Exercise testing and exercise training within cystic fibrosis centres across Australia and New Zealand: what is considered important and what is current practice?

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Author contributions

All authors were involved in the development of the survey methods and design of the survey content. AS and JW were involved in the survey distribution. AS compiled survey data and results, and this was overseen by JW, VC and KH. All authors were involved in and have approved the final version of this manuscript.

Location of study completion

The study was performed through Curtin University in Perth, Western Australia, Australia.

Conflicts of interest

None to declare.

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Approval for this study was granted from the Human Research Ethics Committee at Curtin University (*HRE2018-074*). Completion of the survey was taken as informed consent.

ABSTRACT

Background: Within Australian and New Zealand cystic fibrosis CF centres, exercise testing and exercise training are common components of clinical care, but current practices regarding these components have not been reported. **Aim:** To determine the extent, scope and importance placed on exercise testing and exercise training within CF centres across Australia and New Zealand. **Methods:** Information pertaining to exercise testing and training practices were sought by administering a survey to health professionals working in CF centres across Australia and New Zealand. The survey comprised five sections (46 questions) and was sent via an online link (*Qualtrics*). Response rate was optimised using the Dillman approach. **Results:** A response rate of 80% (n=32/40) was achieved. Each state/territory in Australia, except the Northern Territory was represented in the survey responses. Eight of the 12 major regions in New Zealand were also represented. Regarding tests of exercise capacity, field-based tests were performed more commonly than laboratory-based tests (n=28/32; 88% *versus* n=11/32 centres; 34%; difference: 54%; 95% CI 31% to 70%). Most (89%) respondents perceived field tests to be at least 'somewhat' important, whereas 91% of respondents perceived laboratory tests to be 'a little' to 'somewhat' important. Physical activity and/or exercise were discussed by at least one health professional in the CF team at every clinic appointment and/or annual review. Most centres offered outpatient exercise training each year to their patients (n=24/32; 75%). **Conclusion:** This survey captures the current practices of exercise testing and training in CF centres across Australia and New Zealand.

Key-words: cystic fibrosis, exercise testing, exercise training, health care survey.

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INTRODUCTION

Exercise testing and exercise training are common components of the clinical care of people with cystic fibrosis (CF) [1, 2]. Regarding testing, international recommendations support the completion annual laboratory-based exercise testing (i.e. a cardiopulmonary exercise test [CPET]) to identify exercise intolerance, guide exercise prescription and for prognostication [2-4]. Work done 15 years ago in United Kingdom and Germany reported that annual CPET data were collected on less than 50% of people CF living with the uptake compromised by cost, the need for specialised equipment and technical expertise to conduct these tests with [5, 6]. Field-based exercise tests, such as the six minute walk test (6MWT) or incremental shuttle walk test (ISWT), are likely to have greater clinical utilisation [7].

Regarding participation in daily physical activity and/or exercise training, clinical CF guidelines currently recommend people to complete 30 to 60 minutes of moderate intensity aerobic exercise on most days [8]. This recommendation aligns with that made for the general adult population [9-11]. Current practices regarding advice to participate in regular physical activity or the provision of exercise training programs within Australian and New Zealand CF centres are unclear.

The aim of this survey was to determine the extent, scope, and importance placed on exercise testing and training within CF centres across Australia and New Zealand. Specifically, we sought to explore differences in; (i) the utility of annual exercise testing, (ii) the nadir arterial oxygen saturation (i.e. cut-off value), below which testing and training would be terminated (or rests imposed) and, (iii) the proportion of CF centres who provide an exercise training program.

METHODS

Sample

Health professionals from CF centres within Australia and New Zealand with knowledge or direct involvement in exercise testing and training were eligible to respond to the survey. A list of CF centres was compiled using online resources (<https://www.cysticfibrosis.org.au/what-we-do/cf-clinics> and <https://www.cfnz.org.nz/get-support/resources/annual-report/>).

Instrument

A survey was developed using the online platform '*Qualtrics*'. Three cardiorespiratory physiotherapists in Perth, Western Australia, who were not involved in the study, completed a pilot version. Survey questions were then modified to optimise readability and reduce ambiguity.

The final version of the survey comprised five sections and a maximum of 46 questions (summary provided in Table 1; full version of the survey provided as a supplement). At the end of each section, participants were asked to rate the importance placed on exercise testing and training practices within their CF centre [5, 6]. As the survey used an automatic skip function to avoid participants completing questions that were not applicable, the survey took between five and 20 minutes to be completed.

Table 1. Questions used in the survey that pertained to exercise testing and exercise training

Exercise testing	Exercise training
Location of exercise testing	Health professionals involved
Equipment readily available for exercise test	Exercise training discussion time points
Type of exercise test completed (and protocol)	Type (if any) of outpatient exercise training program
Reason(s) for undertaking exercise test	Referral and triage process
Proportion of patients who completed exercise test in the preceding 12 months	Prescription and progression of exercise training program
The health professional responsible for undertaking the exercise test	Threshold used for nadir oxygen saturation
Threshold used for nadir oxygen saturation permitted Staff availability	Supervision provided (if any)
Limitations to exercise testing	Mode of exercise training
Importance placed on exercise testing	Equipment used for monitoring
	Importance placed on exercise training

Approach

Contact was made with each CF centre via email and/or telephone between November 2018 and March 2019. At initial contact, the details were requested of the health professional who most commonly managed exercise testing and/or training for people with CF at the centre. An email containing a link to the online survey was then distributed to this person.

The survey response rate was optimised using the approach proposed by Dillman and colleagues [12]. One month was allowed for completion of the online survey and if no response was received during this period, a reminder email was sent. This process was repeated for three consecutive months, and if no response was received after the third email reminder, a final attempt was made to contact the designated respondent by phone. Following this attempt, no further attempts at contact were made [12, 13].

Analysis

Survey responses were collated automatically via *Qualtrics* and then exported into a Microsoft Excel spreadsheet. Results are presented in absolute values (i.e. number of respondents) and/or as a percentage of respondents. Where relevant, between-group differences were analysed using two proportion z-tests (STATA, version 15, Texas, USA).

RESULTS

Of the 24 and 21 sites identified in Australia and New Zealand, respectively, five were excluded as they did not have a current designated CF service or offered sporadic outreach or 'visiting' clinics.

Initial contact was made with respondents from 22 sites in Australia and 18 in New Zealand.

Following the initial attempt, 14 survey responses were received and one centre declined to undertake the survey. A second contact attempt yielded a further 10 responses. Fifteen centres were contacted on a third occasion by email and then attempted phone calls, with a further eight completing the survey.

A total of 32 surveys were completed (response rate: 80%). The response rate from Australian and New Zealand centres was 19 of 22 (86%) and 13 of 18 (72%), respectively (difference: 14%; 95% confidence interval [CI] -11 to 39).

Characteristics of respondents and centres

Respondents described a median of 10 years (range: 2 to 35 years) clinical experience in the area of CF and were physiotherapists (n=28/32; 88%), nurses (n=2/32; 6%), a physician (n=1/32; 3%) and a respiratory physiologist (n=1/32; 3%). Fifteen respondents (47%) worked in adult centres, 11 (34%) worked in paediatric centres, and six (19%) were from centres that managed paediatric and adult patients. The median number of people with CF known to each centre was 94 (range: 3 to 430 people), with the clinical care of 3,937 patients represented overall (Australia: n=3,530 and New Zealand: n=407). A median of 195 (range: 6 to 430) people were known to each centre in Australia, whereas a median of 22 (range: 3 to 94) people were known to each centre in New Zealand.

Exercise testing

Uptake

Of the 32 respondents, 11 (34%) reported that their centre had completed laboratory-based exercise testing for patients with CF within the preceding 12 months. Most centres (n=7/11; 64%) had performed these tests on $\leq 20\%$ of patients. Almost all respondents reported that their CF centre had completed field-based exercise testing within the preceding 12 months (n=28/32; 88%). The difference in the number of centres completing laboratory-based *versus* field-based exercise testing within the preceding 12 months was 54% (95% CI 31 to 70). Respondents reported completing field-based exercise tests on the minority (n=4/28; 14%), under half (n=9/28; 32%), about half (n=3/28; 11%), more than half (n=9/28; 32%) or almost all (n=2/28; 7%) of their patients. One centre reported being 'unsure'. As infants and children managed within paediatric centres would not be capable of undertaking exercise testing, data presented in Figure 1 pertaining to the (estimated) number of people with CF who undertook exercise testing (according to location) has been calculated using adults centres only.

Figure 1.

Reasons for and limitations to exercise testing

Reason(s) for completing laboratory-based and field-based exercise testing are summarised in Table 2. The most common reasons for undertaking a laboratory-based exercise test were 'patients reporting reduced exercise tolerance' (n=8/11 centres; 73%) and 'for research' (n=7/11 centres; 64%). Limited availability of staff was the most common barrier to undertaking laboratory-based exercise tests (n=8/24 reports; 33%).

The most common reason for undertaking a field-based exercise tests was for the annual review assessments (n=21/28; 75%). The most common barrier was the availability of staff (n=17/28 reports; 61%) (Table 2).

Table 2. Reason(s) for exercise testing being undertaken.

	Laboratory-based tests; 29 responses from 11 centres	Field-based tests; 99 responses from 28 centres
Annual review	1	21
Patient reports reduced exercise tolerance	8	18
Pre-transplant assessment	1	17
To investigate the effect of a therapeutic intervention	5	12
Exercise prescription	4	13
Research	7	11
Other	3	7

Respondents at each CF centre were permitted to choose more than one response. Results indicate the number of times the response was selected.

Table 3. Barriers to completing exercise testing.

Limitations	Laboratory-based tests; 24 responses from 11 centres	Field-based tests; 53 responses from 28 centres
Staffing availability	8	17
Staff training	2	1
Equipment limitations	1	2
Equipment availability	4	1
Not viewed as important	1	3
Infection control precautions	1	2
Patient declines to complete	2	15
Other*	5	12

Respondents at each CF centre were permitted to choose more than one response. Results indicate the number of times the response was selected. * CF-specific exercise laboratory/space, need for more research output, need for formal exercise testing protocols, support from medical staff

Protocol and equipment

The type of laboratory-based exercise tests are presented in Table 4. For cycle ergometry and treadmill tests, work rate was increased using an incremental-ramp protocol in 10 of the 11 centres (91%). Monitoring equipment included pulse oximetry (n=10/11, 91%), an electrocardiogram (ECG) (n=10/11; 91%), and a metabolic cart for expired gas analysis (n=8/11; 73%).

The type of field-based exercise tests are presented in Table 4. Monitoring equipment included pulse oximetry (n=27/28; 96%) and an ECG (n=2/28; 7%).

Table 4. Type of exercise test used in cystic fibrosis centres in Australia and New Zealand.

	Name of test	Paediatric	Adult	Mixed	Overall
Laboratory-based (n = 11 centres)	Treadmill test	4	-	1	5
	Cycle ergometry test	3	4	1	8
	Step test	-	1	-	1
Field-based (n = 28 centres)	6MWT	6	15	4	25
	ISWT	8	11	4	23
	ESWT	2	2	-	4
	Step test	4	2	4	10

Respondents at each CF centre were permitted to choose more than one response. Results indicate the number of times the response was selected.

Abbreviations: 6MWT: six-minute walk test, ECG: electrocardiogram, ESWT: endurance shuttle walk test, ISWT: incremental shuttle walk test.

Location

Of the 11 centres that had completed laboratory-based exercise tests, five (45%) used a CF specific laboratory with the others using a non-CF specific laboratory. Field-based exercise testing were most commonly performed in an outpatient department (i.e. physiotherapy) (n=24/28; 86%), on the ward (n=5/28; 18%), in the CF clinic (n=9/28; 32%) or in a gymnasium (n=8/28; 29%).

Personnel

Laboratory-based exercise tests were conducted by a respiratory scientist (n=9/11; 82%) or a physiotherapist (n=2/11; 18%). In five centres (46%), a doctor was required to be present during all laboratory-based exercise tests. Field-based exercise tests were facilitated by a physiotherapist (n=28/28; 100%), with five centres (18%) also using respiratory scientists to complete these tests.

Threshold for arterial oxygen desaturation during exercise testing

Five (45%) of 11 centres used a nadir arterial oxygen saturation measured via pulse oximetry (SpO₂) below which laboratory-based exercise tests would be terminated. This cut-off value was 85% in four (36%) centres and 80% in one (9%) centre. The other six centres reported either being unsure (n=3/11; 27%) or having no set cut-off value in place (n=3/11; 27%). Regarding field-based exercise testing, five (18%) centres used a nadir SpO₂ below which the test would be terminated, or a rest would be imposed. This SpO₂ cut-off value was 85% in five centres (18%) and 80% in another five centres (18%). The other 18 centres (64%) reported either being unsure (n=3/28; 11%) or having no set cut-off value (n=15/28; 54%). The use a cut-off value for SpO₂ tended to be more common for laboratory-based tests than field-based tests (difference: 27%; 95% CI -3% to 55%).

Importance placed on exercise testing

Additional comments regarding exercise testing are provided in Table 5 (Comments 1 to 5). The importance placed on laboratory-based and field-based exercise tests is shown in Table 7.

Strength testing

Muscle strength testing undertaken in six (19%) CF centres across Australia and New Zealand. When strength was assessed, it was most often done using a hand-held dynamometer (n=4/6; 67%).

Table 5. Written comments provided by respondents

	Additional comments offered by respondents
Exercise testing	<ol style="list-style-type: none"> 1. "Medical team hoping to implement CPET testing on a yearly basis - but limited by staffing currently - business case currently in place." 2. "Our difficulty, like many centres, is trying to perform testing on most appropriate patients to guide interventions. The volume is great and the availability of space to get through the volume is also problematic." 3. "Sometimes I will bring a patient in for exercise testing if it is required but this is difficult to arrange with a busy inpatient caseload." 4. "Most commonly [CPETs] are used to investigate further if there have been significant changes in field testing (e.g. ISWT or six-minute walk) or if there is a suspicion of abnormality. Some patients have had CPET as part of clinical trials."
Both	<ol style="list-style-type: none"> 5. "For patients with higher exercise tolerance, [I] aim to complete incremental shuttle in clinic, but it is a shared space so patients have to wear a mask limiting the results. Supervised exercise [training] is offered to patients not completing any exercise, post exacerbation or with deterioration in function. It is provided by the ward physio in the inpatient gym so space and time are issues."
Exercise training	<ol style="list-style-type: none"> 6. "Often community-based activities are encouraged. Rarely use outpatient classes such as pulmonary rehab due to risk to CF patient." 7. "Limitations on numbers of people able to be seen due to infection control issues in the gym." 8. "There is a considerable amount of support from local CF association to overcome any financial barriers to gym memberships or equipment in the home. Due to the hospital layout, space, lack of equipment and infection control concerns, exercise has not been promoted or supported well in the hospital setting inpatients or outpatients and is an area that needs to improve." 9. "Training is very limited at our centre, we have no outpatient service for CF, so we are unable to complete gym strength session unless it is done during inpatient admissions." 10. "Supervised exercise is provided by the ward physio in the inpatient gym, so space and time are issues." 11. "It [exercise training] is highly variable, largely based on patient preference. We do refer to local hospitals for our outer metro or country patients. Our health department policies on telehealth mean the value of this is limited - they are better off just being referred to a local clinician - this will hopefully change in the near future so telehealth in the patients' home will be available." 12. "Patients are seen for exercise more specifically if they are approaching transplant or on the list. Most children are doing some form of activity but this is mainly a sport through school. Exercise is always discussed and recommended...limited funding in this area as my role is only 0.1FTE." 13. "We have limited capability to supervise exercise programs."

Participation in exercise training and provision of exercise training programs

Healthcare professionals who discussed physical activity/exercise

Advice regarding physical activity and/or exercise was provided at all centres (n=32/32). This advice was provided by physiotherapists (n=29/32; 91%), physicians (n=19/32; 59%) and nurses (n=13/32; 41%). Discussion occurred at every clinic visit in 27 (84%) centres and during the annual review in 10 centres (31%). A smaller proportion of respondents indicated that discussion occurred only if a patient asked (n=3/32; 9%) or for 'other reasons' (n=5/32; 16%) such as during admissions or 'extra' (non-routine) outpatient appointments.

Provision of exercise training programs and referral process

A total of 24 of 32 (75%) respondents indicated that their centre provided access to an outpatient exercise program and of these, 22 (92%) described offering an individually tailored program. Five centres (21%) provided a standardised outpatient exercise program. Referrers to these programs comprised the physiotherapist who worked with the CF team (n=20/24; 83%), the person with CF (n=11/24; 36%), the medical team (n=14/24; 58%) and/or another health professional (n=9/24; 38%). Five respondents (21%) indicated that of all people with CF were referred for an exercise program (i.e. a 'blanket' referral), and two (8%) respondents were unsure of who referred to the program. Referrals were most frequently triaged according to disease severity (n=14/24; 58%) and if patients were immediately post-discharge (n=11/24; 46%). Four respondents reported there being no specific triage system (16%) and one respondent was unsure (4%).

Prescription and progression

Factors used to prescribe and progress the intensity of exercise training are outlined in Table 6. The majority of respondents (n=16/24; 67%) reported that either moderate intensity continuous exercise or interval training was prescribed based on symptoms and preference.

Table 6. Factors used to guide prescription and progression of exercise training

	Prescription 24 centres	Progression 24 centres
Results of laboratory-based exercise tests	5/24; 21%	1/24; 4%
Results of field-based exercise tests	16/24; 67%	8/24; 33%
Predicted maximal heart rate	18/24; 75%	15/24; 63%
SpO ₂ readings	21/24; 88%	17/24; 71%
Symptom scores	22/24; 92%	19/24; 79%
Unsure	1/24; 4%	-

Respondents at each CF centre were permitted to choose more than one response. Abbreviations: SpO₂: oxygen saturation.

Threshold for arterial oxygen desaturation during exercise training

Of the 24 centres who offered a supervised exercise training program, four (17%) reported using a nadir SpO₂ of 85%, below which the training would be interrupted. Seventeen centres (71%) reported having no specific cut-off value in place and three (12%) reported being unsure of a SpO₂ cut-off value.

Supervision

Exercise training was either entirely supervised (n=16/24; 67%), partially supervised (n=5/24; 21%) or conducted via telehealth (n=1/24; 4%). Two (8%) respondents were unsure of the level of supervision provided.

Importance and limitations

The importance placed on exercise training is shown in Table 7.

A total of 18 respondents provided information regarding the limitation(s) to undertaking an exercise training program. The reasons provided included limitations in staff availability (n=6/18; 33%), insufficient staff training (n=1/18; 6%), equipment limitations/availability (n=3/18; 17%), infection control precautions (n=5/18; 28%), and other reasons (n=3/18; 17%). Additional comments regarding exercise training are available in Table 5 (Comments 6 to 13).

Table 7. Importance placed on exercise testing and training

	Importance				
	Not at all	A little	Somewhat	A lot	Very much
Laboratory-based (n = 11 centres)	0%	3/11; 27%	7/11; 64%	0%	1/11; 9%
Field-based (n = 28 centres)	0%	3/28; 11%	11/28; 39%	6/28; 21%	8/28; 29%
Exercise training (n = 31 centres)	0%	3/31; 10%	9/31; 29%	10/31; 32%	9/31; 29%

Percentages relate to the proportion of CF centres selecting each level of importance. Note: One respondent did not provide a response for the importance placed on exercise training in their centre.

DISCUSSION

This survey describes the current exercise testing and training practices in Australian and New Zealand CF centres. The main findings of this survey were: (i) the majority of CF centres do not undertake laboratory-based exercise tests and if performed, these tests are generally undertaken on the minority of patients; (ii) almost all CF centres undertake field-based exercise testing on at least half of their patients annually; (iii) participation in physical activity/exercise is discussed by at least one health professional in the CF team at every clinic appointment and/or at annual review; (iv) most centres offer some form of exercise training program to patients (entirely or partially supervised) though uptake of these programs is considerably limited by space, staffing and infection control precautions; and (v) a large proportion of centres do not have a cut-off value for SpO₂ below which exercise testing and training would be interrupted or ceased.

The response rate of 80% for this survey was significantly higher than in these previous international surveys (52% and 58%) [5, 6]. Additionally, the estimated number of patients represented in the current survey is similar to relevant data registry reports

(<https://www.cysticfibrosis.org.au/dataregistry> and <https://www.cfnz.org.nz/get-support/resources/annual-report/>). These factors suggest that the survey results are unlikely to be influenced by responder bias and the data are representative of the current practices in Australia and New Zealand.

International groups support the completion of annual laboratory-based exercise tests in people with CF [3, 4]. The results of this survey highlight the infrequent use of this type of exercise test in Australian and New Zealand CF centres. This finding is consistent similar international survey data completed up to 15 years ago and suggests little change in the uptake of these tests [5, 6]. Not surprisingly, field-based exercise tests are the most utilised type of exercise test in Australian and New Zealand CF centres.

Despite the limited data regarding cardiorespiratory responses to exercise obtained during a 6MWT compared to a CPET, the former test is still able to contribute important information. In adults with CF (n=286, median age 28 years [23 to 33 years], median FEV₁ 45% predicted [32 to 65% predicted]), low six minute walk distance (6MWD) and desaturation were associated with poorer survival or need for lung transplantation [14]. Based on these data, field-based exercise tests may be recommended in the first instance in centres that have limited ability to undertake laboratory-based exercise tests. Similar to recommendations in other clinical populations, perhaps an algorithm to guide patient selection for laboratory-based tests would be useful to guide decision making. For example, for adults undergoing lung resection for lung cancer [15], a field-based exercise test is performed initially [15], and if the performance is poor (e.g. <400m on the ISWT), then a laboratory-based test is recommended [15]. Further work is required to support this suggestion and to extrapolate these findings to other field-based exercise tests and to the paediatric population [2, 16].

For people with CF, discussion of the importance of regular participation in physical activity and/or exercise are initiated by at least one health professional at clinic appointments and/or annual review appointments in Australia and New Zealand. In centres who did offer a training program, exercise prescription and progression were largely individualised and the parameters used to guide initial prescription and progression of exercise intensity varied greatly. Future research is needed to determine the training parameters that optimise both health outcomes and long-term adherence.

There was considerable disparity in the approach to managing arterial oxygen desaturation during exercise testing and training. A large proportion of centres reported having no protocol in place regarding a cut-off value for SpO₂ below which exercise would be ceased or interrupted. Guidelines for people with chronic respiratory disease recommend that field-based exercise tests should be ceased in the event of severe desaturation ($\leq 80\%$ SpO₂) [2, 16]. Although in people with CF, maintenance of oxygen saturation during exercise training may result in acute gains in exercise performance [17], the role of supplemental oxygen as a training adjunct in those who desaturate on exertion is unknown and requires further investigation. This is a contentious issue in other respiratory populations, with a recent study demonstrating that the provision of supplemental oxygen during exercise training offered no additional benefit in those with COPD who desaturate on exertion [18].

Finally, apart from staffing, one of the main limitations to implementing an outpatient exercise training program was related to the risk of cross-infection between people with CF. Considering emerging methods of exercise testing and training supervision, such as telehealth [19-21], which was reported in one centre, is likely to be an important alternative to reduce the risk of cross infection.

Limitations

On few occasions, the survey was completed by a member of the team who may not have been directly involved in exercise testing and training practices. Additionally, some respondents may have been involved in exercise testing, but not exercise training and vice-versa, which may reduce the accuracy of the results. To limit the impact of this, respondents were encouraged to discuss questions with their colleagues if they were unsure of an answer. Respondents were permitted to provide multiple responses, or no response (if their centre did not undertake exercise testing and training) for questions related to reason for, limitations to performing and importance placed on exercise testing and training. As smaller centres that did not undertake exercise testing or training were not required to answer questions regarding limitations to performing exercise testing and training, the data on limitations are most likely to reflect those experienced by large centres.

CONCLUSIONS

This survey captures the current practices of exercise testing and training in CF centres across Australia and New Zealand. Few centres undertake laboratory-based exercise tests with time and cost cited as the most common barriers. The impact of undertaking these tests annually on clinical decision making and health outcomes in people with CF remains unanswered and should be a focus of future research. Most centres reported undertaking annual field-based exercise tests on most of their patients. The threshold for arterial oxygen desaturation during exercise testing and training was variable. A high proportion of centres offered some form of outpatient exercise training program. However, the provision of outpatient programs was limited by staffing, space and infection-control concerns. This survey highlights the variability surrounding exercise testing and training practices across Australia and New Zealand, and can be used as a benchmark of current practice.

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Figure 1. Representation of adults living with CF across Australia and New Zealand who received laboratory-based and field-based exercise tests in the preceding 12 months. Estimated number of patients represented in survey: 3,937. Of these, an estimated 2,223 patients were adults. Survey respondents were asked to indicate the % of patients who received laboratory-based and field-based exercise tests in the preceding 12 months (none; the minority [0 to < 20%]; under half [20 to < 50%]; about half [~ 50%]; over half [50 to < 70%]; almost all; unsure). The numbers assigned (in this figure) to laboratory- and field-based tests represent the upper limit of the indicated range provided by respondents.

Abbreviations: ACT: Australian Capital Territory, NSW: New South Wales, NT: Northern Territory, QLD: Queensland, SA: South Australia, TAS: Tasmania, VIC: Victoria, WA: Western Australia.

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