

Parents' views on artificial intelligence for the daily management of childhood asthma: a survey

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1	Parents' views on artificial intelligence for the daily management of childhood asthma:
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26 Clinical Implications

- 27 The parents surveyed were divided about the implementation of artificial intelligence through
- an autonomous algorithmic decision system in the management of their child's asthma. Most
- 29 preferred their physician to keep the control over the care provided to their child.

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31 Parents' views on artificial intelligence for the daily management of childhood asthma:

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As asthma is the most common noncommunicable disease in children worldwide, and as data 33 sources (biomarkers, environmental data, connected objects) increase over the years, it 34 becomes possible to create very large datasets (big data) and train algorithms with the most 35 advanced techniques of artificial intelligence (AI)¹. Soon, it may be possible to propose 36 timely delivery of effective personalised treatments for children with asthma through 37 algorithmic decision systems (ADS) autonomously suggesting changes in asthma treatments 38 and indicating when a medical review is required. The primary aim of this study was to 39 describe parents' perception of AI and to assess if they would accept/prefer an ADS for the 40 management of their child's asthma over current physician-based management. A secondary 41 42 objective was to identify the factors associated with a preference for using an ADS among the parents surveyed. 43

Methods of this study are described in this article's Online Repository at www.jaciinpractice.org. Briefly, a cross-sectional survey was conducted in four paediatric hospitals of France with parents of children with asthma during the winter 2019-2020. Participants were asked on their views on AI in the field of medicine, on the place of AI in medical decisions about themselves and their child, and if they would accept/prefer an ADS which would avoid most follow-up medical consultations for the management of their child's asthma over their current physician-based management.

From the 321 eligible participants, 295 (92%) provided a complete questionnaire that could
be included in the analysis (for characteristics, see Table E1 in this article's Online
Repository at www.jaci-inpractice.org).

Regarding parents' views on AI in the field of medicine, 158 (63%) and 202 (68%) parents agreed that AI could be useful in assisting physicians in the diagnosis and monitoring of diseases, respectively (See Figure E1 in this article's Online Repository at www.jaciinpractice.org). By contrast, only 44 (15%) and 41 (14%) thought that AI could replace physicians in diagnosing or monitoring diseases, respectively.

When asked to determine the respective positions of their doctor (human intelligence) and an AI for medical decisions concerning their child, 60 (23%) parents responded that these decisions should rely on their physician only, 174 (59%) on their physician sometimes assisted by AI, 48 (16%) on their physician often assisted by AI. Only 13 parents (4%) were supporting the idea of medical decisions relying on an AI supervised by their physician, and none supported the idea of medical decisions taken by an AI only.

65 When asked if they would accept to use an ADS for the management of their child's asthma, 158 parents (54%) responded positively. To estimate further if they would prefer an ADS-66 67 based management, they were asked to choose between a physician-based management allowing to obtain asthma control in 60% of cases, and an ADS-based management with rates 68 of success between 50% and 90% (Figure 1). 134 (45%) parents never chose the ADS-based 69 70 management even if this system was associated with a rate of success 30% higher than the physician-based management (level 0 of preference). At the opposite 11 parents (4%) 71 preferred the ADS-based management even if it performed worse (by 10%) than the 72 physician-based management (level 5). Between these two extremes, the cumulative number 73 74 of parents that chose the ADS-based management over the physician-based management were 55 (19%), 96 (33%), 143 (48%) and 161 (55%) when the ADS-based management 75 76 outperformed the physician-based management by 0% (level 4 of preference), 10% (level 3), 20% (level 2) and 30 % (level 1), respectively. In the multivariate analysis, parents were 77 more prone to choose the ADS-based management if they had a professional/intermediate job 78

and owned a higher number of different digital devices, and less prone to choose the ADSbased management if they attached a great importance to the physician-patient relationship
(Table 1).

This study highlights three important points: (1) parents were divided on whether to adopt ADS for the management of their child's asthma; (2) this division was mainly based on socio-economic factors, with parents with higher levels of employment being more likely to use ADS than socially disadvantaged ones; (3) 64% of the parents surveyed would not accept an ADS even if it provided better asthma control than usual care.

The development of AI applications divides people. In an online survey of 1183 adult 87 patients with chronic diseases in France (77 with asthma), only 50% of the patients felt that 88 the development of digital tools and AI in healthcare was an important opportunity². Higher 89 90 levels of education, higher levels of employment and higher household income have frequently been found to be associated with positive views on AI and support for its 91 development^{3–6}. The reluctance of parents belonging to the least-favored social classes to use 92 93 an ADS for their child's asthma management remains of great concern for the future development of AI systems. If parents from lower social classes are reluctant to provide data 94 95 to train ADS, they will be underrepresented in the final ADS developed to guide the management of childhood asthma and will receive suboptimal care compared to higher social 96 classes. 97

Another important finding of this study is that most of the parents surveyed were not ready for an AI-based management of asthma. Loss of human control is a concern that has been expressed by patients in previous studies^{2,7}. Patients think that AI might help physicians in the management of conditions, but that medical decisions should remain the prerogative of physicians. Loss of human contact is another concern expressed by patients. Lack of verbal

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and nonverbal communication, lack of emotion and lack of empathy with AI were the main
limitations that have been reported by patients⁷.

105 This study has some limitations. First, it is a cross-sectional survey, and the opinions 106 reflected in the winter 2019-2020 may change overtime. Second, the opinions expressed by 107 French parents may not reflect those from other countries. Third, a qualitative study would 108 have been more appropriate to assess participants' understanding of AI in general and their 109 vision on how it could be applied in childhood asthma management.

110 In conclusion, the parents surveyed were divided about the implementation of a high level of

111 automation using an ADS for the management of their child's asthma. They preferred their

- 112 physician to keep the control over the care provided to their child and valued the physician-
- 113 patient relationship.

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- 134

135 Figure legends

- 136 Figure 1: Parents' strength of preference for an algorithmic decision system (ADS)-based
- 137 management over current physician-based management depending on the success rate of the
- 138 ADS.

Parents' strength of preference for an ADS-based management of childhood asthma, compared to physician-based management, using varying rates of success in achieving asthma control



	Univariate analysis		Multivariate analysis	
Variable	Odds Ratio	p-	Odds Ratio	p-
	(95% CI)	value	(95% CI)	value
Age (years)	· · ·		· · ·	
• \geq 45 years	0.82 (0.46- 1.46)	0.51	-	-
• < 45 years (reference)	1.00			
Sex of participant				
• Female	1.16 (0.69- 1.94)	0.58	-	-
• Male (reference)	1.00			
Educational level				
• Undergraduate or graduate degree	6.54 (2.50- 17.08)	<0.01	2.73 (0.96- 7.76)	0.06
• High school	2.73 (1.01- 7.38)	0.048	1.90 (0.68- 5.33)	0.22
• Middle school (reference)	1.00		1.00	
Job				
Professional/intermediate	2.96 (1.91- 4.60)	<0.01	2.06 (1.24- 3.42)	<0.01
• Others (reference)	1.00		1.00	
Child's asthma				
 Hospital admission for asthma in the 				
previous 12 months				
• Yes	0.82 (0.46-	0.51	-	-
• No (reference)	1.00			
• Emergency department visit for asthma in the previous 12 months				
o Yes	0.75 (0.47- 1.19)	0.22	-	-
• No (reference)	1.00			
Controller treatment				
o Yes	0.91 (0.49- 1.70)	0.77	-	-
• No (reference)	1.00			
Self-efficacy score	1.34 (0.85- 2.11)	0.21	-	-

Table 1: Univariate and multivariate analysis of factors associated with preference for adoption of an algorithmic decision system for the management of childhood asthma over current physician management.

Equipment in digital devices	1.44 (1.17- 1.79)	<0.01	1.29 (1.02- 1.62)	0.03
Digital literacy	1.55 (1.21- 1.99)	<0.01	1.22 (0.92- 1.61)	0.18
Need for humanity in the physician-patient relationship	0.66 (0.40- 1.06)	0.08	0.56 (0.34- 0.93)	0.02
Knowledge of AI	1.40 (1.18- 1.66)	<0.01	1.10 (0.90- 1.34)	0.36
Data concerns (linked to data collection, privacy, misuse)	1.08 (0.82- 1.43)	0.58	-	-