaria should be maintained. (consensus-based)	↑↑	>90% consensus

3.3 | Pathophysiological aspects

Urticaria is a mast cell-driven disease. Histamine and other mediators, such as platelet-activating factor (PAF) and cytokines released from activated skin mast cells, result in sensory nerve activation, vasodilatation and plasma extravasation as well as cell recruitment to urticarial lesions. The mast cell-activating signals in urticaria are ill-defined and likely to be heterogeneous and diverse. Histologically, wheals are characterized by oedema of the upper and mid dermis, with dilatation and augmented permeability of the postcapillary venules, as well as lymphatic vessels of the upper dermis leading to leakage of serum into the tissue. In angioedema, similar changes occur primarily in the lower dermis and the subcutis. Skin affected by wheals virtually always exhibits upregulation of endothelial cell adhesion molecules, neuropeptides and growth factors and a mixed inflammatory perivascular infiltrate of variable intensity, consisting of neutrophils with or without eosinophils, basophils, macrophages and T cells but without vessel-wall necrosis, which is a hallmark of urticarial vasculitis.[13–17] The nonlesional skin of chronic spontaneous urticaria (CSU) patients shows upregulation of adhesion molecules,[18]

infiltrating eosinophils and altered cytokine expression.[19] A mild to moderate increase in mast cell numbers has also been reported by some authors. These findings underline the complex nature of the pathogenesis of urticaria, which has many features in addition to the release of histamine from dermal mast cells.[20–22] Some of these features of urticaria are also seen in a wide variety of inflammatory conditions and are thus not specific or of diagnostic value. A search for more specific histological biomarkers for different subtypes of urticaria and for distinguishing urticaria from other conditions is desirable.[23]

3.4 | Burden of disease

The burden of CU for patients, their family and friends, the healthcare system and society is substantial. The use of patient-reported outcome measures such as the urticaria activity score (UAS), the angioedema activity score (AAS), the CU quality of life questionnaire (CU-Q2oL), the angioedema quality of life questionnaire (AE-QoL) and the urticaria control test (UCT) in studies and clinical practice has helped to better define the effects and impact of CU on patients.[24] The available data indicate that urticaria markedly affects both objective functioning and subjective well-being.[25–27] Previously, O'Donnell et al showed that health status scores in CSU patients are comparable to those reported by patients with coronary artery disease.[28] Furthermore, both health status and subjective satisfaction in patients with CSU are lower than in healthy subjects and in patients with respiratory allergy.[29] CU also has considerable costs to patients and the society.[30–32]

4 | DIAGNOSIS OF URTICARIA

4.1 | Diagnostic work up in Acute Urticaria

Acute urticaria usually does not require a diagnostic workup, as it is usually self-limiting. The only exception is the suspicion of acute urticaria due to a type I food allergy in sensitized patients or the existence of other eliciting factors such as nonsteroidal anti-inflammatory drugs (NSAIDs). In this case, allergy tests as well as educating the patients may be useful to allow patients to avoid re-exposure to relevant causative factors.

Should routine diagnostic measures be performed in acute urticaria?		
We recommend against any routine diagnostic measures in acute spontaneous urticaria. (consensus-based)	↓↓	>90% consensus

4.2 | The diagnostic work up in CU

The diagnostic work up of CSU has 3 major aims: (i) to exclude differential diagnoses, (ii) to assess disease activity, impact and control and (iii) to identify triggers of exacerbation or, where indicated, any underlying causes. Ad (1) Wheals or angioedema can be present in some other conditions, too. In patients who display only wheals (but no angioedema), urticarial vasculitis and auto-inflammatory disorders such as Schnitzler syndrome or cryopyrin-associated periodic syndromes (CAPS) need to be ruled out. On the other hand, in patients who suffer only from recurrent angioedema (but not from wheals), bradykinin-mediated angioedema-like angiotensin-converting enzyme (ACE) inhibitor-induced angioedema or other nonmast cell-related angioedema, that is HAE type 1-3, should be considered as differential diagnoses (Figure 1). Ad (2) Baseline assessment of disease activity (UAS, AAS), quality of life (CU-Q2oL, AE-QoL) and disease control (UCT) are indispensable for guiding treatment decisions, providing better insights into the patients' disease burden, as well as facilitating, improving and standardizing the increasingly important documentation work (see also section on Assessment of disease activity, impact, and control). Ad (3) History taking is essential in patients with urticaria, as exacerbating triggers are variable. Further diagnostic procedures to reveal underlying causes in patients with long-standing and uncontrolled disease need to be determined carefully.

In the last decades, many advances have been made in identifying causes of different types and subtypes of urticaria, for example in CSU.[33–35] Among others, autoimmunity mediated by functional auto-antibodies directed against the high-affinity IgE receptor or IgE-auto-antibodies to auto-antigens, pseudo-allergy (nonallergic hypersensitivity reactions) to foods or drugs, and acute or chronic infections (eg, *Helicobacter pylori* or *Anisakis simplex*) have been described as causes of CU (Table 6). However, there are considerable variations in the frequency of underlying causes in the different studies. This also reflects regional differences in the world, for example differences in diets and the prevalence of infections. Thus, it is important to remember that not all possible causative factors need to be investigated in all patients, and the first step in diagnosis is a thorough history, taking the following items into consideration:

1. Time of onset of disease
2. Shape, size, frequency/duration and distribution of wheals
3. Associated angioedema
4. Associated symptoms, for example bone/joint pain, fever, abdominal cramps
5. Family and personal history regarding wheals and angioedema
6. Induction by physical agents or exercise
7. Occurrence in relation to daytime, weekends, menstrual cycle, holidays and foreign travel
8. Occurrence in relation to foods or drugs (eg, NSAIDs, ACE-inhibitors)
9. Occurrence in relation to infections, stress
10. Previous or current allergies, infections, internal/autoimmune diseases, gastric/intestinal problems or other disorders
11. Social and occupational history, leisure activities
12. Previous therapy and response to therapy including dosage and duration
13. Previous diagnostic procedures/results

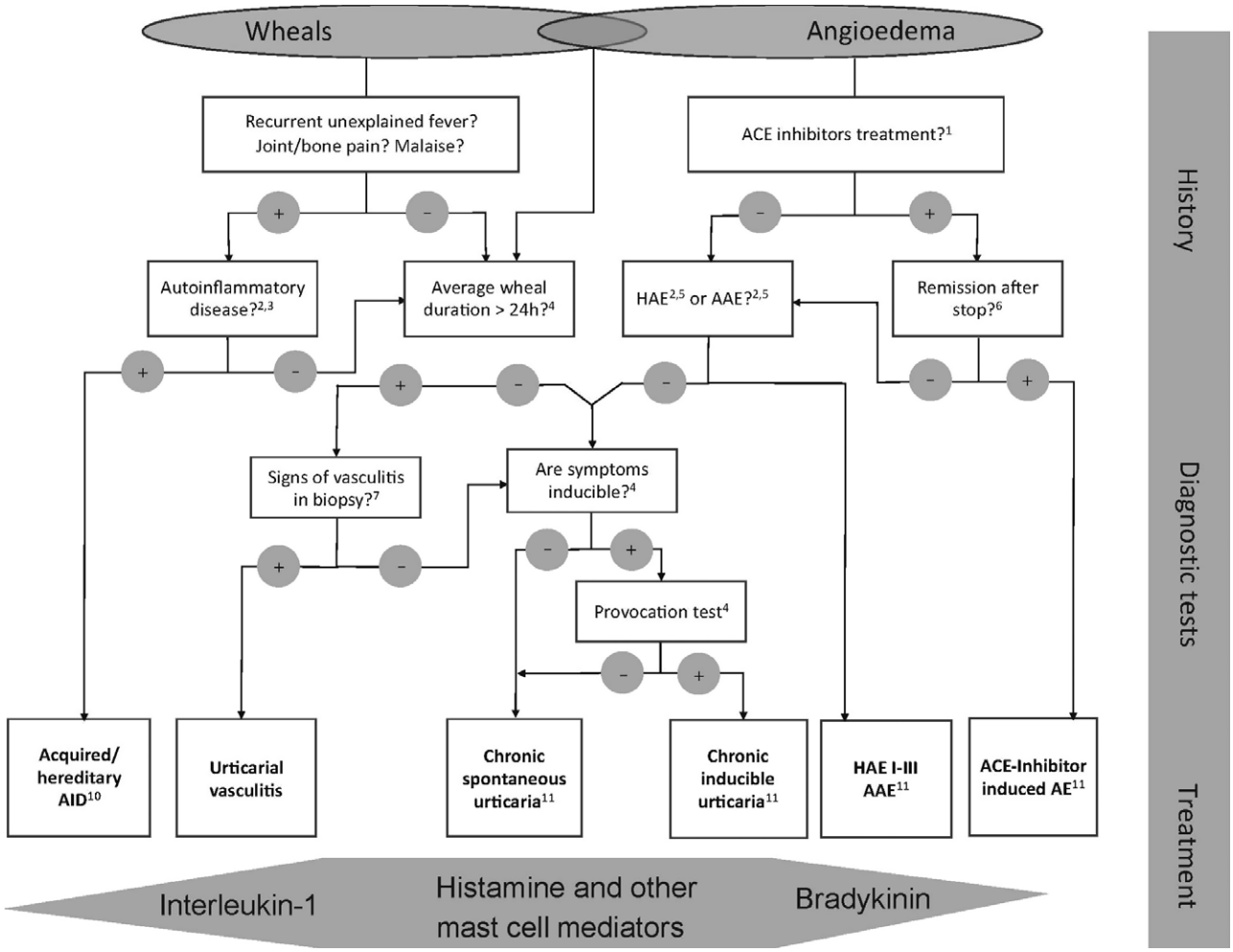

FIGURE 1 Recommended diagnostic algorithm for chronic urticaria. Diagnostic algorithm for patients presenting with wheals, angioedema or both. AAE, Acquired angioedema due to C1-inhibitor deficiency; ACE-Inh, angiotensin-converting enzyme inhibitor; AE, angioedema; AID, auto-inflammatory disease; HAE, hereditary angioedema; RAS, renin-angiotensin system
1. Apart from ACE-inhibitors, other renin inhibitors and sartans have been described to induce angioedema but much less frequently. 2. Patients should be asked for a detailed family history and age of disease onset. 3. Test for elevated inflammation markers (C-reactive protein, erythrocyte sedimentation rate), test for paraproteinemia in adults, look for signs of neutrophil-rich infiltrates in skin biopsy; perform gene mutation analysis for hereditary periodic fever syndromes (eg, cryopyrin-associated periodic syndrome), if strongly suspected. 4. Patients should be asked: "For how long does each individual wheal last?". 5. Test for complement C4, C1-INH levels and function; in addition, test for C1q and C1-INH antibodies, if AAE is suspected; do gene mutation analysis, if former tests are unremarkable but patient's history suggests hereditary angioedema. 6. If there is no remission after 6 months of ACE-inhibitor discontinuation C1-inhibitor should be tested for. 7. Does the biopsy of lesional skin show damage of the small vessels in the papillary and reticular dermis and/or fibrinoid deposits in perivascular and interstitial locations suggestive of urticarial vasculitis? 8. Patients should be asked: "Can you make your wheals come? Can you bring out your wheals?". 9. In patients with a history suggestive of inducible urticaria standardized provocation testing according to international consensus recommendations[69] should be performed. 10. Acquired auto-inflammatory syndromes include Schnitzler's syndrome as well as systemic-onset juvenile idiopathic arthritis (sJIA) and adult-onset Still's disease (AOSD); hereditary auto-inflammatory syndromes include Cryopyrin-associated periodic syndromes (CAPS) such as familial cold auto-inflammatory syndromes (FCAS), Muckle-Wells syndrome (MWS) and neonatal-onset multisystem inflammatory disease (NOMID), more rarely hyper-IgD syndrome (HIDS) and tumour necrosis factor receptor alpha-associated periodic syndrome (TRAPS). 11. In some rare cases, recurrent angioedema is neither mast cell mediator-mediated nor bradykinin-mediated, and the underlying pathomechanisms remain unknown. These rare cases are referred to as "idiopathic angioedema" by some authors.

The second step of the diagnosis is the physical examination of the patient. Where it is indicated by history and/or physical examination, further appropriate diagnostic tests should be performed. The selection of these diagnostic measures largely depends on the nature of the urticaria subtype, as summarized in Figure 1 and Table 6.

TABLE 6 Recommended diagnostic tests in frequent urticaria subtypes

Types	Subtypes	Routine diagnostic tests (recommended)	Extended diagnostic programme[a] (based on history) For identification of underlying causes or eliciting factors and for ruling out possible differential diagnoses if indicated
Spontaneous urticaria	Acute spontaneous urticaria	None	None[b]
	CSU	Differential blood count. ESR and/or CRP	Avoidance of suspected triggers (eg, drugs); Conduction of diagnostic tests for (in no preferred order): (i) infectious diseases (eg, *Helicobacter pylori*); (ii) functional auto-antibodies (eg, autologous skin serum test); (iii) thyroid gland disorders (thyroid hormones and auto-antibodies); (iv) allergy (skin tests and/or allergen avoidance test, eg, avoidance diet); (v) concomitant CIndU, see below[69]; (vi) severe systemic diseases (eg, tryptase); (vii) other (eg, lesional skin biopsy)
Inducible urticaria	Cold urticaria	Cold provocation and threshold test[c,d]	Differential blood count and ESR or CRP, rule out other diseases, especially infections[168]
	Delayed pressure urticaria	Pressure test and threshold test[c,d]	None
	Heat urticaria	Heat provocation and threshold test[c,d]	None
	Solar urticaria	UV and visible light of different wavelengths and threshold test[c]	Rule out other light-induced dermatoses
	Symptomatic dermographism	Elicit dermographism and threshold test[c,d]	Differential blood count, ESR or CRP
	Vibratory angioedema	Test with vibration, for example Vortex or mixer[d]	None
	Aquagenic urticaria	Provocation testing[d]	None
	Cholinergic urticaria	Provocation and threshold testing[d]	None
	Contact urticaria	Provocation testing[d]	None

ESR, erythrocyte sedimentation rate; CRP, C-reactive protein.
[a]Depending on suspected cause.
[b]Unless strongly suggested by patient history, for example allergy.
[c]All tests are carried out with different levels of the potential trigger to determine the threshold.
[d]For details on provocation and threshold testing see.[69]

Should differential diagnoses be considered in patients with chronic spontaneous urticaria?		
We recommend that differential diagnoses be considered in all patients with signs or symptoms suggestive of chronic urticaria based on the guideline algorithm. (consensus-based)	↑↑	>90% consensus
What routine diagnostic measures should be performed in chronic spontaneous urticaria?		
We recommend limited investigations. Basic tests include differential blood count and CRP and/or ESR. (consensus-based) In CSU, we recommend performing further diagnostic measures based on the patient history and examination, especially in patients with long-standing and/or uncontrolled disease. (consensus-based)	↑↑	>90% consensus
Should routine diagnostic measures be performed in chronic inducible urticaria?		
We recommend using provocation testing to diagnose chronic inducible urticaria. We recommend to use provocation threshold measurements and the UCT to measure disease activity and control in patients with chronic inducible urticaria, respectively. (consensus-based)	↑↑	>90% consensus

(Continues)

Intensive and costly general screening programs for causes of urticaria are strongly advised against. The factors named in Table 6 in the extended programme should only be investigated based on patient history. Type I allergy is an extremely rare cause of CSU. In contrast, pseudo-allergic (nonallergic hypersensitivity reactions) to NSAIDs or food may be more relevant for CSU. Diagnosis should be based on history of NSAID intake or a pseudo-allergic elimination diet protocol. Bacterial, viral, parasitic or fungal infections, for example with *H. pylori*, streptococci, staphylococci, *Yersinia*, *Giardia lamblia*, *Mycoplasma pneumoniae*, hepatitis viruses, *norovirus*, *parvovirus B19*, *Anisakis simplex*, *Entamoeba* spp, *Blastocystis* spp, have been implicated to be underlying causes of urticaria.[36–38] The frequency and relevance of infectious diseases vary considerably between

different patient groups and different geographical regions. For example, *Anisakis simplex*, a sea fish nematode, has only been discussed as a possible cause of recurrent acute spontaneous urticaria in areas of the world where uncooked fish is eaten frequently.[39,40] The relevance of *H. pylori*, dental or ear, nose and throat infections also appears to vary between patient groups.[38,41–44] More research is needed to make definitive recommendations regarding the role of infection in urticaria.

Routine screening for malignancies in the diagnosis of underlying causes for urticaria is not suggested. Although it is noted that a slightly increased prevalence has been reported in Taiwan,[45] there is not sufficient evidence available for a causal correlation of urticaria with neoplastic diseases. Ruling out malignancies is, however, warranted if patient history (eg, sudden loss of weight) points to this.

Currently, the only generally available tests to screen for autoantibodies against either IgE or FcεR1 (the high-affinity IgE receptor) are the autologous serum skin test (ASST) and basophil activation tests (BATs). The ASST is a nonspecific screening test that evaluates the presence of serum histamine-releasing factors of any type, not just histamine-releasing auto-antibodies. The ASST should be performed with utmost care as infections might be transmitted if, by mistake, patients were injected with someone else's serum. The subject is further elucidated in a separate EAACI/GA^{2}LEN position paper.[46,47]

BATs assess histamine release or upregulation of activation markers of donor basophils in response to stimulation with the serum of CSU patients. BATs can help to co-assess disease activity in patients with urticaria [48,49] as well as to diagnose autoimmune urticaria.[50] Furthermore, BAT can be used as a marker for responsiveness to ciclosporin A or omalizumab.[51,52]

In some subjects with active CSU, several groups have noted blood basopenia and that blood basophils exhibit suppressed IgE receptor-mediated histamine release to anti-IgE. Blood basophils are detected in skin lesions of CSU patients.[19] CSU remission is associated with increases in blood basophil numbers and IgE receptor-triggered histamine response.[53,54] A rise in basophil number is also observed during anti-IgE treatment [55] This finding, however, needs to be examined in future research and currently does not lead to diagnostic recommendations. However, it should be noted that a low basophil blood count should not result in further diagnostic procedures. It is also known that levels of D-dimer are significantly higher in patients with active CSU and decrease according to the clinical response of the disease to omalizumab. The relevance of this finding is not yet clear, and currently, it is not recommended to measure D-dimer levels.[56,57]

4.2.1 | Assessment of disease activity impact and control

Disease activity in spontaneous urticaria should be assessed both in clinical care and trials with the UAS7 (Table 7), a unified and simple scoring system that was proposed in the last version of the guidelines and has been validated.[58,59] The UAS7 is based on the assessment of key urticaria signs and symptoms (wheals and pruritus), which are documented by the patient, making this score especially valuable. The use of the UAS7 facilitates comparison of study results from different centres. As urticaria activity frequently changes, the overall disease activity is best measured by advising patients to document 24-h self-evaluation scores once daily for several days. The UAS7, that is the sum score of 7 consecutive days, should be used in routine clinical practice to determine disease activity and response to treatment of patients with CSU. For patients with angioedema, a novel activity score, the angioedema activity score (AAS) has been developed and validated.[60] In addition to disease activity, it is important to assess the impact of disease on quality of life as well as disease control both in clinical practice and trials. Recently, the urticaria control test (UCT) has become valuable in the assessment of patients' disease status.[61,62] The UCT was developed and validated to determine the level of disease control in all forms of CU (CSU and CIndU). The UCT has only 4 items with a clearly defined cut-off for patients with "well-controlled" vs "poorly controlled" disease, and it is thus suited for the management of patients in routine clinical practice. The cut-off value for a well-controlled disease is 12 of 16 possible points. This helps to guide treatment decisions.

Patients should be assessed for disease activity, impact and control at the first and every follow up visit, acknowledging that some tools, for example the UAS can only be used prospectively and others, for example the UCT, allow for retrospective assessment. Validated instruments such as the UAS7, AAS, CU-Q2oL, AE-QoL and UCT should be used in CU for this purpose.

Should patients with chronic urticaria be assessed for disease activity, impact, and control?		
We recommend that patients with CU be assessed for disease activity, impact, and control at every visit. (consensus-based)	↑↑	>90% consensus
Which instruments should be used to assess and monitor disease activity in chronic spontaneous urticaria patients?		
We suggest the use of the urticaria activity score, UAS7, and of the angioedema activity score, AAS, for assessing disease activity in patients with chronic spontaneous urticaria. (consensus-based)	↑	>90% consensus
Which instruments should be used to assess and monitor quality of life impairment in chronic spontaneous urticaria patients?		
We suggest the use of the chronic urticaria quality of life questionnaire, CU-Q2oL, and the angioedema quality of life questionnaire, AE-QoL, for assessing quality of life impairment in patients with chronic spontaneous urticaria. (consensus-based)	↑	>90% consensus
Which instruments should be used to assess and monitor disease control in chronic spontaneous urticaria patients?		
We suggest the use of the urticaria control test, UCT, for assessing disease control in patients with chronic spontaneous urticaria. (consensus-based)	↑	>90% consensus

In CIndU, the threshold of the eliciting factor(s) should be determined to assess disease activity, for example critical temperature

TABLE 7 The urticaria activity score (UAS7) for assessing disease activity in CSU

Score	Wheals	Pruritus
0	None	None
1	Mild (<20 wheals/24 h)	Mild (present but not annoying or troublesome)
2	Moderate (20-50 wheals/24 h)	Moderate (troublesome but does not interfere with normal daily activity or sleep)
3	Intense (>50 wheals/24 h or large confluent areas of wheals)	Intense (severe pruritus, which is sufficiently troublesome to interfere with normal daily activity or sleep)

and stimulation time thresholds for cold provocation in cold urticaria. These thresholds allow both patients and treating physicians to evaluate disease activity and response to treatment.[63–68]

Sum of score: 0-6 for each day is summarized over one week (maximum 42).

4.3 | The diagnostic work up in CIndU

In CIndUs, the routine diagnostic work up should follow the consensus recommendations on the definition, diagnostic testing and management of CIndUs.[69] Diagnostics in CIndU are used to identify the subtype of CIndU and to determine trigger thresholds.[69] The latter is important as it allows for assessing disease activity and response to treatment. For most types of CIndU, validated tools for provocation testing are meanwhile available.[69] Examples include cold and heat urticaria, where a Peltier element-based provocation device (Temp*Test*®) is available,[70] symptomatic dermographism for which a dermographometer (Fric*Test*®) has been developed,[71,72] and delayed pressure urticaria. In cholinergic urticaria, a graded provocation test with office-based methods, for example pulse-controlled ergometry, is available.[66,73] Patients with contact urticaria or aquagenic urticaria should be assessed by appropriate cutaneous provocation tests.[69]

4.4 | Diagnosis in children

Urticaria can occur in all age groups, including infants and young children. Although data for childhood CSU are still sparse, recent investigations indicate that the prevalence of CIndUs and CSU, and underlying causes of CSU are very similar to the prevalence and causes in adults, with some minor differences.[74–77]

Thus, the diagnostic approaches for children should be similar to those in adults.

The diagnostic work up of CSU in children has the same aims as in adults: (i) differential diagnoses should be excluded with a special focus on cryopyrin-associated periodic syndrome (CAPS). CAPS is a rare disease with a urticaria-like rash that manifests in childhood.[78] (ii) If possible, that is depending on the age of the child, disease activity, impact and control should be assessed using assessment tools similar to those used in adults, although it has to be noted that no validated disease-specific tools for children are available as of now. (iii) Triggers of exacerbation should be identified and, where indicated, underlying causes, which appear to be similar to those in adults, should be searched for. In children with CIndU, similar tests for provocation and the determination of trigger thresholds should be performed.

5 | MANAGEMENT OF URTICARIA

5.1 | Basic considerations

1. The goal of treatment is to treat the disease until it is gone.
2. The therapeutic approach to CU can involve
   - **a.** the identification and elimination of underlying causes,
   - **b.** the avoidance of eliciting factors,
   - **c.** tolerance induction, and/or
   - **d.** the use of pharmacological treatment to prevent mast cell mediator release and/or the effects of mast cell mediators
3. Treatment should follow the basic principles of treating as much as needed and as little as possible. This may mean stepping up or stepping down in the treatment algorithm according to the course of disease.

Should treatment aim at complete symptom control in urticaria?		
We recommend aiming at complete symptom control in urticaria, considering as much as possible the safety and the quality of life of each individual patient. (consensus-based)	↑↑	>90% consensus

5.2 | Identification and elimination of underlying causes and avoidance of eliciting factors

To eliminate an underlying cause, an exact diagnosis is a basic prerequisite. The identification of a cause in CU is, however, difficult in most cases, for example infections may be a cause, aggravating factor or unrelated. The only definite proof of a causative nature of a suspected agent or trigger is the remission of symptoms following elimination and recurrence of symptoms following re-challenge in a double-blind provocation test. Spontaneous remission of urticaria can occur any time, the elimination of a suspected cause or trigger can also occur coincidentally.

5.2.1 | Drugs

When these agents are suspected in the course of diagnostic work up, they should be omitted entirely or substituted by another class of agents if indispensable. Drugs causing nonallergic hypersensitivity reactions (the prototypes being NSAIDs) cannot only elicit, but can also aggravate pre-existing CSU,[79] so that elimination in the latter case will only improve symptoms in some patients.

Should patients with chronic spontaneous urticaria be advised to discontinue medication that is suspected to worsen the disease?		
We recommend advising patients with chronic spontaneous urticaria to discontinue medication that is suspected to worsen the disease, for example NSAIDs. (consensus-based)	↑↑	>90% consensus

5.2.2 | Physical stimuli

Avoidance of physical stimuli for the treatment of CIndUs is desirable, but mostly very difficult to achieve. Detailed information about the physical properties of the respective stimulus should make the patient sufficiently knowledgeable to recognize and control exposure in normal daily life. Thus, for instance, it is important in delayed pressure urticaria and in symptomatic dermographism to point out that pressure is defined as force per area and that simple measures, such as broadening of the handle of heavy bags for pressure urticaria or reducing friction in case of symptomatic dermographism, may be helpful in the prevention of symptoms. Similar considerations hold for cold urticaria where the impact of the wind chill factor in cold winds needs to be remembered. For solar urticaria, the exact identification of the range of eliciting wavelengths may be important for the appropriate selection of sunscreens or for the selection of light bulbs with an UV-A filter. However, in many patients, the threshold for the relevant physical trigger is low and total avoidance of symptoms is virtually impossible. For example, severe symptomatic dermographism is sometimes confused with CSU because seemingly spontaneous hives are observed where even loose-fitting clothing rubs on the patient's skin or unintentional scratching by patients readily causes the development of wheals in that area.

5.2.3 | Eradication of infectious agents and treatment of inflammatory processes

In contrast to CIndU, CSU is often reported to be associated with a variety of inflammatory or infectious diseases. This is regarded as significant in some instances, but some studies show conflicting results and have methodological weaknesses. These infections, which should be treated appropriately, include those of the gastrointestinal tract like *H. pylori* infection or bacterial infections of the nasopharynx[80] (even if association with urticaria is not clear in the individual patient and a meta-analysis shows overall low evidence for eradication therapy,[80] *H. pylori* should be eliminated as an association with gastric cancer is suggested[81]). Bowel parasites, a rare possible cause of CSU in developed industrial countries, should be eliminated if indicated.[80,82] In the past, intestinal candidiasis was regarded as a highly important underlying cause of CSU,[80] but more recent findings fail to support a significant causative role.[83] Apart from infectious diseases, chronic inflammatory processes due to diverse other diseases have been identified as potentially triggering CSU. This holds particularly for gastritis, reflux oesophagitis or inflammation of the bile duct or gall bladder.[84,85] However, similar to infections, it is not easily possible to discern whether any of these are relevant causes of CSU but should be treated as many of them may be also associated with development of malignancies.

5.2.4 | Reduction of physical and emotional stress

Although the mechanisms of stress-induced exacerbation are not well investigated, some evidence indicates that disease activity and severity are correlated with stress levels.[86] This holds true for emotional stress as well as physical stress which in some entities can be relevant for the development of symptoms such as in cholinergic urticaria.[87]

5.2.5 | Reduction in functional auto-antibodies

Direct reduction in functional auto-antibodies by plasmapheresis has been shown to be of temporary benefit in some, severely affected patients.[88] Due to limited experience and high costs, this therapy is suggested for auto-antibody-positive CSU patients who are unresponsive to all other forms of treatment.

5.2.6 | Dietary management

IgE-mediated food allergy is extremely rarely the underlying cause of CSU.[84,89] If identified, the specific food allergens need to be omitted as far as possible which leads to a remission within less than 24 hours. In some CSU patients, pseudo-allergic reactions (non-IgE-mediated hypersensitivity reactions) to naturally occurring food ingredients and in some cases to food additives have been observed.[84,89–93] A pseudoallergen-free diet, containing only low levels of natural as well as artificial food pseudoallergens, has been tested in different countries [94] and also a low histamine diet may improve symptoms in those patients.[95] Those diets are controversial and as yet unproven in well-designed double-blind placebo-controlled studies. However, when used, they must usually be maintained for a minimum of 2-3 weeks before beneficial effects are observed. However, it should be pointed out that this kind of treatment requires cooperative patients and success rates may vary considerably due to regional differences in food and dietary habits. More research is necessary on the effect of natural and artificial ingredients of food in causing urticaria.

5.3 | Inducing tolerance

Inducing tolerance can be useful in some subtypes of urticaria. Examples are cold urticaria, cholinergic urticaria and solar urticaria, where even a rush therapy with UV-A has been proven to be effective within 3 days.[96] However, tolerance induction is only lasting for a few days, and thus, a consistent daily exposure to the stimulus just at threshold level is required. Tolerance induction and maintenance are often not accepted by patients, for example in the case of cold urticaria where daily cold baths/showers are needed to achieve this.

5.4 | Symptomatic pharmacological treatment

A basic principle of the pharmacological treatment is to aim at complete symptom relief. Another general principle in pharmacotherapy is to use as much as needed and as little as possible. The extent and selection of medication may therefore vary in the course of the disease.

The main option in therapies aimed at symptomatic relief is to reduce the effect of mast cell mediators such as histamine, PAF and others on the target organs. Many symptoms of urticaria are mediated primarily by the actions of histamine on H_1-receptors located on endothelial cells (the wheal) and on sensory nerves (neurogenic flare and pruritus). Thus, continuous treatment with H_1-antihistamines is of eminent importance in the treatment of urticaria (safety data are available for use of several years continuously). Continuous use of H_1-antihistamines in CU is supported not only by the results of clinical trials[97,98] but also by the mechanism of action of these medications, that is that they are inverse agonists with preferential affinity for the inactive state of the histamine H_1-receptor and stabilize it in this conformation, shifting the equilibrium towards the inactive state.

However, other mast cell mediators (PAF, leukotrienes, cytokines) can also be involved and a pronounced cellular infiltrate including basophils, lymphocytes and eosinophils may be observed.[99] These may respond completely to a brief burst of corticosteroid and may be relatively refractory to antihistamines.

These general considerations on pharmacotherapy refer to all forms of acute and chronic urticaria. The difference between spontaneous urticaria and CIndU is, however, that in some forms of physical urticaria, for example cold urticaria instead of continuous treatment, on-demand treatment may be useful. In particular, if the patient knows of a planned trigger such as expected cold exposure, when going for a swim in summer, the intake of an antihistamine 2 hours prior to the activity may be sufficient.

Antihistamines have been available for the treatment of urticaria since the 1950s. The older first-generation antihistamines have pronounced anticholinergic effects and sedative actions on the central nervous system (CNS) and many interactions with alcohol and drugs affecting the CNS, such as analgesics, hypnotics, sedatives and mood elevating drugs, have been described. They can also interfere with rapid eye movement (REM) sleep and impact on learning and performance. Impairment is particularly prominent during multi-tasking and performance of complex sensorimotor tasks such as driving. In a GA²LEN position paper,[100] it is strongly recommended not to use first-generation antihistamines any longer in allergy both for adults and especially in children. This view is shared by the WHO guideline ARIA.[101] Based on strong evidence regarding potential serious side effects of old sedating antihistamines (lethal overdoses have been reported), we recommend against the use of these sedating antihistamines for the routine management of CU as first-line agents, except for the rare places worldwide in which modern 2nd-generation antihistamines are not available. The side effects of first-generation H_1-antihistamines are most pronounced for promethazine, diphenhydramine, ketotifen and chlorphenamine and are well understood. They penetrate the blood-brain barrier, bind to H_1-receptors in the CNS and interfere with the neurotransmitter effects of histamine. Positron-emission tomography (PET) studies document their penetration into the human brain and provide a new standard whereby CNS H_1-receptor occupancy can be related directly to effects on CNS function.[102]

The development of modern 2nd-generation antihistamines led to drugs which are minimally or nonsedating and free of anticholinergic effects. However, 2 of the earlier modern 2nd-generation drugs, astemizole and terfenadine, which were essentially pro-drugs requiring hepatic metabolism to become fully active, had cardiotoxic effects if this metabolism was blocked by concomitant administration of inhibitors of the cytochrome P450 (CYP) 3A4 isoenzyme, such as ketoconazole or erythromycin. These 2 drugs are no longer available in most countries, and we recommend that they are not used.

Further progress with regard to drug safety has been achieved in the last few decades with a considerable number of newer modern 2nd-generation antihistamines.[102] Not all antihistamines have been tested specifically in urticaria, but many nonsedating antihistamines studies are available, for example cetirizine, desloratadine, fexofenadine, levocetirizine, loratadine, ebastine, rupatadine and bilastine. Modern 2nd-generation antihistamines should be considered as the first-line symptomatic treatment for urticaria because of their good safety profile. However, up to date, well-designed clinical trials comparing the efficacy and safety of modern 2nd-generation H_1-antihistamines in urticaria are largely lacking.

Are 2nd-generation H_1-antihistamines to be preferred over 1st-generation H_1-antihistamines for the treatment of chronic urticaria?		
We suggest 2nd-generation H1-antihistamines over 1st-generation H1-antihistamines for the treatment of patients with chronic urticaria. (evidence-based and consensus-based)	↑	>90% consensus
Should modern 2nd-generation H_1-antihistamines be used as first-line treatment of urticaria?		
We recommend 2nd-generation H_1-antihistamines as first-line treatment of chronic urticaria. (evidence-based and consensus-based)	↑↑	>90% consensus
Should modern 2nd-generation H_1-antihistamines be taken regularly or as needed by patients with chronic urticaria?		
We suggest 2nd-generation H_1-antihistamines to be taken regularly for the treatment of patients with chronic urticaria. (evidence-based and consensus-based)	↑	>90% consensus
Should different 2nd-generation H_1-antihistamines be used at the same time?		
We recommend against using different H_1-antihistamines at the same time. (consensus-based)	↓↓	>90% consensus

There are studies showing the benefit of a higher dosage of 2nd-generation antihistamines in individual patients[103–105] corroborating earlier studies which came to the same conclusion employing first-generation antihistamines.[106,107] This has been verified in studies using up- to fourfold higher than recommended doses of bilastine,

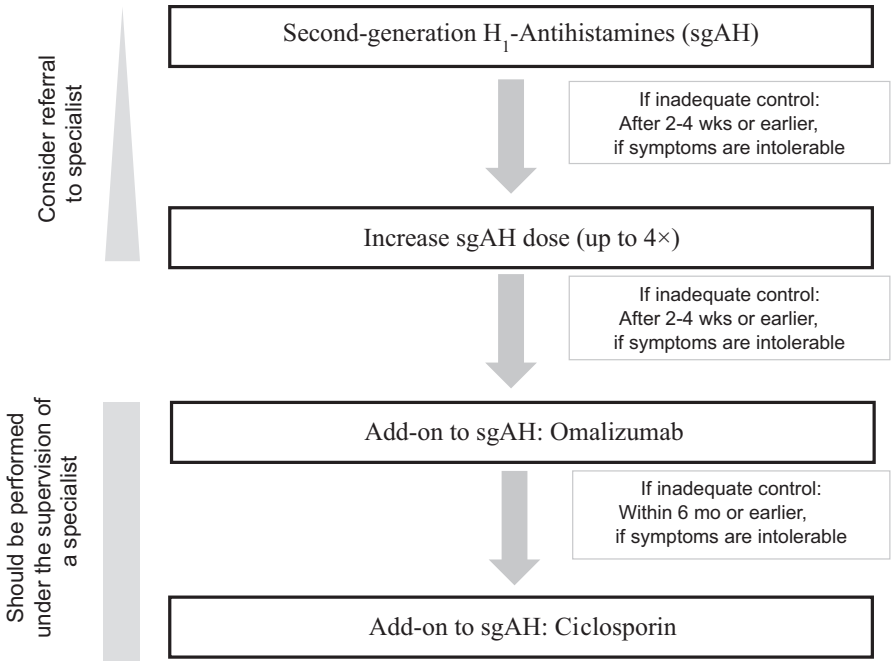

FIGURE 2 Recommended treatment algorithm for urticaria*

cetirizine, desloratadine, ebastine, fexofenadine, levocetirizine and rupatadine.[103,104,108–111]

In summary, these studies suggest that the majority of patients with urticaria not responding to standard doses will benefit from up-dosing of antihistamines. Modern 2nd-generation antihistamines at licensed doses are first-line treatment in urticaria and up-dosing is second-line treatment (Figure 2).

Is an increase in the dose to fourfold of modern 2nd-generation H_1-antihistamines useful and to be preferred over other treatments in urticaria (second-line treatment)?		
We suggest up-dosing 2nd-generation H_1-antihistamines up to fourfold in patients with chronic urticaria unresponsive to 2nd-generation H_1-antihistamines onefold. (evidence-based and consensus-based)	↑	>90% consensus

(Continues)

If there is no improvement, should higher than fourfold doses of 2nd-generation H_1-antihistamines be used?		
We recommend against using higher than fourfold standard dosed H_1-antihistamines in chronic urticaria. (consensus-based)	↓↓	> 90% consensus

5.5 | Further therapeutic possibilities for antihistamines-refractory patients

Omalizumab (anti-IgE) has been shown to be very effective and safe in the treatment of CSU.[112–117] Omalizumab has also been reported to be effective in CIndU[118,119] including cholinergic urticaria,[120] cold urticaria,[68,121] solar urticaria,[122] heat urticaria,[123] symptomatic dermographism,[67,124] as well as delayed pressure urticaria.[125] In CSU, omalizumab prevents angioedema development,[126] markedly

Chronic urticaria treatment algorithm. This algorithm was voted on after finishing all separate GRADE questions taking into consideration the existing consensus. It was decided that omalizumab should be tried before ciclosporin A since the latter is not licensed for urticaria and has an inferior profile of adverse effects. In addition: A short course of glucocorticosteroids may be considered in case of severe exacerbation. Other treatment options are available, see Table 9. >90% consensus.

First line = High-quality evidence: Low cost and worldwide availability (eg, modern 2nd-generation antihistamines exist also in developing countries mostly cheaper than old sedating antihistamines), per daily dose as the half life time is much longer, very good safety profile, good efficacy

Second line = high-quality evidence: Low cost, good safety profile, good efficacy

Third line as add-on to antihistamine

Omalizumab = High-quality evidence: High cost, very good safety profile, very good efficacy

Fourth line as add-on

Ciclosporin A = High-quality evidence: Medium to high cost, moderate safety profile, good efficacy

Short course of corticosteroids = Low-quality evidence: Low cost, worldwide availability, good safety profile (for short course only), good efficacy during intake, but not suitable for long-term therapy

improves quality of life,[9,127] is suitable for long-term treatment[128] and effectively treats relapse after discontinuation.[128,129] Omalizumab, in CU, is effective at doses from 150 to 300 mg per month. Dosing is independent of total serum IgE.[112] The recommended dose in CSU is 300 mg every 4 weeks. The licensed doses and treatment duration vary between different countries.

Is omalizumab useful as add-on treatment in patients unresponsive to high doses of H_1-antihistamines (third-line treatment of urticaria)?		
We recommend adding on omalizumab* for the treatment of patients with CU unresponsive to 2nd-generation H_1-antihistamines. (evidence-based and consensus-based) *currently licensed for urticaria	↑↑	>90% consensus

Ciclosporin A also has a moderate, direct effect on mast cell mediator release.[130,131] Efficacy of ciclosporin A in combination with a modern 2nd-generation H_1-antihistamine has been shown in placebo-controlled trials [132–134] as well as open controlled trials [135] in CSU, but this drug cannot be recommended as standard treatment due to a higher incidence of adverse effects.[133] Ciclosporin A is off-label for urticaria and is recommended only for patients with severe disease refractory to any dose of antihistamine and omalizumab in combination. However, ciclosporin A has a far better risk/benefit ratio compared with long-term use of steroids.

Is ciclosporin A useful as add-on treatment in patients unresponsive to high doses of H_1-antihistamines (third-line treatment of urticaria)?		
We suggest adding on ciclosporin A for the treatment of patients with CU unresponsive to 2nd-generation H_1-antihistamines. (evidence-based and consensus-based)	↑	>90% consensus
Comment by the authors: as shown in the consensus-based treatment algorithm (Figure 2), which was voted on later, it was decided that omalizumab should be tried before ciclosporin A as the latter is not licensed for urticaria and has an inferior profile of adverse effects.		

Some previous RCTs have assessed the use of leukotriene receptor antagonists. Studies are difficult to compare due to different populations studied, for example inclusion of only aspirin and food additive intolerant patients or exclusion of ASST-positive patients. In general, the level of evidence for the efficacy of leukotriene receptor antagonists in urticaria is low but best for montelukast.

Are leukotriene antagonists useful as add-on treatment in patients unresponsive to high doses of H_1-antihistamines?		
We cannot make a recommendation with respect to montelukast as add-on treatment to H_1-antihistamines in patients with chronic urticaria unresponsive to H_1-antihistamines. (evidence-based and consensus-based)	0	>90% consensus

At present, topical corticosteroids are frequently and successfully used in many allergic diseases, but in urticaria topical steroids are not helpful (with the possible exception of pressure urticaria on soles as alternative therapy with low evidence). If systemic corticosteroids are used, doses between 20 and 50 mg/day for prednisone are required with obligatory side effects on long-term use. There is a strong recommendation against the long-term use of corticosteroids outside specialist clinics. Depending on the country, it must be noted that steroids are also not licensed for CU (eg, in Germany prednisolone is only licensed for acute urticaria). For acute urticaria and acute exacerbations of CSU, a short course of oral corticosteroids, that is treatment of a maximum of up to 10 days, may, however, be helpful to reduce disease duration/activity.[136,137] Nevertheless, well-designed RCTs are lacking.

Should oral corticosteroids be used as add-on treatment in the treatment of urticaria?		
We recommend against the long-term use of systemic glucocorticosteroids in CU. (consensus-based)	↓↓	>90% consensus
We suggest considering a short course of systemic glucocorticosteroids in patients with an acute exacerbation of CU. (consensus-based)	↑	>90% consensus

While antihistamines at up to quadruple the manufacturers' recommended dosages will control symptoms in a large part of patients with urticaria in general practice, alternative treatments are needed for the remaining unresponsive patients. Before changing to an alternative therapy, it is recommended to wait for 1-4 weeks to allow full effectiveness.

As the severity of urticaria may fluctuate, and spontaneous remission may occur at any time, it is also recommended to re-evaluate the necessity for continued or alternative drug treatment every 3-6 months.

Except for omalizumab and ciclosporin A, which both have restrictions due to their high cost, many of the alternative methods of treatment, such as combinations of modern 2nd-generation H_1-antihistamines with leukotriene receptor antagonists, are based on clinical trials with low levels of evidence (Table 9). Based on the level of evidence, the recommended third-line and fourth-line treatment options are thus limited (see algorithm figure 2).

H_2-antagonists and dapsone, recommended in the previous versions of the guideline, are now perceived to have little evidence to maintain them as recommendable in the algorithm but they may still have relevance as they are very affordable in some more restricted healthcare systems. Sulphasalazine, methotrexate, interferon, plasmapheresis, phototherapy, intravenous immunoglobulins (IVIG/IGIV) and other treatment options have low-quality evidence, or just case series have been published[2] (Table 9). Despite the lack of published evidence, all these drugs may be of value to individual patients in the appropriate clinical context.[138]

Are H_2-antihistamines useful as add-on treatment in patients unresponsive to low or high doses of H_1-antihistamines?		
We cannot make a recommendation for or against the combined use of H_1-and H_2-antagonists in patients with chronic urticaria. (evidence-based and consensus-based)	0	>75% consensus

Antagonists of tumour necrosis factor alpha (TNF-alpha)[139] and IVIG/IGIV,[140–143] which have been successfully used in case reports, are recommended currently only to be used in specialized centres as last option (ie, anti-TNF-alpha for delayed pressure urticaria and IVIG/IGIV for CSU).[144,145]

For the treatment of CSU and symptomatic dermographism, UV-B (narrow-band UV-B, TL01), UV-A and PUVA treatment for 1-3 months can be added to antihistamine treatment.[146–148]

Some treatment alternatives formerly proposed have been shown to be ineffective in double-blind, placebo-controlled studies and should no longer be used as the grade of recommendation is low. These include tranexamic acid and sodium cromoglycate in CSU,[149,150] nifedipine in symptomatic dermographism/urticaria factitia [151] and colchicine and indomethacin in delayed pressure urticaria.[152,153] However, more research may be needed for patient subgroups, for example recently Ref.[154] a pilot study of patients with elevated D-dimer levels showed heparin and tranexamic acid therapy may be effective.

Could any other treatment options be recommended as third-line treatment in urticaria?		
We cannot make a recommendation with respect to further treatment options. (evidence-based and consensus-based)	0	> 90% consensus

TABLE 8 Areas of further research in urticaria

- Global epidemiology, in adults and children
- The socio-economic consequences
- Identification of mast cell/basophil activating factors
- Identification of new histological markers
- Identification of serum biomarkers of urticarial activity/mast cell activation
- Determination of minimal important differences for instruments that assess disease activity or impact relevant response (eg, UAS, CU-Q2oL)
- Clarification of the role of coagulation/coagulation factors in CSU
- Development of commercially available in vitro tests for detecting serum auto-antibodies for anti-IgE or anti-FcεRI
- Evaluation of IgE-auto-antibodies
- Clarification of associated psychiatric/psychosomatic diseases and their impact
- Pathomechanisms in antihistamine-resistant urticaria/angioedema
- Double-blind control trials comparing different modern 2nd-generation H_1-antihistamines in higher doses in CSU and different subtypes of urticaria
- Regular vs on-demand use of H_1-antihistamines on the duration of urticaria/severity of urticaria
- Safety profile of available treatments, long-term phamacosurveillance
- Multicentre studies on the possible effect of anticoagulants (oral and heparin derivatives) on CSU
- Controlled multicentre trials on the possible effect of add-on of H_2-antihistamines, montelukast, sulphones (dapsone/sulphasalazine), methotrexate, azathioprine

5.6 | Treatment of special populations

5.6.1 | Children

Many clinicians use first-generation, sedating H_1-antihistamines as their first choice in the treatment of children with allergies assuming that the safety profile of these drugs is better known than that of the modern 2nd-generation H_1-antihistamines due to a longer experience with them. Also, the use of modern 2nd-generation H_1-antihistamines is not licensed for use in children less than 6 months of age in many countries while the recommendation for the first-generation H_1-antihistamines is sometimes less clear as these drugs were licensed at a time when the code of good clinical practice for the pharmaceutical industry was less stringent. As a consequence, many doctors choose first-generation antihistamines which, as pointed out above, have a lower safety profile compared with modern 2nd-generation H_1-antihistamines. A strong recommendation was made by the panel to discourage the use of first-generation antihistamines in infants and children. Thus, in children, the same first-line treatment and up-dosing (weight and age adjusted) is recommended as in adults. Only medications with proven efficacy and safety in the paediatric population should be used. Cetirizine,[155] desloratadine,[156,157] fexofenadine,[158] levocetirizine,[159] rupatadine,[160] bilastine[161] and loratadine[155] have been well studied in children, and their long-term safety has been well established in the paediatric population. In addition, the choice of the modern 2nd-generation H_1-antihistamines in children depends on the age and availability as not all are available as syrup or fast dissolving tablet suitable for children. The lowest licensed age also differs from country to country. All further steps should be based on individual considerations and be taken carefully as up-dosing of antihistamines and further treatment options are not well studied in children.

Should the same treatment algorithm be used in children?		
We suggest using the same treatment algorithm with caution in children with chronic urticaria. (consensus-based)	↑	> 90% consensus

5.6.2 | Pregnant and lactating women

The same considerations in principle apply to pregnant and lactating women. In general, use of any systemic treatment should generally be avoided in pregnant women, especially in the first trimester. On the other hand, pregnant women have the right to the best therapy possible. While the safety of treatment has not been systematically studied in pregnant women with urticaria, it should be pointed out that the possible negative effects of increased levels of histamine occurring in urticaria have also not been studied in pregnancy. Regarding treatment, no reports of birth defects in women having used modern 2nd-generation antihistamines during pregnancy have been reported to date. However, only small sample size studies are available for cetirizine[162] and one large meta-analysis for loratadine.[163] Furthermore, as several modern 2nd-generation

TABLE 9 Alternative treatment options. Although evidence from publications is low, clinical experience indicates that they may be useful in certain contexts. Interventions are listed in alphabetical order by frequency of use rather than efficacy

Intervention	Substance (class)	Indication
Widely used		
Antidepressant	Doxepin[a]	CSU
Diet	Pseudoallergen-free diet[b]	CSU
H_2-antihistamine	Ranitidine	CSU
Immunosuppressive	Methotrexate Mycophenolate mofetil	CSU ± DPU[c] Autoimmune CSU
Leukotriene receptor antagonist	Montelukast	CSU, DPU
Sulphones	Dapsone, Sulphasalazine	CSU ± DPU CSU ± DPU
Infrequently used		
Anabolic steroid	Danazol	Cholinergic urticaria
Anticoagulant	Warfarin	CSU
Antifibrinolytic	Tranexamic acid	CSU with angioedema
Immunomodulator	IVIG Plasmapheresis	Autoimmune CSU Autoimmune CSU
Miscellaneous	Autologous blood/serum Hydroxychloroquine	CSU CSU
Phototherapy	Narrow-band UV-B	Symptomatic dermographism
Psychotherapy	Holistic medicine	CSU
Rarely used		
Anticoagulant	Heparin	CSU
Immunosuppressive	Cyclophosphamide Rituximab	Autoimmune CSU Autoimmune CSU
Miscellaneous	Anakinra Anti-TNF-alpha Camostat mesilate Colchicine Miltefosine Mirtazapine PUVA	DPU CSU ± DPU CSU CSU CSU CSU CSU
Very rarely used		
Immunosuppressive	Tacrolimus	CSU
Miscellaneous	Vitamin D Interferon alpha	CSU CSU

[a]Has also H_1- and H_2-antihistaminergic properties.
[b]Does include low histamine diet as pseudoallergen-free diet is also low in histamine.
[c]Treatment can be considered especially if CSU and DPU are coexistent in a patient.

antihistamines are now prescription free and used widely in both allergic rhinitis and urticaria, it must be assumed that many women have used these drugs especially in the beginning of pregnancy, at least before the pregnancy was confirmed. Nevertheless, as the highest safety is mandatory in pregnancy, the suggestion for the use of modern 2nd-generation antihistamines is to prefer loratadine with the possible extrapolation to desloratadine and cetirizine with a possible extrapolation to levocetirizine. All H_1-antihistamines are excreted in breast milk in low concentrations. Use of second-generation H_1-antihistamines is advised, as nursing infants occasionally develop sedation from the old first-generation H_1-antihistamines transmitted in breast milk.

The increased dosage of modern 2nd-generation antihistamines can only be carefully suggested in pregnancy as safety studies have not been carried out, and with loratadine it must be remembered that this drug is metabolized in the liver which is not the case for its metabolite desloratadine. First-generation H_1-antihistamines should be avoided.[100] The use of omalizumab in pregnancy has been proven to be safe and to date there is no indication of teratogenicity.[164–166] All further steps should be based on individual considerations, with a preference for medications that have a satisfactory risk-to-benefit ratio in pregnant women and neonates with regard to teratogenicity and embryotoxicity. For example, ciclosporin, although not teratogenic, is embryo-toxic in animal models and is associated with preterm delivery and low birth weight in human infants. Whether the benefits of ciclosporin in CU are worth the risks in pregnant women will have to be determined on a case-by-case basis. However, all decisions should be re-evaluated according to the current recommendations published by regulatory authorities.

Should the same treatment algorithm be used in pregnant women and during lactation?		
We suggest using the same treatment algorithm with caution both in pregnant and lactating women after risk-benefit assessment. Drugs contraindicated in pregnancy should not be used. (consensus-based)	↑	>90% consensus

6 | NEED FOR FURTHER RESEARCH

The panel and participants identified several areas in which further research is needed. These points are summarized in Table 8.

ACKNOWLEDGMENT

The authors thank physicians and specialists who contributed to the development of this revision and update of the guidelines by active participation in the democratic process and discussion within the 5th International Consensus Meeting on Urticaria 2016. They also thank to all national societies for funding their delegates, and Tamara Dörr for her substantial assistance in the preparation of this manuscript. GA²LEN-UCARE-Network (www.ga2len-ucare.com).

Endorsing societies: AAAAI, American Academy of Allergy, Asthma & Immunology (endorsing with comments); AAD, American Academy of Dermatology; AAIITO, Italian Association of Hospital and Territorial Allergists and Immunologists; ACAAI, American College of Allergy, Asthma and Immunology; AEDV, Spanish Academy of Dermatology and Venereology; APAAACI, Asia Pacific

Association of Allergy, Asthma and Clinical Immunology; ASBAI, Brazilian Association of Allergy and Immunopathology; ASCIA, Australasian Society of Clinical Immunology and Allergy; BAD, British Association of Dermatologists; BSACI, British Society for Allergy and Clinical Immunology; CDA, Chinese Dermatologist Association; CMICA, Mexican College of Clinical Immunology and Allergy; CSACI, Canadian Society of Allergy and Clinical Immunology; DDG, German Society of Dermatology; DDS, Danish Dermatological Society; DGAKI, German Society of Allergology and Clinical Immunology; DSA, Danish Society for Allergology; DST, Dermatological Society of Thailand; EAACI, European Academy of Allergology and Clinical Immunology; EDF, European Dermatology Forum; EMBRN, European Mast Cell and Basophil Research Network; ESCD, European Society of Contact Dermatitis; GA²LEN, Global Allergy and Asthma European Network; IAACI, Israel Association of Allergy and Clinical Immunology; IADVL, Indian Association of Dermatologists, Venereologists and Leprologists; JDA, Japanese Dermatological Association; NVvA, Dutch Society of Allergology (the official delegate agreed with the guideline but at time of publication the official letter of endorsement was not received. If received later an update will be published on the GA²LEN website.); MSAI, Malaysian Society of Allergy and Immunology; ÖGDV, Austrian Society for Dermatology; PSA, Polish Society of Allergology; RAACI, Russian Association of Allergology and Clinical Immunology; SBD, Brazilian Society of Dermatology; SFD, French Society of Dermatology; SGAI, Swiss Society for Allergology and Immunology; SGDV, Swiss Society for Dermatology and Venereology; SIAAIC, Italian Society of Allergology, Asthma and Clinical Immunology; SIDeMaST, Italian Society of Medical, Surgical and Aesthetic Dermatology and Sexual Transmitted Diseases; SPDV, Portuguese Society of Dermatology and Venereology; TSD, Turkish Society of Dermatology; UNBB, Urticaria Network Berlin-Brandenburg; UNEV, Urticaria Network; WAO, World Allergy Organization.

CONFLICT OF INTEREST

This are only the COI of the first author. Please refer to the table in the Method's paper where the COI of all authors are listed in detail

ORCID

T. Zuberbier http://orcid.org/0000-0002-1466-8875
R. Asero http://orcid.org/0000-0002-8277-1700
J. A. Bernstein http://orcid.org/0000-0002-3476-1196
Z. Brzoza http://orcid.org/0000-0002-1230-7013
M. Hide http://orcid.org/0000-0001-6183-6467
D. Larenas-Linnemann http://orcid.org/0000-0002-5713-5331

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How to cite this article: Zuberbier T, Aberer W, Asero R, et al. Endorsed by the following societies: AAAAI, AAD, AAIITO, ACAAI, AEDV, APAAACI, ASBAI, ASCIA, BAD, BSACI, CDA, CMICA, CSACI, DDG, DDS, DGAKI, DSA, DST, EAACI, EIAS, EDF, EMBRN, ESCD, GA²LEN, IAACI, IADVL, JDA, NVvA, MSAI, ÖGDV, PSA, RAACI, SBD, SFD, SGAI, SGDV, SIAAIC, SIDeMaST, SPDV, TSD, UNBB, UNEV and WAO. The EAACI/GA²LEN/EDF/WAO guideline for the definition, classification, diagnosis and management of urticaria. *Allergy*. 2018;73:1393-1414. https://doi.org/10.1111/all.13397