

# Automatic screening of self-evaluation apps for urticaria and angioedema shows a high unmet need

To the Editor,

In chronic urticaria (CU) and recurrent angioedema (RAE), the need for effective treatment is high. The goals are for patients to have no signs and symptoms, normal quality of life (QoL), and complete disease control. Disease activity is assessed using scores such as the urticaria and the angioedema activity scores, that is, patient-reported outcome measures (PROMs) that rely on the daily documentation, by patients, of wheals and itch and of angioedema, respectively. This is complemented by the regular assessment of QoL and disease control with suitable PROMs, for example, the urticaria control test (UCT) or the angioedema control test (AECT).<sup>1</sup>

Apps are ideally suited for documentation of the patients' daily signs and symptoms and regular assessments of their QoL and disease control. Apps can also help to identify relevant triggers (eg, stress and infections), consequences (eg, sleep impairment, missing work, or school), and comorbidities, a major need in CU and RAE. Moreover, apps can optimize treatment by individualizing therapy in order to reach goals.

However, the availability and functionality of apps for the self-evaluation of CU and RAE are unknown. To address this knowledge gap, we developed and applied an automatic search algorithm for self-evaluation apps for CU and RAE in Apple App and Google Play stores.

We used the methods that we had previously applied to asthma and anaphylaxis.<sup>2</sup> The search was performed in July 2021 (Figure 1). Briefly, we first designed the search algorithm to include seven search terms, each in three languages, that is, English, German, and Spanish (Table S1), then used the algorithm to search the app stores in 16 countries (Table S2), and finally assessed the apps identified for eligibility, that is, helping patients to track their signs and symptoms and manage their disease, by integrating information on triggers, consequences, comorbidities, and/or treatment. Our manual search, performed in parallel, used the same search terms, app stores, languages, countries, and eligibility criteria (Table 1). The apps were then assessed for their availability, functions, and features.

Our automatic and manual searches both identified the same nine apps for CU and/or RAE self-evaluation (Table 1): (a) four for hereditary angioedema (HAE), that is, Advance HAE, HAERO, myHAE, and HAE & me, none of which allow for tracking of wheals or itch, and (b) five for CU, that is, TARGET My Hives, UrCare, UrticariApp, and SymTrac™ HIVES (Table 1). All apps can be used to document signs and symptoms, an inclusion criterion of our search. Of the nine apps, six allowed for the documentation of triggers, three for PROM-based disease-driven impact, six for treatment, and one for disease control. Only one app was available in more than two languages, and none covered comorbidities or provided individualized advice (Table 1).

Our findings demonstrate that currently available iOS/Android apps for the self-evaluation of CU and RAE are very limited in number, function, and geographical reach, and that none cover comorbidities. Use of the same approach in asthma and anaphylaxis showed very similar results. The results of the UCARE CURICT study demonstrated that most CU patients, especially those with higher education and in rural areas, are interested in the use of digital tools for their health care.<sup>3,4</sup> Clearly, better apps are needed and wanted.

Taken together, we identified a major unmet need in CU and RAE: that of the lack of suitable apps for patients to (a) self-evaluate their disease activity, impact, and control, (b) improve the self-management of their condition by recognizing important triggers of exacerbation, comorbidities, and consequences of their disease, and (c) optimize their therapy including allergic comorbidities. Novel apps that allow patients to do this are needed globally. Such apps are expected to improve the management of CU and RAE and may also serve as important tools for CU and RAE research.

## KEYWORDS

apple, automatic search, google, itch, javascript, swelling, wheals

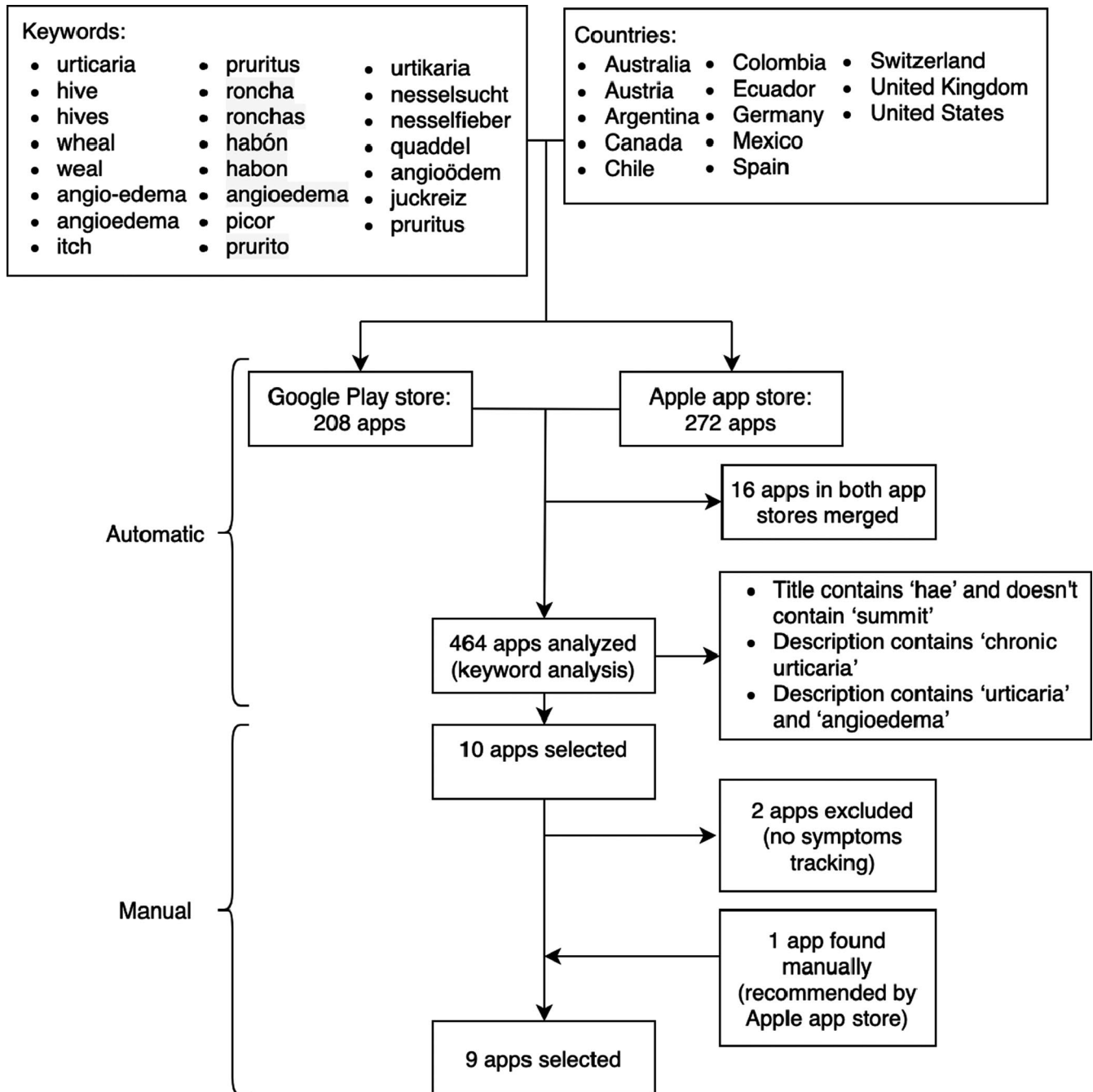


FIGURE 1 Search and exclusion criteria

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**CONFLICT OF INTEREST**

Dr. Antó has nothing to disclose. Rasmus Maurer has nothing to disclose. Dr. Gimenez-Arnau reports grants and personal fees from Uriach Pharma, grants, personal fees and other from NOVARTIS PHARMA, personal fees from SANOFI - REGENERON, personal fees from AMGEN, grants and personal fees from GSK, personal fees from THERMO FISHER, personal fees from ALMIRALL, grants

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TABLE 1 Available apps for the self-evaluation of urticaria and angioedema

Name of App	For	App store(s) availability	Signs and symptoms	Triggers	Impact	Comorbidities	Medication	Advice	Languages	Made by
Advance HAE	HAE	Apple, Google	<ul style="list-style-type: none"> <li>Angioedema (duration and location)</li> </ul>	N = 22 <sup>a</sup> Others (can be entered)	School/work days missed	No	N = 7 <sup>b</sup> regular N = 16 <sup>c</sup> on demand Others (can be entered)	No	Eng	HAEA
HAERO	HAE	Apple, Google	<ul style="list-style-type: none"> <li>Angioedema (location)</li> <li>Pain</li> </ul>	N = 9 <sup>d</sup> Others (can be entered)	School/work days missed	No	N = 5 <sup>e</sup>	No	Eng, Fre	AOHQ
myHAE	HAE	Apple, Google	<ul style="list-style-type: none"> <li>Angioedema (body part affected)</li> </ul>	N = 6 <sup>f</sup> Others (can be entered)	No	No	On demand and regular medication can be entered	No	Eng, Ger	Takeda
HAE & Me	HAE	Apple	<ul style="list-style-type: none"> <li>Angioedema (location)</li> <li>Angioedema severity</li> </ul>	N = 8 <sup>g</sup> Others (can be entered)	No	No	N = 9 <sup>h</sup>	No	Eng	Pharming
TARGET My Hives	CU	Apple	<ul style="list-style-type: none"> <li>Urticaria severity</li> <li>Angioedema severity</li> </ul>	N = 9 <sup>i</sup> Others (can be entered)	Yes	No	On demand medication can be entered	No	Eng, Fre, Ger, Gre, Por, Spa, Tur	Novartis
UrCare	CU	Apple, Google	<ul style="list-style-type: none"> <li>Urticaria severity</li> <li>Angioedema severity</li> <li>Number of hives</li> </ul>	No	QoL (CU-Q2oL)	No	Yes, access to online drug database	No	Eng, Spa	Novartis
Urticaria	CU	Google	<ul style="list-style-type: none"> <li>Wheals, Redness, Swellings (numbers)</li> <li>Itch (duration and intensity)</li> </ul>	Yes (can be entered)	Yes (question 3 of UCT)	No	On demand and regular medication can be entered	No	Eng, Ger	GAAPP
UrticariApp	CU	Apple, Google	<ul style="list-style-type: none"> <li>Wheals (number)</li> <li>Itch (severity)</li> <li>Angioedema (location)</li> </ul>	No	Yes, can be entered	No	No	No	Eng, Spa	AAUC
SymTrac™ HIVES	CU	Google	<ul style="list-style-type: none"> <li>Urticaria (severity)</li> <li>Angioedema severity</li> <li>Number of hives</li> </ul>	No	QoL (DLQI)	No	No	No	Eng	Novartis

Note: For = Disease the app was developed for, that is, HAE = hereditary angioedema or CU = chronic spontaneous urticaria (all CU apps are only for patients chronic spontaneous urticaria, and not for patients with other forms of chronic urticaria); Advice = Does the app offer individualized advice to user, based on the user's data/documentation.

Abbreviations: AAS, angioedema activity score; AAUC, Asociación der Afectados de Urticaria Crónica; AOHQ, Association des Patients d'Angio-Oedeme Hereditaire du Quebec; CU-Q2oL, chronic urticaria quality of life questionnaire; DLQI, dermatologic quality of life index; Eng, English; Fre, French; Ger, German; Gre, Greek; HAEA, US Hereditary Angioedema Association; that is, yes/no = screener question, 5 follow up questions for yes; Por, Portuguese; Spa, Spanish; Tur, Turkish; GAAPP = Global Allergy and Asthma Patient Platform; UAS, urticaria activity score, that is, assessment of itch (none, mild, moderate, severe) and wheals (0, 0–19, 20–50, >50) in last 24h; UCT, urticaria control test.

<sup>a</sup>routine dental cleaning, other dental procedure, medical procedure, minor injury or prolonged physical pressure, infection/illness, taking birth control, menstrual period, menopause, being pregnant, fatigue, being on hormone replacement therapy, food or non-alcoholic beverages, stress, anger/frustration, lack of sleep, medication, alcohol, sadness/depression, constipation, anxiety, weather

<sup>b</sup>androgens, antifibrinolytics, C1-inhibitor intravenously; C1-inhibitor subcutaneously, progesterone, clinical study drug (can be typed in), lanadelumab

<sup>c</sup>berinert, cinryze, ruconest, heagarda, kalbitor, firazyr, corticosteroids, antihistamines, clinical trial study drug (can be typed in), narcotic pain medicine, intravenous fluids, additional androgens, additional antifibrinolytics, fresh frozen plasma, epinephrine

<sup>d</sup>stress, trauma, surgical procedures, contraceptives, angiotensin converting enzyme inhibitors, dental work, viral infections, hormone replacement therapy, unknown

<sup>e</sup>berinert, cinryze, firazyr, heagarda, takhzyro








<sup>f</sup>infection, stress, medical or dental procedure, trauma, flu-like symptoms, unknown

<sup>g</sup>anxiety, stress, minor injury, dental/medical/surgical procedure, fatigue, certain medications, infection, hormonal changes

<sup>h</sup>ruconest, firazyr, kalbitor, berinert, cinryze, heagarda, takhzyro, orladeyo, generic icatibant; Remind = apps reminds user to enter data and/or to refill prescription.

<sup>i</sup>scratching, cold, sun, pressure, exercise, heat, alcohol, allergies, unknown.

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#### SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.