THE AUSTRALIA AND NEW ZEALAND SOCIETY OF RESPIRATORY SCIENCE INC

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Mouthpiece

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ANZSRS ASM

CAIRNS, QLD

MARCH 2002

President's Address

February already – where did January go? I hope those fortunate enough to have holidays over December-January enjoyed them thoroughly and have returned to work full of enthusiasm. I can almost smell the sun-tan cream so the 2002 ASM must be fast approaching – no doubt too fast for some who are presenting. I look forward to seeing many of you in Cairns.

2002 ASM

Peter Rogers and the Local Organising Committee are doing a wonderful job with the program. There have been some minor alterations to the program to accommodate members leaving Cairns mid afternoon in order catch appropriate flights home. The amended program may be found on the Society website (www.anzsrs.org.au).

The Executive has decided to award a record amount in travel grants in order to support as many ANZSRS members as possible. This year over $8000 was awarded in travel grants, mainly to those presenting or junior members of the Society.

CRFS

Four candidates were successful in 2001 taking the total number of Certified Respiratory Function Scientists to 52. I urge as many as possible to consider participation in the CRFS process and to re-sit the exam if necessary.

CS & HTA Health Technicians Project

Community Services & Health Training Australia – Health Technicians Project
This package is a proposed new basis for national qualifications and skill recognition in the health industry for Health Technicians. This proposal may be found at the CS & HTA website – www.cshta.com.au The ANZSRS have been invited to contribute to this project as a Professional Association. Others may have been invited to contribute as a Government Employer, Private Employer, Union Representative, or Educational Institution.

The aim of the project is to provide a means for unqualified health technicians to achieve a Diploma level qualification. There has been considerable debate amongst Society members about the need for such a package, particularly as relevant training/education avenues already exist. There was also much debate on the demand for such a program (ie. Who would choose to complete this qualification?). Whilst it is

President's Address (cont)

acknowledged that some of our members are currently employed as Technicians, we feel that the future needs of our profession would be best met by ensuring a solid scientific qualification of all respiratory laboratory employees. Such a background should ensure the adequate skills and professionalism for all future respiratory personnel and form the basis for any further qualifications. It is felt the CS&HTA project may have the potential to undo much of the previous work done by the ANZSRS in achieving recognition of the level of responsibility of those working in a Respiratory Laboratory.

The objectives of this Society include "the advancement of knowledge of respiratory science" and "to encourage training and education in respiratory science". To achieve these aims should we not be seen to raise our sights and pursue qualifications such as the CRFS, Charles Sturt courses and other higher degrees rather than lower them? We believe that the best pathway for the Society to follow may include registration of all persons performing Respiratory Testing. Alan Crockett has mooted this previously, and New Zealand appears to following this path. Perhaps now is the time to re-explore a registration process in Australia.

This is a complicated issue with many views already expressed by many members. The Executive will be working towards an outcome we believe best serves all ANZSRS members. If you have any concerns about this project, please contact any member of the Executive, or your Regional Board Member

Congratulations

The 2001 Royal Prince Alfred Foundation Medal for Excellence in Medical Research was awarded to ANZSRS members Sandy Anderson, Lily Daviskas & John Brannan for their work on mannitol. This work included the development of a provocation test using mannitol, and the application of inhaled mannitol to enhance mucociliary clearance in patients with chronic bronchitis, bronchiectasis & cystic fibrosis. I'm sure all ANZSRS members will me in offering our collective congratulations.

Positions Vacant

Geoff Foote, the elected Treasurer, has accepted a position with Resmed in Malaysia and has tendered his resignation from the Executive. Geoff will be sorely missed by Mike & myself as he seemed to relish the task of Treasurer. We wish him well with his new venture. We have seconded Andrew Coates to take on the Treasurers role and hope to ratify this at the forthcoming Board and Annual General Meetings.

As mentioned in the December edition of Mouthpiece, Jeff Pretto has resigned from the position of Webpage Coordinator. If you are interested in this role please contact any member of the Executive.

'Til Cairns,

Brenton Eckert. CRFS.
President.

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"AGM REMINDER!"

The ANZSRS AGM will be held at the Cairns Convention Centre on Saturday March 23 at 3.30 pm.

All Members Welcome

From The editor

I am very excited about this edition of Mouthpiece it has been designed with the ASM in mind and to give you a taste of what's to come. For anyone unable to attend the ASM, consider this is your "Virtual Reality Issue".

The underlying theme is "Kids and Lung Function". I am extremely honoured to present to you an article by Professor Janet Stocks who is one of our key speakers at the ASM, her article covers infants and lung function. Even though her schedule was bursting with commitments, Professor Stocks managed squeeze in this valuable article for Mouthpiece and again I'd like to thank her.

Alison Boyton and Andrew Coates have also contributed articles on kids. There are some very interesting insights and valuable comments in both articles so I urge you to read on.

Just a couple more points, has anyone delved into the issue of The Privacy Act that came into play on 21st Dec 2001? If so please let us all know your views on how it affects lung function labs.

If you're reading your colleague's issue of Mouthpiece it's probably because we haven't received your change of address! Please send us any changes so we can update the data base.

It's a big issue of Mouthpiece, you'll need two cuppas for this one! I hope you enjoy it as much as I did putting it together.

Best Regards

Cecilia

Farewell from the Treasurer

I have submitted my resignation as treasurer to the executive as I will be departing shortly to work overseas for the next two years. Under the terms of the constitution, a new treasurer will have to be elected at the next AGM. Until then, we are set up sufficiently to keep operating normally.
The treasurer's position has been more demanding than I expected and I would like to have committed more time to doing a more thorough job.

I would like to note that the remaining current executive members, Brenton and Mike have left me breathless with their dedication, thoroughness, enthusiasm and commitment to the Society. Having been a Society member for about fifteen years, I had little idea of the work being done behind the scenes in order to keep it ticking along. I hope that all members appreciate the time and personal effort put in by all of the Society's representatives – executive, board members, committee members, Mouthpiece editors and so on, who make the ANZSRS what it is. The Society has evolved into an organisation which is truly representative of our chosen profession, let's keep it evolving.

Geoff Foote.

The Challenges of Spirometry in Children.

Andrew Coates, Mater Children's Hospital, Brisbane

Having children presented to you for lung function testing can place some unique challenges on your skills and abilities; those that you thought were well developed. My first child for testing was something like in the recent movie Monsters Inc, when Sully and Mike (monsters) were first confronted by Boo (a little girl). It was the fright and flight response, and I, the monster, wanted to get away fast. My boys loved this part, but there was the familiar sense of trepidation for me. Testing children can be quite a challenge!

The forced expiratory manoeuvre of spirometry has four basic components, all of which need to be complied with to achieve acceptability and reproducibility criteria. They are 1) the initial inhalation must be at or very close to total lung capacity (TLC). 2) Once blowing, an almost immediate rise to peak expiratory flow (PEF) is achieved. 3) A maximal forced expiratory effort is made throughout. And, 4) the exhalation is complete, or close to the residual volume (RV). For children to achieve this they need to be cooperative, have a good attention span, a good level of frustration tolerance, and understanding.[1]

It is very important to engage the child, in a comfortable non-threatening environment, with interruptions minimised. However, I am opposed to having the accompanying carer away from the child, unless the child is distracted or even intimidated by that person.

Spirometry is generally limited to children over the age of five. This is evident by the lack of reference values for children less than the age of six. If spirometry is attempted on younger children, then usually the reference values are back extrapolated. We often see healthy young children exceed these extrapolated reference values.

However, a recent study on preschool-aged children (3-5 years) by Eigen and co-workers has shown that given 15 minutes of careful teaching, 214 out of 259 (83%) of children produced technically adequate forced expiratory manoeuvres.[2] They have compiled reference values, which will be useful to clinics that see young children.

In teaching spirometry to young children it is essential to use communication, which captures the child's imagination. This can be achieved through creative visualisation techniques, voice intonation, the choice of words, and body language. Examples include "blow like the Big Bad Wolf", "blow the biggest mountain" in the flow volume loop window, or "blow fast right to here", and point to a target on the spirogram. It is useful to instruct to "blow very hard and right out", holding your arm out to accentuate the distance. Words such as "inhale", and "maximum" should be avoided. They may be familiar to us, but a child may have never experienced these words. Children do not all learn in the same way, so the techniques and explanations should be varied appropriately. Above all spirometry should be made fun!

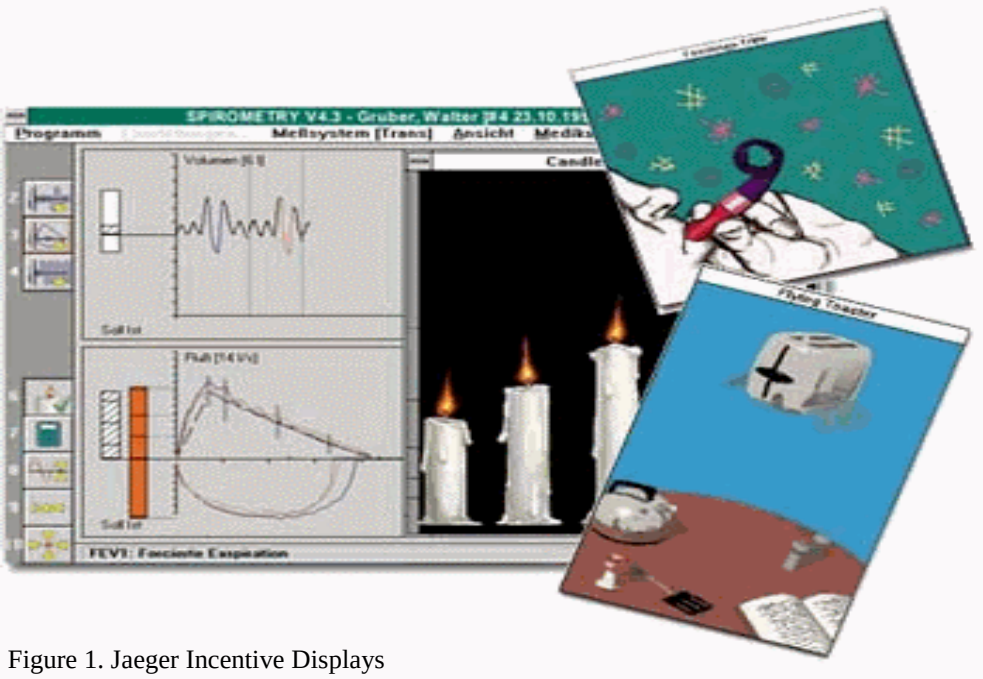

Figure 1. Jaeger Incentive Displays

Animated incentive displays (figure 1) such as those supplied by Jaeger are helpful in motivating the child. They have been shown to produce more reproducible and consistently higher readings in young children. Consequently, a reference set was readjusted in 4-7 year olds to reflect this.[3]

An exciting new concept for preschool children (and possibly others!) are computer-animated interactive programs that can teach the Forced Vital Capacity (FVC) manoeuvre. Amongst a group of 3 to 6 year-olds the new prototype "SpiroGame" system resulted in 69% achieving technically successful spirometry compared with 49% success using the Jaeger "candles".[4] This game sounds like great fun. There is a series of two games. The first teaches the difference between inhalation and exhalation, by tracking the crawling of a caterpillar to an apple. The second encourages the FVC by simulating a bee flying from flower to flower and over a fence. There are several levels of difficulty, and upon completion of a manoeuvre, there is the reward of a new picture. The possibilities of interactive games are many. We may not be able to keep children away from our laboratories!

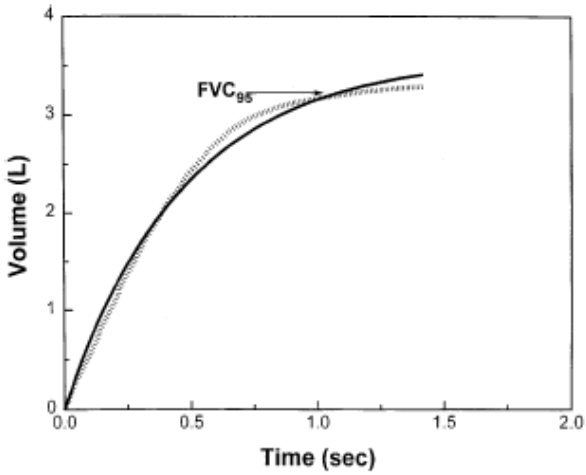

Figure 2. Actual volume time (*solid line*) and fitted exponential curve (*dotted line*). It can be seen that the actual volume exceeds the FVC_{95} as indicated. The fitted curve's equation is $V(t)=0.8*(1-e^{(-t/0.4)}) + 2.8*(1-e^{(-t/0.5)})$ with r^2 =0.99197. From Desmond et al. Ref 8

Standards for Spirometry in Children

The ATS[5] and ERS[6] standards that are used for adults are usually also applied to children. For children older than eight, 95% have been shown to successfully conform to the ATS standards.[7] However the standards are not met for reproducibility of PEF and longer rise time to PEF.[7] This is a part of the reason that many respiratory paediatricians do not favour PEF monitoring as do the adult physicians. Also most healthy children can reach an end-of-test (EOT) plateau within 3 seconds.[7] The ERS compared with the ATS standards do not require the >6 seconds of exhalation time, and so perhaps are better for children. The ATS standards do however state that for exhalation time less than 6 seconds, the manoeuvres are often acceptable. To make the ATS statement more objective for children, Desmond et al have defined the FVC_{95} parameter.[8] If a child reaches the FVC_{95} then a satisfactory end-of-test is attained. The FVC_{95} is 95% of the extrapolated calculated FVC of the best manoeuvre. The extrapolation is achieved by curve fitting a double exponential function to the volume time curve. (See figure 2.) In their study on 382 children (aged 5 to 18), only 19% met the current ATS EOT standard despite 91% achieving the FEV1 and FVC reproducibility standards. Interestingly 90% met their FVC_{95} target. This technique however might be beyond the scope of many laboratories, without the support of manufacturers and their software developers.

In conclusion, the challenges that you face in performing spirometry on children are many and varied. There is probably no completely right or wrong way in your approach, but be prepared to be flexible. As to the future, I hope that affordable help is on the way with innovative computer-animation incentives and games. Furthermore, investigations need to continue into improving standards for spirometry in children. Importantly, we need to be able to apply these standards easily into our laboratories.

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2 Eigen H. Spirometric pulmonary function in healthy preschool children. Am J Respir Crit Care Med. 2001 Vol 163 pp619-623

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Infant Lung Function Testing Comes of Age

Professor Janet Stocks PhD

Professor of Respiratory Physiology

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Introduction

Assessment of respiratory function in the very young has major implications for our understanding of respiratory health and disease, not just during childhood but throughout life, particularly in view of the growing awareness of the association between respiratory function in early life and chronic lung disease in adulthood. It is therefore appropriate to review recent progress in this field and to identify the various challenges that must be met in the near future if we are to optimise the application and interpretation of respiratory function tests in the infant and young child.

Although the first descriptions of respiratory measurements in infants were made in the late 19th century, relatively little progress was made until 40 years ago when classical techniques, originally developed for use in adults, began to be adapted for use in infants. Such techniques were further developed and validated during the 1970s and 1980s but at this stage there was also a change in emphasis as new and less complex techniques, specifically designed for use in infants began to be developed.

Recent advances on the equipment front

In addition to various physiological differences between infants and adults, including the strong respiratory reflexes, highly compliant chest wall and tendency to dynamically elevate functional residual capacity (FRC), one of the greatest difficulties in assessing respiratory function in early childhood has been that of obtaining suitable equipment. Until recently, a lack of commercially available, well validated systems, meant that most research establishments used their own home made equipment and software which, while facilitating high standards within such centres, impeded training, attempts to establish multicentre trials, and/or any meaningful comparison of results *between* different centres. During recent years, close collaboration between scientists and the manufacturers, led by an ERS/ATS Task Force, together with technological advances in terms of improved frequency response and miniaturisation of equipment, and increasingly sophisticated software, have meant that facilities for assessing respiratory function in infants are no longer limited to specialised research establishments. The series of manuscripts recently published by the Task Force now provides some guidance and recommendations to both users and manufacturers regarding suitable specifications for infant lung function equipment, which should provide a firm basis for future developments in this field.

Even with the help of a mild sedative, the time an infant spends asleep (and which is therefore available for assessing respiratory function) is very limited. Consequently, important decisions have to be made regarding which test (s) should be used. Regrettably in the past such decisions have often been based primarily on what equipment happened to be available

within any given centre, without any consideration of the underlying pathophysiology or hypothesis that was being investigated. This in turn has led to many inconclusive or contradictory reports in the literature.

An ideal lung function test for infants and young children would be one that was

- applicable to any age and arousal state
- simple and involved no risk
- accurate, even in the presence of lung disease
- reproducible
- sensitive enough to distinguish between health and disease and
- able to reflect the clinical situation

No such test currently exists, and even if it did, no single test is ever likely to provide all the necessary information.

While it is impossible to recommend the best combination of tests - particularly without knowledge of the underlying question, evidence is accumulating that if, for example, airway function is to be assessed, results will ideally need to be interpreted with respect to lung volume, and that some combination of tests that allows assessment of both dynamic airway calibre over the tidal range and flow limitation during forced expiratory manoeuvres, together with tissue and airway wall mechanics might be the ideal. There is also increasing interest in the use of inert gas washout to assess ventilation inhomogeneities, as a measure of small airway function in such infants. By contrast, when studying new-borns with respiratory distress or chronic lung disease, assessment of lung volume, tissue mechanics and ventilation efficiency may be of greater relevance. Since the lung cannot be described as a single compartment for many respiratory diseases, integrative measures of lung function may at times prove more useful than assessment of mechanical parameters.

The choice of test will also depend on the age and clinical stability of the subjects, with assessments in preterm and newborn infants being limited to those which can be applied during natural quiet sleep, since sedation is usually contra-indicated in such subjects. Additional consideration needs to be given to factors such as whether the same test can be used at different stages through infancy and early childhood, since serial measurements will always be far more informative than those obtained on a single occasion, and whether appropriate reference values are available, with which to distinguish the effects of disease from those of development during this incredibly rapid period of somatic and lung growth.

Visit http://www.ich.ucl.ac.uk/units/portex/homepage.htm

The clinical applications of lung function tests in individual infants remain controversial. Investigations are rarely performed for diagnostic purposes, but rather to monitor nature or severity of lung disease or to assess the response to treatment.

Which tests should we use for assessing lung function in infants?

While providing valuable information regarding type

Infant Lung Function Testing Comes of Age

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and severity of functional disorders, respiratory function testing has not achieved the widespread clinical application in individual infants that it has in older subjects. Further developments and adaptations of techniques suitable for this age range, determination of the discriminative ability of specific tests, increased availability of appropriate reference data and improved training facilities could increase clinical applicability. Nevertheless, the complexity of measurements in these small uncooperative subjects, combined with the need for sedation in most infants above one month of age, makes it unlikely that these tests will ever be used as widely in the very young as in older children and adults. Most importantly, clinical reasoning and an understanding of the clinical questions being posed, rather than simply availability of equipment and expertise, should determine the choice of technique. Similarly, the integration of results and the actions arising from lung function measurement in children requires close communication between those requesting and those performing the measurements.

Reference values

While response to treatment can often be determined by internal reference, completeness of recovery requires data from a reference population, as do assessments of the magnitude of any observed changes in lung function and how these may change over time. Longitudinal reference data are also important in the evaluation of the growth of lung function and for epidemiological studies. The use of inappropriate reference data has resulted in serious misinterpretation of many published papers in the field of infant lung function testing, and can lead to false clinical judgements in individual patients. Both manufacturers and users need to be aware that, despite the numbers regularly displayed on commercially available equipment, valid reference values for the various indices of infant lung function are rarely available. While many research groups have reported so called 'normative data', these are generally based on relatively few observations and are only applicable to a specific population (e.g. sex, ethnic, socio-economic and age related factors) and the use of a specific test and type of equipment. Attempts to overcome some of these problems have been addressed recently by collating results of maximal flows at Functional Residual Capacity (V'_{maxFRC}) from infants studied on over 600 occasions in 3 centres using similar equipment and methods, in order to produce sex-specific prediction equations for this parameter. Nevertheless, recent improvements in equipment, including reduced deadspace and resistance, mean that infant breathing patterns during the testing session may differ from those previously recorded. This in turn could result in systematic differences in recorded values for lung mechanics and volumes, from those previously published. There is therefore an urgent need to develop more reliable reference standards that are based not only on equipment currently available but on sufficient numbers of subjects over a wide enough age range to allow results to be expressed as Z (standard deviation) scores.

Clinical and Epidemiological Applications of Infant Lung Function Tests

Increasing awareness of the potential relevance and significance of lung function assessments in early life when applied as objective outcome measures in clini-

cal or epidemiological studies, together with increasing availability of suitable equipment, has been accompanied in recent years by a dramatic increase in both the number of centres assessing respiratory function in infants, and the applications to which such tests are now put. As prospects for early intervention, based on antenatal or early postnatal diagnosis or on gene therapy for specific defects, become more widespread, the contribution of measurements of lung mechanics during early life is likely to increase further.

Recent assessments of airway function and responsiveness in infancy have contributed to improved understanding of the natural history and pathophysiology of wheezing disorders, cystic fibrosis, chronic lung disease and other respiratory illnesses during early life. In addition, awareness that the foundations of chronic airway obstruction may be laid not so much during childhood as during fetal development and the first year of life, when the lungs and airways are developing so rapidly, has focused renewed attention on early pulmonary development. Numerous factors are known to influence intra-uterine and perinatal lung growth, including a complex interaction of hormones, growth factors and physical constraints. In addition it is now recognised that numerous genetic and environmental factors will influence the normal growth and development of the lungs. These include maternal smoking during pregnancy, low birthweight for gestational age, sex, ethnicity, family history of asthma and atopy, together with factors such as preterm delivery, and the need for ventilatory support and supplementary oxygen therapy during the neonatal period. Although some remodelling of the lungs and airways may occur during the first year of life, those born with sub optimal lung function tend to remain on the lower centiles thereafter. This suggests that the level of lung and airway function may be determined for life during fetal and early postnatal development. Indeed, it is now recognised that adverse events occurring during the period of rapid growth and development in early life may have long term and irreversible effects and that hyper-responsiveness shortly after birth may be a predictor of subsequent childhood asthma.

Future Directions

In view of the burden of respiratory disease during early life and its potential impact on later lung health, it is essential to develop objective and standardised measurements of lung function, airway responsiveness and airway inflammation that can be applied during infancy and early childhood. Future challenges include the design and execution of multi-centre studies that use standardised methods of lung and airway function during early childhood as objective outcome measures to address pertinent questions aimed at minimising morbidity and mortality associated with inherited, congenital, developmental, acquired and infectious respiratory illnesses during early life. These include clinical and epidemiological applications of infant LFTs to elucidate the mechanisms by which insults to the developing lung contribute to respiratory disease, identification of which of the many infants who wheeze will go on to develop asthma, determination of the most beneficial treatments for various lung diseases, preservation of lung function in infants with CF

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by detection of, and appropriate interventions for, early changes in lung function, and identification of factors that contribute to the development of chronic lung disease of prematurity, so that alternative, improved strategies of both antenatal and postnatal management can be developed and implemented. In addition, carefully designed longitudinal studies commencing in early infancy will be required to gain further insights into the mechanisms underlying the relationship between childhood respiratory problems and adult lung disease.

With respect to methodology, future challenges include development of tests that do not require sedation and tests that provide more detailed, relevant information regarding lung development, specifically with respect to alveolar surface area, gas exchange, tissue mechanics, the relationship between respiratory mechanics and control and more precise location of any airways obstruction. Future strategies must also encompass a multi-centre, multi-disciplinary, collaborative approach whereby there are increasing links between structure and function (e.g. physiological vs imaging techniques), between physiology, epidemiology, genetics, infection and immunology, and between basic science and clinical applications.

Ultimately the aim should be to develop and validate infant respiratory function tests sufficiently so that they can be used as objective and reliable outcome measures both for individual infants and in multicentre trials, thereby strengthening the scientific basis for the prevention and treatment of respiratory disease in early life. This in turn should help to minimise suffering from respiratory illness not only during early childhood but, hopefully, throughout life.

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Editor's Note: Professor Stocks provided a list of 75 references. Anyone wishing to view additional references can email me at cecilia.a@bigpond.com for a copy.

Testing Young Children is Child's Play, or Is It ?

Alison Boynton, Sydney Children's Hospital, Randwick

Respiratory disease is one of the most common causes of infant mortality worldwide. Asthma affects up to 1:4 young children and 1:7 adolescent children in Australia and remains the most common childhood chronic disorder requiring admission to hospital. The ability to measure lung function in young children can provide objective information on the presence and severity of abnormality, as well as monitor response to therapy. Young children present a challenge in obtaining reliable measurements and standardisation of testing procedures in paediatrics is still a developing science.

"Asthma affects up to 1:4 young children and 1:7 adolescent children in Australia and remains the most common childhood chronic disorder requiring admission to hospital."

At present the most commonly used measurement of lung function in young children (4-6 yrs and over) is spirometry. Spirometry measures the volume of air exhaled from the lungs during a maximal expiratory effort. The forced vital capacity (FVC) is the total amount of air that can be exhaled. The forced expiratory volume timed (FEVt) is the volume of air forcefully expired from full inhalation within a given time. The rate (flow) of a volume of gas exhaled is measured as litres per second (L/sec) or litres per minute (L/min). ATS criteria for "acceptability" state that for an acceptable FVC manoeuvre expiration should be sustained for 6 seconds or at least reach a plateau. "Acceptability" also requires a minimum of 3 acceptable manoeuvre's with the two best FEV's within 0.2L of each other as well as the two largest FVC's within 0.2 L of each other. These criteria are for adults and cannot be strictly applied to children.

FVC is difficult to obtain from young children as they find it difficult to comprehend the concept of inhaling and exhaling maximally. This is where having the right equipment and a non-threatening environment are important in achieving valid and reliable results. An experienced tester who encourages young children to perform at their best is desirable, but a well trained tester who is able to recognise and report on technique and sub-maximal effort is paramount to the accurate interpretation of the test. Underestimation of FVC due to subjects stopping before the end of their forced expiratory manoeuvre can erroneously indicate restrictive rather than obstructive disease. Young children usually need to perform more than three tests before an adequate test can be obtained, and often will not be able to perform acceptable manoeuvres on their first visit to the lab. This requires extra time and patience from the tester, and once again, a well trained tester will be able to coach on correct technique while keeping the experience positive for the child. As in adults, every effort needs to be examined for acceptability and reproducibility.

As with all physiological measurements, these techniques require reliable and accurate instrumentation. Testing equipment requires daily/weekly checks to ensure accuracy and safety, and calibration tests to monitor reliability. Special training is required for those administering testing to children if reliable data is to be obtained. The child's posture is important, requiring head and torso to be erect while testing. Nose clips may be used where there is evidence of failure to mouth breathe but most children automatically occlude when doing a forced expiration, and some find the nose clip too distracting. The test may be performed either standing or sitting, as long as the torso and head remain erect. Just as important as having the right equipment is having a trained, observant tester who is able to report accurately on the attempts of the subject during lung function tests. Such measures put into application can only enhance the acquisition of reliable measurements for the clinician in the assessment of respiratory disease in children.

Obtaining acceptable spirometry from such a young age group depends largely on patient cooperation. Young children are easily distracted and generally apprehensive in unfamiliar environments. It is important to have a calm,

encouraging environment where time is set aside before testing to answer questions and reassure that testing will not hurt. Most 5- year-old children can successfully perform an acceptable flow-volume loop following the example of the scientist/ technician, and with the implementation of testing strategies and techniques. Clear uncomplicated instructions delivered one step at a time, while demonstrating the technique helps to reduce confusion. Most children can be distracted from intimidating testing equipment by initiating the test as a game with incentives for effort. A simple device such as a small "windmill" attached to the back of the flow- head will spin when a good effort is produced. This device can be gradually moved further back after each effort to encourage greater effort.

Standardised equipment using incentive programmes for spirometry, appropriate for age, have recently been shown to encourage maximal effort in children as young as 3 years. With the use of such incentive programmes it may be possible in the future to test children as young as 3 yrs and obtain meaningful data. However, before this can happen there is much research needed to determine reference values for such a young age group. The criteria for acceptability would also require adjusting as most young children are unable to sustain expiration for 6 seconds. Lemen's (1990) criteria for acceptable spirometry in children states that a sustained expiration for at least 3 seconds, with an artefact free curve shape and at least 3 FVC's within 10% of best effort is required. While it is important to obtain artefact-free and reproducible results with younger children as well as adults, sustained expiration on a timed basis is not so easily applicable to children. Perhaps accepting a plateau on the volume versus time graph, rather than a timed expiration, for end of expiration criteria would be more suitable. Research results on infants from Hogg and associates (1970) concluded that rather than the airways of the infant being simply a miniature version of the adult, there are significant differences in the development of the airway and parenchyma while in adults this occurs equally. As mentioned previously, the ATS criteria for acceptability is based on adult measures and therefore certain modifications should be investigated to help standardise acceptability in spirometric measurements for young children.

Classifications of mild, moderate, and severe in children also differ from adults. The classification for Normal is 80% of predicted on FEV1,
Mild dysfunction : 60 - 79% of predicted FEV1
Moderate dysfunction : 40 - 59% of predicted FEV1
Severe dysfunction : < 40 % of predicted FEV 1
These estimations are only a simple guide and since pre-disease FEV1 is even less likely to be known in young children, a young child with relatively small lungs may record an FEV1 of 79% and have completely normal lungs. This child could subsequently record an FEV1 of 58% of predicted and still only have mild dysfunction rather than moderate. Young children are in a constant state of growth and change and it has often been reported that a single prediction equation for the entire paediatric age range does not adequately describe the changing relationship between pulmonary function and growth.

“With the use of such incentive programmes it may be possible in the future to test children as young as 3 yrs and obtain meaningful data.”

Lung growth and change continues with increases in luminal diameter of conducting airways and continuous separation of the alveoli until early adolescence, by which time more than 200 million alveoli have been formed. The functional implications of these changes should reflect airway development, and available measurements do reveal and correspond to structural changes in the lung from infancy to adolescence. However, differences in airway growth and lung parenchyma growth among individuals suggest the relationship between airway development and airspace development are not as direct as they may seem. Some individuals

Testing Young Children is Child's Play, or Is It ?

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can develop large airways and yet have restricted airspace due to small lungs, while others can develop the opposite. This suggests that such developmental changes may be more a reflection of individual variability rather than the development of disease. Increasing epidemiologic evidence suggests that disease in childhood, at least where wheezing occurs with lower respiratory infections, is related to physiological indicators of lung and airway size. The basic structure of the airways is already present at birth and may be genetically determined.

Hence sources of variation in lung function can be due to anatomic variables (small airways), as well as disease variables and methodological variables including patient cooperation and technical aspects. Whether the dysanapsis between airway and lung growth is significant concerning disease susceptibility is yet to be seen. The measurement of lung volumes and capacities provides information that must be objectively assessed. Patient cooperation and technical problems can be sources of error. With standardisation of testing procedures, familiarisation with testing strategies and techniques, and the introduction of the microchip, variation in measurement has been greatly decreased. However the widespread availability of commercial computerised equipment for lung function testing has contributed to assessments being performed by health personnel untrained in their use or unversed in these potential and significant causes of variation.

In summary the following conditions are important for reproducible and accurate measurements of lung function in young children.
A recognition that children (especially younger ones) are not small adults and therefore modifications in technique and interpretation of results is vital.
A trained scientist / technician able to recognise sub-optimal efforts and deficiency in technique.
Standardised, well serviced computerised equipment and appropriate predictive equations and reference values suitable for population being tested. A cooperative patient and awareness that children are fast learners and a little patience can go a long way.

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Changes to the Privacy Act: A note from the Editor

On the 21st December 2001, changes to the Privacy Act took hold. What does this mean? Is it relevant to respiratory labs? How do we get it right?

I attended a seminar on the topic and here is the how I understood the Act to affect our Laboratory. This is my interpretation, if anyone has more to add or disagrees about anything I have written please send a reply to the editor, it's a topic needs further discussion.

There are many changes to the Act the main ones include Patient Privacy issues and Patient Consent issues. As of the 21st December 2001 patients are allowed to view their medical records. However, they can only view these records if they are a current patient (which is an ambiguous time frame). Patients are entitled to copies of their records and you are entitled to charge them (again this is at your discretion).

You are allowed to release information to other practices, doctors, lawyers etc if you have consent from the patient and *then* you can only release test data or records that are relevant to your laboratory/ practice. The patient consent should be written but in some cases, e.g, patient is sitting infront of the doctor while he's on the phone to you, a verbal consent is okay.

The Privacy Act affects everyone dealing with patients. For example, it is considered a breech of Privacy if you read a patients' address or date of birth out loud in a waiting room full of people (yes, all you are doing is making sure you have the correct details and patient). This may sound pedantic or out of this world but it's true.

"Implied Consent" is a lovely expression and puts a wide umbrella over the issue of consent. The fact that someone rings up and says "got to book in for XYZ test" and then turns up to do the test is considered "Implied Consent".

I have only skimmed the surface but there are pages on this at the government website www.privacy.gov.au

Take the time to understand the issue because one day you may be a patient too!

The Challenges of Spirometry in Children
(Continued from page 5)

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CRFS Examination

CRFS examination dates (and Application Deadlines) for 2002 are:
18th May (19 April)
20th July (14 June)
23rd November (18 October)

For details of the examination and application forms, please contact:

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