

## Asthma App Use and Interest Among Patients With Asthma: A Multicenter Study

Jácome C<sup>1</sup>, Almeida R<sup>1</sup>, Pereira AM<sup>1,2</sup>, Araújo L<sup>2</sup>, Correia MA<sup>2</sup>, Pereira M<sup>1,3</sup>, Couto M<sup>2</sup>, Lopes C<sup>4,5</sup>, Chaves Loureiro C<sup>6</sup>, Catarata MJ<sup>6</sup>, Santos LM<sup>6</sup>, Ramos B<sup>6</sup>, Mendes A<sup>7</sup>, Pedro E<sup>7</sup>, Cidrais Rodrigues JC<sup>8</sup>, Oliveira G<sup>8</sup>, Aguiar AP<sup>8</sup>, Arrobas AM<sup>9</sup>, Costa J<sup>9</sup>, Dias J<sup>9</sup>, Todo Bom A<sup>10</sup>, Azevedo J<sup>10</sup>, Ribeiro C<sup>10</sup>, Alves M<sup>10</sup>, Pinto PL<sup>11</sup>, Neuparth N<sup>11,12</sup>, Palhinha A<sup>11</sup>, Marques JG<sup>11</sup>, Martins P<sup>11,12</sup>, Trincão D<sup>11</sup>, Neves A<sup>11</sup>, Todo Bom F<sup>13</sup>, Santos MA<sup>13</sup>, Branco J<sup>13</sup>, Lozoya C<sup>14</sup>, Costa A<sup>15</sup>, Silva Neto A<sup>15</sup>, Silva D<sup>16</sup>, Vasconcelos MJ<sup>16</sup>, Teixeira MF<sup>17</sup>, Ferreira-Magalhães M<sup>1,17</sup>, Taborda Barata L<sup>18</sup>, Carvalhal C<sup>18</sup>, Santos N<sup>19</sup>, Sofia Pinto C<sup>20</sup>, Rodrigues Alves R<sup>21</sup>, Moreira AS<sup>21</sup>, Morais Silva P<sup>22</sup>, Fernandes R<sup>23,24</sup>, Ferreira R<sup>23</sup>, Alves C<sup>25</sup>, Câmara R<sup>25</sup>, Ferraz de Oliveira J<sup>26</sup>, Bordalo D<sup>27</sup>, Calix MJ<sup>28</sup>, Marques A<sup>28</sup>, Nunes C<sup>29</sup>, Menezes F<sup>30</sup>, Gomes R<sup>30</sup>, Almeida Fonseca J<sup>1,2,3,31</sup>, INSPIRERS group

<sup>1</sup>Center for Health Technology and Services Research (CINTESIS), Faculty of Medicine, University of Porto (FMUP), Porto, Portugal

<sup>2</sup>Allergy Unit, Instituto and Hospital CUF, Porto, Portugal

<sup>3</sup>MEDIDA – Medicina, Educação, Investigação, Desenvolvimento e Avaliação, Porto, Portugal

<sup>4</sup>Unidade de Imunoalergologia, Hospital Pedro Hispano, Unidade Local de Saúde de Matosinhos, Matosinhos, Portugal

<sup>5</sup>Imunologia Básica e Clínica, Faculdade de Medicina, Universidade do Porto, Porto, Portugal

<sup>6</sup>Serviço de Pneumologia A, Hospital Universitário de Coimbra, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal

<sup>7</sup>Serviço de Imunoalergologia, Hospital de Santa Maria, Centro Hospitalar Lisboa Norte, Lisboa, Portugal

<sup>8</sup>Serviço de Pediatria, Hospital Pedro Hispano, Unidade Local de Saúde de Matosinhos, Matosinhos, Portugal

<sup>9</sup>Serviço de Pneumologia B, Hospital Geral, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal

<sup>10</sup>Serviço de Imunoalergologia, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal

<sup>11</sup>Serviço de Imunoalergologia, Hospital de Dona Estefânia, Centro Hospitalar Universitário de Lisboa Central, Lisboa, Portugal

<sup>12</sup>Pathophysiology, CEDOC, Integrated Pathophysiological Mechanisms Research Group, Nova Medical School, Lisboa, Portugal

<sup>13</sup>Serviço de Pneumologia, Hospital Beatriz Ângelo, Loures, Portugal

<sup>14</sup>Serviço de Imunoalergologia, Hospital Amato Lusitano, Unidade Local de Saúde de Castelo Branco, Castelo Branco, Portugal

<sup>15</sup>Serviço de Pediatria, Hospital da Senhora da Oliveira, Guimarães, Portugal

<sup>16</sup>Serviço de Imunoalergologia, Centro Hospitalar Universitário de São João, Porto, Portugal

<sup>17</sup>Serviço de Pediatria, Centro Materno Infantil do Norte, Centro Hospitalar Universitário do Porto, Porto, Portugal

<sup>18</sup>Serviço de Imunoalergologia, Hospital Pêro da Covilhã, Centro Hospitalar Universitário Cova da Beira, Covilhã, Portugal

<sup>19</sup>Serviço de Imunoalergologia, Centro Hospitalar Universitário do Algarve, Portimão, Portugal

<sup>20</sup>Serviço de Pneumologia, Hospital São Pedro de Vila Real,

Centro Hospitalar de Trás-os-Montes e Alto Douro, Vila Real, Portugal

<sup>21</sup>Unidade de Imunoalergologia, Hospital do Divino Espírito Santo, Ponta Delgada, Portugal

<sup>22</sup>Imunoalergologia, Grupo HPA Saúde, Portimão, Portugal

<sup>23</sup>Serviço de Pediatria, Departamento de Pediatria, Hospital de Santa Maria, Centro Hospitalar Universitário de Lisboa Norte, Lisboa, Portugal

<sup>24</sup>Laboratório de Farmacologia Clínica e Terapêutica, Instituto de Medicina Molecular, Faculdade de Medicina, Universidade de Lisboa, Portugal

<sup>25</sup>Serviço de Pneumologia, Hospital Nossa Senhora do Rosário, Centro Hospitalar Barreiro Montijo, Barreiro, Portugal

<sup>26</sup>Imunoalergologia, Hospital Privado de Alfena, Trofa Saúde, Alfena, Portugal

<sup>27</sup>Serviço de Pediatria, Unidade Hospitalar de Famalicão, Centro Hospitalar do Médio Ave, Vila Nova de Famalicão, Portugal

<sup>28</sup>Serviço de Pediatria, Hospital de São Teotónio, Centro Hospitalar Tondela-Viseu, Viseu, Portugal

<sup>29</sup>Imunoalergologia, Centro de Imunoalergologia do Algarve, Portimão, Portugal

<sup>30</sup>Serviço de Pneumologia, Hospital Garcia de Orta, Almada, Portugal

<sup>31</sup>Department of Community Medicine, Information and Health Decision Sciences (MEDCIDS), Faculty of Medicine, University of Porto, Porto, Portugal

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Mobile applications (apps) are a promising approach for improving self-management behaviors in patients with asthma, as they can be easily integrated into adolescents' and adults' everyday lives [1,2]. Smart mobile devices have the advantages of being personal, portable, connected, (increasingly) low cost and computationally powerful. It is hypothesized that through gamification and patient-to-patient (peer) interaction [3], apps may be ubiquitous solutions capable of improving and maintaining self-management behaviors in the long term and impacting large numbers of patients, especially adolescents and adults, who are considered the demographic groups most comfortable with smartphones. However, current use of smart devices, social networks, and apps among patients with asthma remains unexplored, as does the interest of these groups in asthma apps. The lack of published studies on the use of mHealth in allergic diseases was highlighted in the recent position paper of the European Academy of Allergy and Clinical Immunology (EAACI) [1]. Thus, we aimed to investigate the use of smart devices, social networks, and apps, as well as the use of and interest in asthma apps among adolescents and adults with asthma.

We based our investigation on data from a prospective observational study focusing on adherence to asthma inhalers

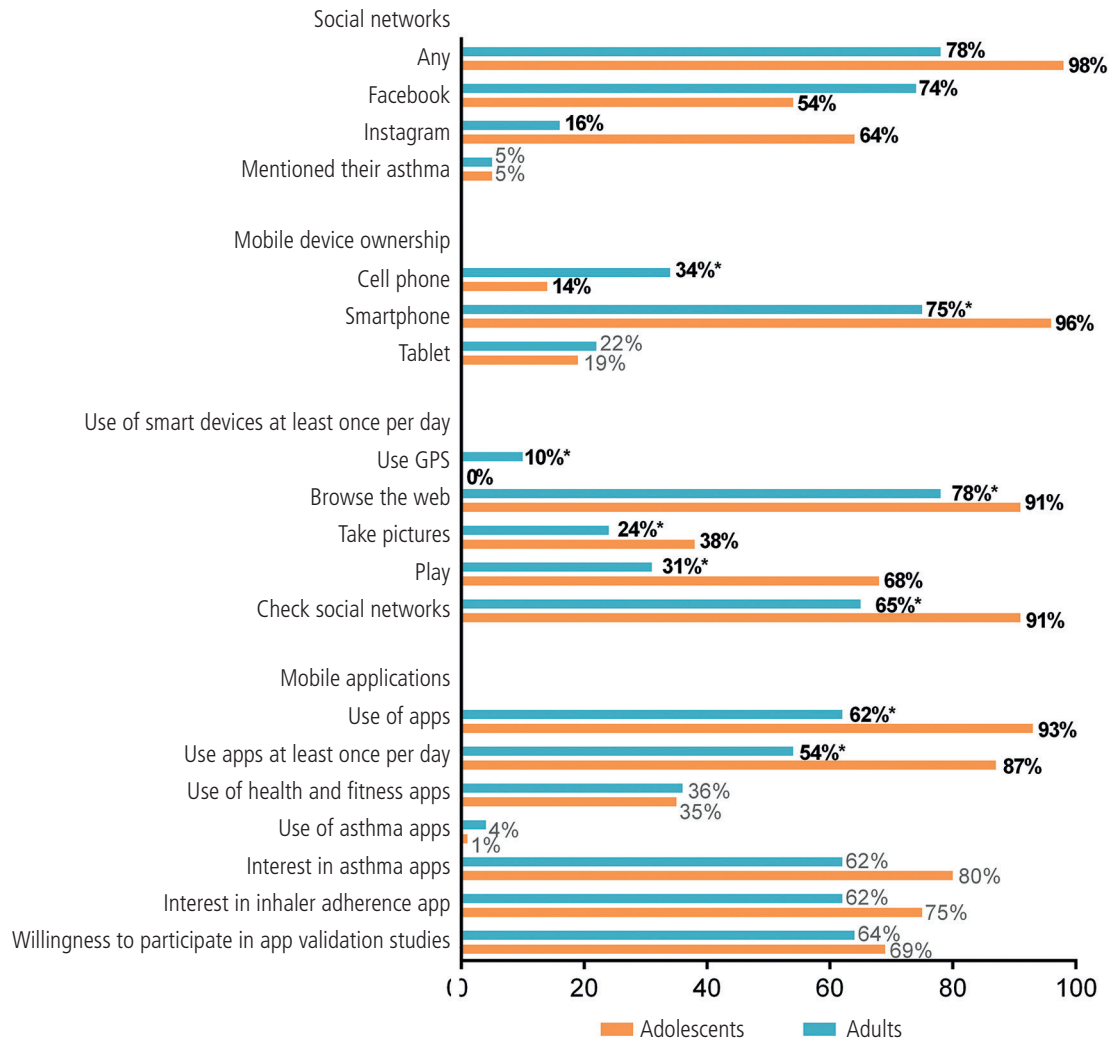


Figure. Use of social networks, mobile devices, and mobile applications (n=336).  
\*Significant differences between adolescents and adults.

among adolescents and adults with persistent asthma [4]. Patients were recruited during medical visits by convenience sampling at 25 allergy, pulmonology, and pediatric outpatient clinics in Portugal. The study was approved by the local ethics committees. Patients were included if they had persistent asthma, were at least 13 years old, and had an active prescription for an inhaled controller medication. Patients were surveyed regarding ownership of cell phones (simple devices for voice calls and text messages), smartphones (combined phone, web browser, and computer capabilities), and tablets. To characterize the use of smart mobile devices, we used 5 items of the Media and Technology Usage and Attitudes Scale (use GPS, browse the web, take pictures, gaming, check social networks) [5]. We also included questions on the following: patients' use of social networks; previous download/use of general, health/fitness, or asthma apps; willingness to use an app to monitor asthma and to improve inhaler adherence; and willingness to participate in studies evaluating apps for asthma. Descriptive statistics were used to describe the data

collected, and the  $\chi^2$  test was applied to compare proportions between adolescents and adults.

This study included 336 participants: 104 (31%) adolescents and 232 (69%) adults. Participants were mostly female (62%), and their mean (SD) age was 34.3 (19.2) years (Supplementary material). Results on use of social networks, mobile devices, and apps are summarized in the Figure. Social networks were used by almost all adolescents (98%) and by 78% of adults ( $P<.001$ ): Instagram was more common in adolescents (64%) and Facebook in adults (74%). Only 5% of participants have ever referred to their asthma in social networks.

A total of 288 (86%) participants owned a smart mobile device: 274 (82%) a smartphone and 71 (21%) a tablet. The rate of smart device ownership was higher among adolescents (96% vs. 81%,  $P<.001$ ), as was the frequency of use of smart devices in activities such as browsing the web, taking pictures, gaming, and checking social networks ( $P<.015$ ).

Most adolescents (93%) and adults (62%) had downloaded/used an app ( $P<.001$ ), with 87% of adolescents using apps

daily, in contrast with 54% of adults ( $P < .001$ ). However, only one-third of participants had ever used a health/fitness app, with 3% reporting the use of an asthma app. Nevertheless, around two-thirds of patients would be interested in using an asthma app—specifically an app to improve inhaler adherence—as well as in participating in studies for validation of asthma apps.

The rates of adolescents and adults owning a smartphone in this study are in line with those described among patients with conditions such as allergic respiratory diseases and mental health disorders [6-8]. Furthermore, our results are in accordance with findings in the general population in Europe [9] and the USA [10].

The use of social networks among patients with asthma followed the pattern observed in the general population, with adolescents engaging more with social networks than adults [11]. In addition, the dominant online platforms differed between age groups, in line with other studies: Instagram for adolescents (61% to 72% [10,12]) and Facebook for adults (53% to 82% [11-13]).

Regardless of the age group, about three-quarters of the patients with asthma had downloaded/used an app, although only one-third had used a health/fitness app. These findings are in line with reported frequencies for general apps (71% to 79% [7,8]) and health/fitness (28% [8]) apps, although in the lower end of the range found in the literature. The most discouraging result was that only 3% of the participants had ever used an app directly related to their asthma. Indeed, asthma apps capture <1% of the target market [14]. This contrasts with other app market segments, such as diabetes, mental health, and nutrition, which have been able to attract and retain users to a much greater degree [7,14]. This result may be explained by the lack of knowledge of existing apps and of their benefits for asthma management among patients' and health professionals. However, it may also be related to the fact that most asthma apps are exclusively tracker apps, do not provide behavior change support/coaching solutions, and do not enable automated data input or personalized feedback [2,14].

Importantly, about two-thirds of patients expressed interest in using an app to manage their asthma, namely, to improve inhaler adherence, a well-known problem among patients with asthma. This interest is similar to that reported by patients with other health conditions [6,15]. Moreover, two-thirds of patients reported being interested in participating in studies for validation of asthma apps, which may reflect the sampling method and voluntary participation in the study. The contrasting findings of low use but high interest in asthma apps, may be linked to previously reported reasons and highlight the need to develop asthma apps supported by evidence-based, user-informed, and attractive approaches [1,2,14].

Our sample comprised adolescents and young and middle-aged adults with persistent asthma, who were mostly recruited from secondary health care centers. Population studies with larger samples of patients with an extended age range (including children and older adults) should be conducted in the future. The patients' allergic profile was not collected, although it might play a role in mHealth-related habits. Future studies could also address this issue.

Most patients had access to smart devices and apps, although only one-third were engaged with health/fitness apps. Despite this low engagement, two-thirds were interested in using apps to support asthma management as part of their care. Smartphone and apps are integrated in patients' routines and might be promising tools for improving asthma monitoring and management.

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#### *Conflicts of Interest*

The authors declare that they have no conflicts of interest.

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**João A Fonseca**

Center for Health Technology and Services Research  
Faculty of Medicine  
University of Porto  
Rua Dr. Plácido da Costa  
Porto 4200-450, Portugal  
E-mail: [fonseca.ja@gmail.com](mailto:fonseca.ja@gmail.com)