

Journal Pre-proof

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Patient selected treatment goals in severe asthma

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Abstract**Background:**

Goal orientated healthcare accounts for patient preferences and values, not just physician treatment aims. The GINA management strategy states clinicians should elicit patient's own treatment goals as a central part of care. Despite this recommendation, data on patient's treatment goals is sparse among patients with severe asthma.

Objective:

The objective of this study is to investigate the relationship between rates of treatment adherence and goal achievement, and patient-selected goals.

Methods:

Thematic analysis was used to characterise patient-selected goals. Previously undescribed goal categories in asthma were identified, quantified, and related to clinical characteristics. Goal achievement was aligned with objectively measured treatment adherence.

Results:

Three categories of patients-selected goals were identified from two RCTs: disease-specific (n=98[51%] and n=92[54%] respectively), function-related (n=90[48%] and n=61[36%]) and knowledge (n=1[1%] and n=17[10%]). Only 53% of goals aligned with clinician treatment goals. Patients who chose disease-specific goals were more likely to achieve both control and their specified goal (n=98[45%], O.R. 1.789, C.I. 1.066 – 3.001). Male participants are more likely to focus on disease-specific goals. Patients who achieved their goals were more likely to be T2-high, have an elevated FeNO at their first visit and lower FeNO value at their

50 final visit. Interestingly, adherence rates decline significantly for those who achieve their
51 goals.

52 **Conclusion:**

53 Almost half of patient-selected goals do not align with GINA clinical asthma management
54 goals. Participants who chose goals that do align with clinicians were more likely to achieve
55 them.

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Key words: asthma, adherence, inhaler education, inhaler technique, patient goals, treatment goals, respiratory.

Abbreviations: shared decision making (SDM), randomised control trial (RCT), asthma control test (ACT), mini asthma quality of life questionnaire (mAQLQ), fractional exhaled nitric oxide (FeNO), 95% confidence interval (95% C.I.), body mass index (BMI), principal component analysis (PCA).

Highlights Box:

1) What is already known about this topic?

Guidelines state that clinicians should elicit patients' treatment goals as discordance between patient and clinician treatment aims may result in poor adherence to treatment. However, little information is available on patient goals in asthma

2) What does this article add to our knowledge?

This article identified treatment goal categories in asthma previously un-described. GINA clinical asthma management aligned goals are more likely to be achieved.

3) How does this study impact current management guidelines?

The additional goal categories may be used by clinicians in the development of new treatment strategies. Treatment adherence findings may aid in the development of strategies to increase engagement with asthma treatment.

Introduction

Goal-orientated care is healthcare that takes account of the patient's preferences and values, not just the goals and treatment aims of the physician (1-3). The use of a patient's goals may be used as a tool to increase patient engagement and adherence, enhance communication as well as aid clinicians in avoiding common pitfalls such as a preference misdiagnosis(4). Mulley *et al.* define preference diagnosis as a doctor's inference of a patient's preference if he/she is fully informed, and describe this inaccurate assumption as preference misdiagnosis (2). The importance of preference diagnosis in asthma has been highlighted as it increases patient engagement in treatment resulting in better clinical outcomes and reduced healthcare costs (2, 5-7). This goal-orientated approach, however, creates a challenge for clinicians as they now must find a balance between clinically appropriate treatment aims and patient preferences and values (8, 9).

The GINA management strategy outlines that the long-term treatment goals of asthma care are the control of symptoms, maintenance of normal activity levels, and the reduction in future risk of exacerbations. The strategy also states that clinicians should elicit the patient's own treatment goals as these may differ from those listed above (10). Despite this recommendation, there is no information on patient-related goals with regards to patients with severe asthma. This lack of data is important because a discordance between patient and clinician-aligned goals may manifest in poor adherence to asthma treatment, a common problem in asthma care (11).

A patient centred approach that is already well studied and practiced is shared decision making. Shared decision making (SDM) is a technique in which both patients and clinicians decide on the best way to approach a patient's specific situation. Despite strong support for

SDM it is not part of the standard approach to the management of asthma (12). SDM may be warranted when there is uncertainty over which treatment option to choose, or when it will affect a patient's preferences or values (13), thereby overcoming the problem of preference misdiagnosis. The use of SDM in asthma is promising and has led to improved adherence to inhaled medication and better communication between patients and clinicians (14). Despite the many benefits reported in the literature from taking an SDM approach the most common barrier reported that prevents the use of SDM is time constraint (15). A goal-oriented approach may limit time constraints due to its simple application.

To begin addressing this lack of information on patient-selected goals in asthma, we analysed data from two randomised control trials (RCTs). Both RCTs enlisted patients with severe asthma and aimed at promoting adherence to preventer therapy through the use of a digital audio device attached to an inhaler (the INCA device) (16). In both RCTs, the patients' goals for treatment were recorded. In this study we used thematic analysis to describe and characterise the treatment goals of patients with severe asthma. Previously undescribed goal categories in asthma were identified, quantified, and related to clinical characteristics. Moreover, goal achievement was aligned with objectively measured treatment and adherence. We hypothesized that patient-selected goals that align with clinician treatment goals were more likely be associated with higher rates of adherence and more likely to be achieved.

Methodology

Source Data

INCA 1 is a 12-week long randomised, nurse-delivered study (NCT01529697). This study consisted of four visits over three months, during which the patients were provided with an

INCA device to objectively monitor inhaler adherence. The active group received education on adherence and technique from biofeedback from the INCA device, whereas the second group received generalised training in inhaler adherence and technique. During the INCA 1 RCT, along with other data such as lung function, Peak Expiratory Flow Rate (Vitalograph asthma-1 USB), questionnaires (Asthma Control Test [ACT] and miniAQLQ [mAQLQ]), eosinophil count, and exacerbations, patient selected goals were assessed. At their first visit patients are asked three goals that they are hoping to achieve through work on their inhaler adherence and education throughout the course of the study (17). In this study these data were used for baseline analysis of goal selection, but not used for analysis of goal achievement or adherence as goal achievement was not recorded in this study.

INCA SUN is a 32-week long prospective multicentre randomised control trial (RCT) (NCT02307669) to optimise the management of symptomatically unstable asthma patients comparing two management strategies. One, the use of the INCA device (16) which objectively records medication use and an electronic peak flow meter, this is then aligned with the patient's clinical course, and two, using the current clinical practice (i.e. no technology) . During the INCA 1 RCT, along with other data such as lung function, Peak Expiratory Flow Rate (Vitalograph asthma-1 USB), Fraction of Exhaled Nitric Oxide (FeNO), questionnaires (Asthma Control Test [ACT] and miniAQLQ [mAQLQ]), eosinophil count, and exacerbations, patient selected goals were assessed (18). At each visit patients provided a single line verbal update on goal progression, and at their final visit patients were asked to rate goals as "achieved" or not. In this study these data were used for both baseline analysis of goal selection and for analysis of goal achievement and adherence.

See Table 1 for the baseline demographics of these two study populations. Table 2 contains an outline of study procedures carried out at each visit/time interval for both the INCA 1 and INCA SUN studies.

Goals were categorised using a thematic analysis approach outlined by Braun and Clarke (19). These data were reviewed, and coded, initially inductive thematic analysis was used to divide data into seven categories. These data were analysed without the use of a pre-existing theory (20). Using a mix between quantitative and qualitative analysis, these categories were reviewed and further refined into three overarching categories. These categories/themes are described in this study and were compared with demographic factors, measures of disease, and goal achievement.

Statistical analysis

Factors affecting goal selection were analysed separately for both studies using Stata IC13 (21) and R (22). Factors affecting goal achievement were only examined among the INCA SUN cohort as goal achievement was not assessed in the INCA 1 study.

Data are presented as mean (standard deviation, SD) unless otherwise stated. Logistic regression was used to analyse the relationship between goal selection and the results of the principal component analysis, and between goal selection and goal achievement; data are presented as odds ratio (O.R.) and 95% confidence interval (95% C.I.). Linear regression was used to compare the relationship between adherence and goal achievement; data are presented as coefficient and 95% C.I. As there were up to three goals per patient, all statistical analyses were corrected to account for intra-subject correlation. For the purpose of analysis, all goals were assessed as having equal importance, regardless of whether the goal was chosen as the patient's first, second, or third goal.

As the data between INCA 1 and INCA SUN datasets are not analogous, the logistic regression models were designed as the best estimator for each analysis.

Goals categorised as knowledge based were omitted from analysis as these were achieved by 73% of patients; this is to be expected as the study has a two-month education phase. The remaining knowledge-based goals that were not achieved were due to patients not completing the trial, or the knowledge goal aiming to identify causes of symptoms that are likely caused by comorbidity (*e.g.* cause of rash, if sore tonsils may be “exasperating asthma symptoms”).

Results

Data from 438 participants in two randomised clinical trials were analysed. The participants were on average 48 years of age, two thirds were female and the mean body mass index (BMI) was 30 kg/m², see Table 1.

Goal selection

In both studies, patients selected three treatment goals on their first study visit. Initially, inductive thematic analysis was used to divide the goals into seven subcategories: 1 – symptom reduction, 2 – increased control, 3 – medication reduction, 4 – fitness, 5 – social, 6 – emotional, 7 knowledge. The most common combinations of these subcategories are shown in Figure 1. The vertical bars show from left to right the subcategories that are most often chosen together by patients to least often chosen by patients. While the horizontal bars show how often each particular subcategory was chosen by patients.

The relationship between goal subcategories selected per patient is shown in Figure 2. Upon further review of these subcategories it was decided that these subcategories may account

for the same desired outcome for the patients. A re-categorization of goals was performed due to high negative correlation between certain subcategories (*e.g.* “symptom reduction” and “increased control”).

The seven goal subcategories were refined into three overarching categories, into which all goals fell. Subcategories “symptom reduction”, “asthma control” and “medication reduction” were categorised as “disease-specific” goals. The subcategories of “fitness”, “social” and “emotional” were combined into a new category, “function-related” goals. Finally, patient goals based on knowledge and education were assigned to their own category, “knowledge” goals. The distribution of these categories by patients in the two studies population is shown in Figure 3. Examples of patient selected goals and their categories are shown in Table 3. Disease-specific goals reflect the long-term treatment goals outlined by GINA and were considered clinician-aligned goals. Among patients in both studies, only 53% of patient goals aligned with clinician goals. The remaining two categories (knowledge-based and function-related goals) were not considered to be aligned with GINA clinical asthma management goals. Among patients in both studies, 47% of patient goals were not necessarily aligned with GINA clinical asthma management goals. The observed frequency of goals that were aligned/not aligned with GINA clinical asthma management goals can be seen in Figure 4.

Factors determining goal selection

To determine the influence of lung function on the choice of goal, principal component analysis (PCA) was performed on spirometry data which resulted in three components. Component 1 captures the main overall variation in spirometry with the FEV1, FVC, and the

FEV1/FVC ratio. Component 2 captures the contrast between the FEV1 and FVC. Component 3 appears to be due to noise, the eigenvalue associated with is too small to be interpreted as having a significant impact. Participants with large values for component 2 will have an FEV1 which is large compared to the FVC, whereas participants with small values for component 2 will have a reduced FEV1 compared to the FVC. A reduced FEV1 compared to the FVC will produce a lower FEV1/FVC ratio which is consistent with obstructed lung function. The logistic regression model at the bottom of table 4 indicates that participants who choose predominantly disease specific goals (patients who chose at least two goals that were disease-specific) have smaller values for component 2, and therefore a more obstructed picture on their lung function. This relationship is present, albeit non-significant, (n=109 [50%], O.R. 0.636, 95% C.I. 0.376 – 1.075) as is the relationship with lower BMI (log) (n=109 [50%], O.R. 0.262, 95% C.I. 0.048 – 1.432). The logistic regression model indicated that patients with predominantly disease-specific goals were more likely to be male (n=109 [50%], O.R. 0.264, 95% C.I. 0.094 – 0.737). Table 4.

Goal achievement

Patients who choose disease-specific (GINA clinical asthma management-aligned) goals were more likely to achieve both control (asthma control was defined as an ACT score of 20 or more and no exacerbation in the last three months) and their goal (n=98 [45%], O.R. 1.789, 95% C.I. 1.066 – 3.001). Patients who achieved their goals were more likely to be T₂ high (FeNO >45ppb and an eosinophil count $\geq 0.4 \times 10^9/L$) (n=99 [45%], O.R. 1.908, 95% C.I. 1.049 – 3.471), have an elevated mean FeNO (>45ppb) recorded at their first visit (n=123 [56%], O.R. 1.019, 95% C.I. 1.001 – 1.037) and a lower mean FeNO value (<45ppb) at their final visit (n=123 [56%], O.R. 0.964, 95% C.I. 0.935 – 0.933).

Asthma control (measured by ACT) improved significantly in both those who achieved their goals (n=168, coefficient 1.3, 95% C.I. 1.125 – 1.475), and those who did not achieve their goals (n=168, coefficient 0.691, 95% C.I. 0.511 – 0.87). There is a larger improvement in those who achieved their goals than those who did not achieve their goals. This can be seen in Figure 5.

Relationship of adherence with goal achievement

The INCA device records both attempted adherence (adherence measured by the number of times a patient attempted to use their inhaler corrected for timing) and actual adherence (attempted adherence corrected for timing of dose and technique). Both actual and attempted adherence were included in this study as most electronic adherence devices measure attempted adherence alone. Both attempted adherence rates and actual adherence rates declined significantly over the course of 8 months for those who achieve their goals (attempted: n=94 [43%], coefficient -1.028, C.I. -1.692 – -0.426; actual: n=94 [43%], coefficient -1.073, confidence interval -1.771 – -0.375), but adherence did not decline in those who do not achieve their goals (attempted: n=92 [42%], coefficient -0.584, C.I. -1.287 – 0.12; actual: n=92 [42%], coefficient -0.442, confidence interval -1.251 – 0.376), see Figure 5. Both adherence rates were tested in linear regression models which account for final visit FeNO values, patient reported control (ACT), and exacerbations throughout the study. The details of this analysis can be seen within Table 5. Of note there was no difference in baseline adherence between those who achieve their goals, and those that do not (n=115 [52%], coef. -3.438, 95% C.I. -10.146 – 3.27). Adherence rates for goal achieved and goals not achieved can be seen in Table E1 in the online repository.

Discussion

Patient reported goals from two separate RCTs showed that only 53% of patients had a goal that was disease-specific and hence in line with GINA clinical asthma management goals. The additional goal categories identified in this study, knowledge-related and function-related, do not align with the goals of care described in the GINA management strategy (10) and accounted for 47% of the goals selected by patients in these trials. When patient goals did align with GINA clinical asthma management goals, these were more likely to be selected by male participants with a lower BMI, and more obstructed lung function. Patients who chose goals which aligned with GINA clinical asthma management goals more frequently achieved their goals. Surprisingly, among patients who achieved their goals adherence rates dropped over the course of the study. These findings illustrate how investigating patient goals can provide insights into a patient's case, that may not otherwise be achieved through standard clinical approaches.

Although it is often stated that a clinician should identify patients' goals for treatment, there is minimal evidence in the literature which provides guidance to do so. The three goal model for patients' goals in severe asthma, described in this study, aligns with a previously described model by Vermunt *et al.* (23). Their model suggests an interrelationship of functional goals, disease or symptom specific goals, and fundamental goals (values and priorities in life), whereas both the INCA 1 and INCA SUN datasets use disease-specific, function-related, and knowledge-based goals.

In this study, patients with disease-specific goals were more likely to be achieved over function-related goals, which may be explained by the nature of the intervention. If a goal is asthma-specific and the intervention widely applied is for the treatment of asthma, this

increases the chances of that goal being achieved. However, function-related goals, in which no specific intervention is applied (*e.g.* to swim further), are less likely to be achieved. In such cases, this may highlight the need for the clinician to introduce an additional specific intervention that targets the subject of function-related goals *e.g.* social, fitness. This finding also underlies the importance of health literacy, a topic of great importance in asthma care due to its effects on clinician-patient communication, asthma education, and self-management (14). Poor perception of lack of understanding of asthma symptoms and required reliever inhaler use results in patients believing their asthma to be controlled when it is not (24), this may result in lower levels of treatment engagement. In order to enhance communication and adherence to treatment it is the responsibility of the clinicians to assess patient's health literacy, language, support, and cultural history (14). This is of vital importance in the case of function-related goals as bridging the gap between a patient's desired outcome and the requirement to engage with treatment is less clear than with disease-specific goals. Clinicians must engage with patients to ensure that they understand the link between their desired treatment outcome and the treatment itself.

In this study adherence levels at the end of the study were related to asthma control (see Figure 5) at the end of the study. Adherence rates were found to drop significantly in patients who achieved the goals. Individuals who did not achieve their goals had greater adherence but poorer asthma control. Lower adherence with better asthma control is consistent with the concept of intelligent non-adherence, which is defined as cases in which patients do not comply with treatment for reasons that have a rational basis. Examples of this include bad taste, interference with daily activities – cases in which the patient believes that the disadvantages outweigh the benefits (25). In the case of the current study

the authors believe that this drop in adherence may be due to patients reducing their effort having already achieved their desired outcome. Similar patterns in behaviour were reported, by Anderson and Greene, in a study looking at online chess players who will undergo great efforts to achieve a highest ranking, and then quitting once this has been achieved (26). This pattern of behaviour is seen elsewhere in a medical setting in which patients with osteoarthritic pain who were being monitored for adherence to prescribed exercise. Patients who achieved alleviation of pain were found to have lower adherence to exercise than those who continued to experience pain (27). These findings are supported by evidence from the literature, which suggests that for a new behaviour, in this case adherence to preventer medication, to persist participants require a motivator such as self-determination, satisfaction, behavioural enjoyment, and in the case of patient-selected goals, behavioural congruence with beliefs or goals (28). As such, patient-selected goals could be used as a tool to increase adherence to therapy. However, these behavioural changes in the study are implemented at the start of the trial when motivation is high and the cost of the behaviour is low. When motivation drops and the effort required to maintain the behaviour increases, as in this case when a goal is achieved, there is a need for self-regulatory effort to be increased to maintain adherence. If this behaviour persist over time, the need for self-regulation will reduce and the behaviour may become habitual. However, if this effort reduces a relapse in behaviour is likely (28), as is seen with reduced adherence to therapy in this study. The use of patient-selected goals may aid clinicians in identifying a point when medication doses can be reduced. This might also suggest a novel method of maintaining adherence rates, in which goals are used to communicate the importance of adherence and the achievement of control. To limit the need for self-regulation of the adherence behaviour on a goal which has already been achieved, a patient could set a new

goal, thereby reducing the effect of goal achievement on adherence, as demonstrated in this study.

The drop in adherence may also be due to a goal achievement behavioural pattern in which individuals relax their efforts towards short term goals once achieved to maintain limited resources/effort required for overall long term goals (29, 30), in this example, asthma control. According to Höchli *et al.* there are benefits and drawbacks to short term goal setting, for example short term goals are more action focussed and less abstracted than long term goals (ie. Asthma control), so therefore are easier to approach in terms of action plans. However, the achievement of short term goals can lead to short sightedness and result in a loss of focus, and be detrimental to long term goals. They recommend the best of both worlds, with the setting of long term goals as the overall outcome (asthma control in this case) and short term goals (increased exercise, adherence, disease education, weight loss), stating that it is possible to achieve the benefits of both approaches while balancing out the short comings (31). This mixed hierarchical approach of goals is a disease management tool that requires further study in the approach to asthma management.

Strengths

This study provides novel insight into the diagnostic implications of the choice of patient selected goal on asthma phenotype, endotype, and the potential for the achievement of disease control. It highlights the lack of insight into desired outcomes of nearly half of the participants within this study. Two additional categories of treatment goal in asthma were identified that clinicians should be aware of when considering treatment strategies for their patients, which have been lacking in the literature to date. This paper has identified a novel

cause for poor adherence, patient perceived recovery, and suggested a method for mitigating this effect.

Limitations

Quantitative analysis of goal progress and goal achievement was limited in this study due to the methodology surrounding goal updates from patients at each visit. Patients provided a single line update on the progress of their goals. How close an individual was to achieving their goal could not be extracted through qualitative analysis and categorisation. This may be achieved through patients marking the progress of their goal on a continuous 100-point visual analogue scale.

To allow for patient based characteristics rather than the association between goals and characteristics, it may be preferable to ask patients to choose a single goal. Patients were asked to provide three treatment goals in this study.

Conclusions

Only half of goals selected by patients with severe asthma align with what a clinician may consider to be a reasonable expectation of asthma treatment. Two additional treatment goal categories were reported, which were previously lacking in the literature, and may be used by clinicians while developing treatment strategies. Patients who reported disease-specific goals were more likely to achieve both control and their own selected goal. Once their goals were achieved, patients' adherence to their preventer treatment started to decline. Hence, we recognised a paradoxical cause of poor adherence to preventer therapy among patients with asthma (achievement of their desired outcome), and suggest strategies to mitigate against this.

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Figure Legends

Figure 1. UpSet plot of subcategories of goals selected by patients during the INCA SUN RCT. The plot indicates the frequency at which subcategories were selected together by the same patient.

Figure 2. A Spearman correlation matrix examining the combination of goal subcategories. Negative correlation indicates that the combination of goal subcategories were rarely/not chosen together. Subcategories: 1 – symptom reduction, 2 – increased control, 3 – medication reduction, 4 – fitness, 5 – social, 6 – emotional, 7 – knowledge.

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Figure 5. The relationship between ACT scores and adherence in participants who did or did not achieve their goals.

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481 Table 1. Study population demographics from INCA 1 and INCA SUN RCTs

Demographics	INCA 1 (n=218)		INCA SUN (n= 220)	
	Mean	SD	Mean	SD
Age	49.2	16.5	47	14.5
BMI	29.9	7	30.48	8.1
Female	64%		65%	
Male	36%		35%	
No. of exacerbations in the last year	4.5	3.5	4.7	3.2
Steroid courses in the last year	3.9	3.4	3.8	2.8
FEV1 (% predicted)	73	22.1	83	23.4
FEV1/FVC ratio	66.2	12	69	12
PEFR at visit 1	370 (L/min)	130.771	400 (L/min)	141.2
ACT score	12.1	4.5	12	3.4
Mini AQLQ score	3.7	1.2	3.8	1.1
FeNO			28.8(ppb)	34
Eosinophil count	0.34 (10 ⁹ /L)	0.4	0.4 (10 ⁹ /L)	0.4
Total IgE count	467.5 (kU/L)	877.6	337 (kU/L)	689

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484 Table 2. Study procedures from source datasets: INCA 1 and INCA SUN

	INCA 1				INCA SUN					
	Visit 1 Week 0	Visit 2 Week 4	Visit 3 Week 8	Visit 4 Week 12	Visit 1 Week 0	Visit 2 Week 1	Visit 3 Week 4	Visit 4 Week 8	Visit 5 Week 20	Visit 6 Week 32
INFORMED CONSENT	X				X					
DEMOGRAPHICS	X				X					
MEDICAL HISTORY & CURRENT MEDICATION	X				X					
INCLUSION/EXCLUSION CRITERIA	X				X					
PHYSICAL EXAMINATIONS	X			X				X	X	X
ACT & MINI-AQLQ	X	X	X	X	X		X	X	X	X
RANDOMISATION	X	X	X			X				
DISPENSE INCA ADAPTED SERETIDE INHALER	X	X	X		X	X	X	X	X	
DISPENSE ELECTRONIC PEFR MONITOR	X	X	X		X	X	X	X	X	
DOWNLOAD ELECTRONIC PEFR MONITOR		X	X	X		X	X	X	X	x
DOWNLOAD INCA DEVICE READINGS		X	X	X			X	X	X	X
INHALER USE EDUCATION	X	X	X	X	X	X	X	X	X	X
ADVERSE EVENTS RECORDED		X	X	X		X	X	X	X	X
CONCOMITTANT MEDICATIONS RECORDED		X	X	X		X	X	X	X	X
BLOODS: IGE AND RAST IGE					X					
BLOODS: PAXGENE					X					
BLOODS: EOSINOPHIL AND PERIOSTIN					X	X	X	X	X	X
FENO					X	X	X	X	X	X
DISPENSE HOME FENO MONITOR					X					
RETRIEVE HOME FENO MONITOR						X				
DISPENSE ADAPTED FLUTICASONE INHALER					X					
RETRIEVE ADAPTED FLUTICASONE INHALER						X				
PEFR					X	X	X	X	X	X
SPIROMETRY					X		X	X	X	X
EQ-5D-3L AND WPAI					X		X	X	X	X
PERFORM IPS (CONTROL ONLY)					X			X		
RECORD PATIENT SELECTED GOALS	X				X					
RECORD PATIENT SELECTED GOAL ACHIEVEMENT										X

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488 Table 3. Examples of patient selected goals and assigned categories

Examples of Patient Goals	Goal Category
"To reduce steroids taken per year"	Disease-specific
"Be able to get a good night's sleep"	Disease-specific
"To learn more about asthma"	Knowledge
"Too understand more about asthma"	Knowledge
"To get back to boxing training"	Functional
"To swim further"	Functional

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Table 4. Principal component analysis of spirometry data – A logistic regression model comparing the choice of goal with baseline spirometry, BMI and sex, in the INCA SUN RCT.

	Eigenvalue	Proportion	Cumulative
			(n= 130)
Component 1	2.319	0.773	0.773
Component 2	0.67	0.223	0.996
Component 3	0.011	0.003	1

Eigenvectors Variable	Component 1	Component 2	Component 3	Unexplained
V1 FEV1	0.654	-0.058	-0.754	0
V1 FVC	0.561	-0.633	0.534	0
V1 FEV1/FVC	0.508	0.772	0.382	0

Logistic Regression on dominant patient goals	Odds Ratio	95% Confidence Interval
		(n= 109)
Component 1	1.048	0.798 – 1.377
Component 2	0.615	0.373 – 1.015
Component 3	1.051	0.022 – 51.074

Logistic Regression on dominant patient goals	Odds Ratio	95% Confidence Interval
		(n= 109)
Component 2	0.636	0.376 – 1.075
Log BMI	0.262	0.048 – 1.432
Sex	0.264	0.094 – 0.737
(1= Female, 0=Male)		

* Eigenvalues provide a weighting of each principal component

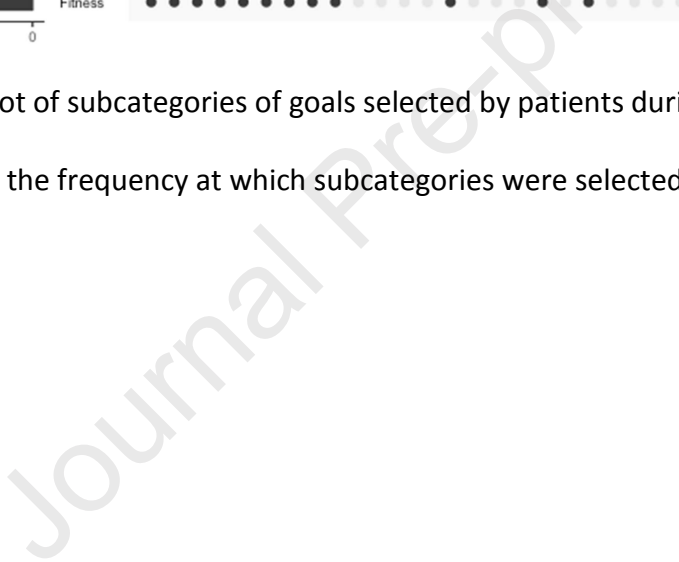
* FEV1 – The amount of air that can be forcibly exhaled in one second. Measured in L/min

* FVC – Forced Vital Capacity. The amount of air that can be forcibly exhaled after a full inspiration. Measured in L/min

* FEV1/FVC ratio – The ratio of FEV1 to FVC. A reduced FEV1/FVC ratio is seen in obstructive diseases

Table 5. Linear regression analysis comparing adherence of goal-achievers vs non-achievers
controlling for FeNO, exacerbations and patient reported control (ACT)

n=94				
Goals achieved	Coefficient	Standard Error	p-value	95% C.I.
<i>Actual adherence</i>	-1.073	0.351	0.003	-1.771 - -0.375
<i>Adverse events</i>	2.527	1.639	0.126	-0.728 - 5.781
<i>Final visit FeNO</i>	-0.067	0.177	0.706	-0.417 - 0.284
<i>Final visit ACT</i>	0.184	0.619	0.767	-1.045 - 1.414
n=92				
Goals not achieved	Coefficient	Standard Error	p-value	95% C.I.
<i>Actual adherence</i>	-0.442	0.407	0.281	-1.251 - 0.376
<i>Adverse events</i>	-1.776	1.573	0.262	-4.901 - 1.349
<i>Final visit FeNO</i>	-0.061	0.206	0.768	-0.471 - 0.349
<i>Final visit ACT</i>	-0.445	0.648	0.494	-0.841 - 1.731
n=94				
Goals achieved	Coefficient	Standard Error	p-value	95% C.I.
<i>Attempted adherence</i>	-1.028	0.303	0.001	-1.692 - -0.426
<i>Final visit ACT</i>	0.263	0.497	0.598	-0.724 - 1.249
<i>Final visit FeNO</i>	-0.097	0.145	0.507	-0.384 - 0.191
<i>Adverse events</i>	2.004	1.198	0.098	-0.375 - 4.383
n=92				
Goals not achieved	Coefficient	Standard Error	p-value	95% C.I.
<i>Attempted adherence</i>	-0.584	0.354	0.103	-1.287 - 0.12
<i>Final visit ACT</i>	0.028	0.451	0.951	-0.869 - 0.925
<i>Final visit FeNO</i>	-0.082	0.192	0.672	-0.464 - 0.3
<i>Adverse events</i>	-0.106	0.999	0.916	-2.09 - 1.878



The plot indicates the frequency at which subcategories were selected together by the same patient.

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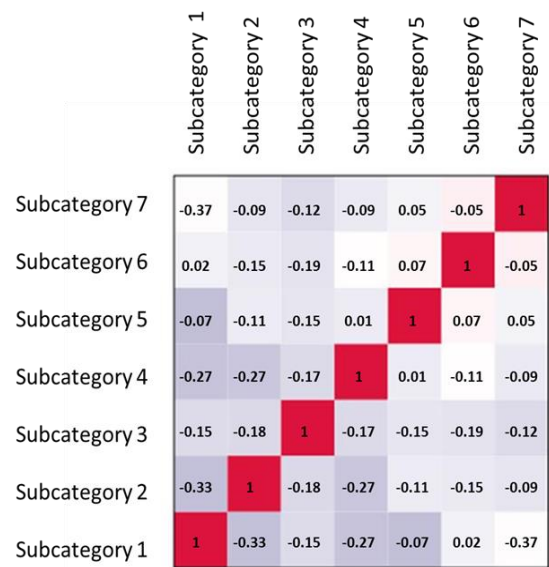


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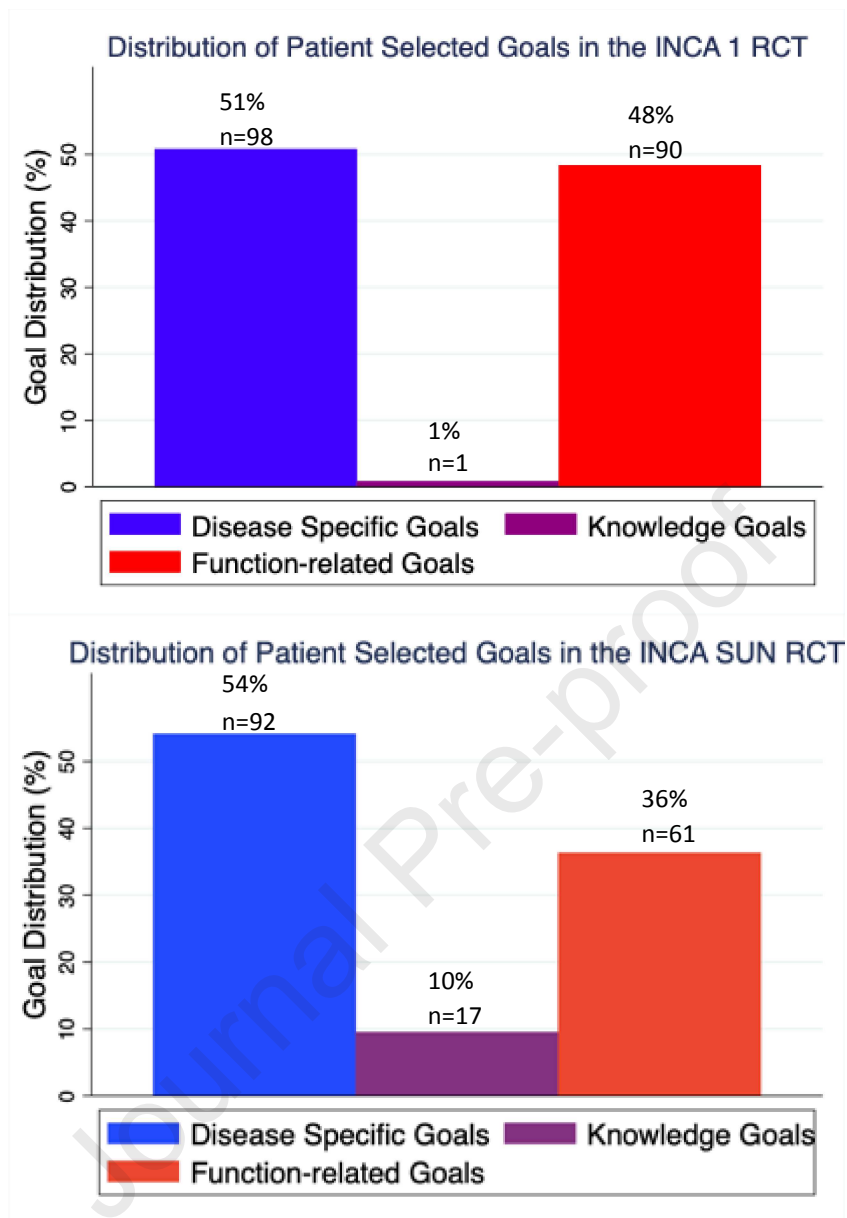


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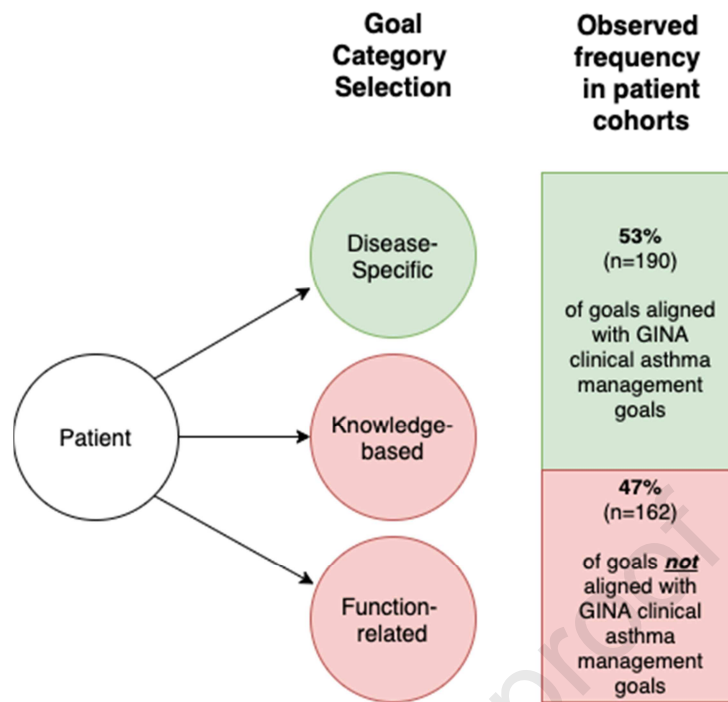


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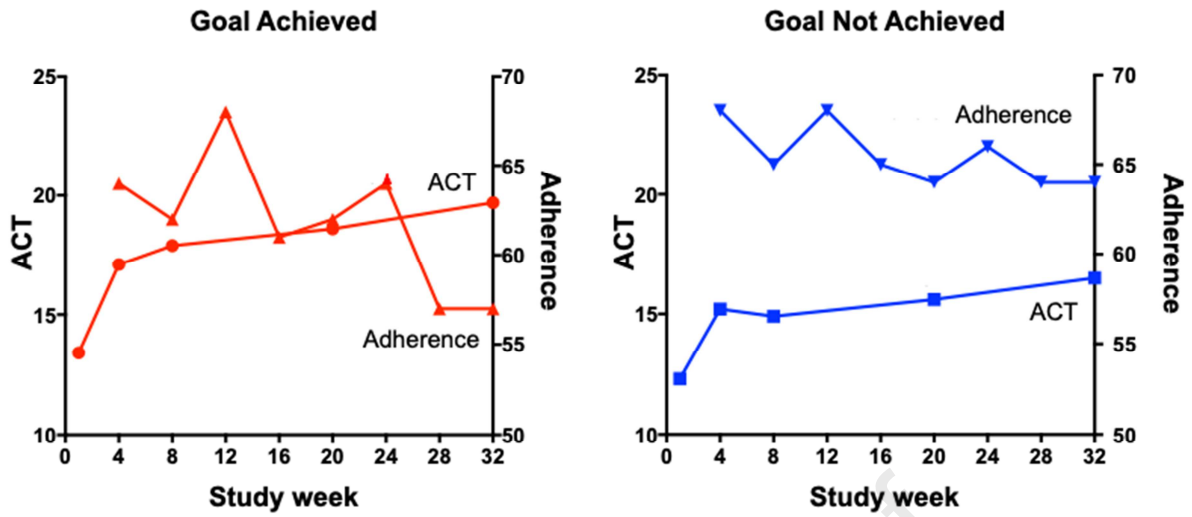


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