

THE SIGNIFICANCE OF RESPIRATORY IMPAIRMENT FOR PUBLIC HEALTH IN SCOTLAND

A symposium
held at the University of Glasgow
17th February 2011

SHORT REPORT



This symposium was held to review the public health significance of what is known about the epidemiology of respiratory impairment, based largely on Scottish studies, but also drawing on expert and generalist knowledge.

The meeting confirmed the significance of respiratory impairment, as measured by FEV1 or by FVC, as a major predictor of disease-specific and all cause mortality in men and women, including never smokers, based on data from several Scottish cohorts including the

- Renfrew and Paisley (Midspan) study (1972-76)
- Twenty-07 Study (1987)
- Scottish Health Surveys (1995, 1998 and 2003)
- Midspan Family Study (1996)

Public health importance of lung function

The epidemiology and importance of respiratory impairment is that it is associated with mortality from most causes, extending far beyond its associations with respiratory disease and providing a substantial additional explanation of poor health in Scotland in general and Glasgow in particular.

It is possible that these observations may add to understanding of the “Glasgow and Scottish Effects” which have been described, mostly on the basis of ecological data, as the component of high mortality rates in Glasgow and Scotland which is not explained by conventional risk factors.

Natural history

The natural history of lung function comprises an initial period of growth, reaching a peak in early adulthood and followed by a period of decline with age, which may be fast or slow depending on the respiratory hazards encountered. It seems likely that the initial period of growth is not specific to the lung, but is part of general body growth and development.

Despite the strength and consistency of the epidemiological signal, it is not clear what actions can be taken to maximise respiratory function or to prevent or slow subsequent decline. More research is needed, especially in non-smokers.

If the epidemiological findings concerning respiratory impairment are part of a more general phenomenon, whereby impaired body growth is associated with premature mortality, it would seem unlikely that interventions focused on the lung could substantially reverse these wider effects.

A separate issue concerns the epidemiology of airways obstruction, as measured by FEV1/FVC, including its reversible (asthmatic) and non-reversible forms. Over the course of the listed studies, atopy, hay fever and asthma have all increased in prevalence, while symptoms of COPD have declined. The symposium noted that the genetic determinants of asthma are not the same as those associated with lung function.

From an aetiological point of view, there is great interest in both the antenatal and postnatal determinants of the development of lung function in never smokers, as well as the determinants of the onset and rate of subsequent lung function decline. New or modified existing research cohorts are needed to address these questions.

What to measure?

As measurements, FEV1 and FVC are very closely related, and are largely interchangeable in studies of non-respiratory mortality. The convention has been to use FEV1, but there is some suggestion that FVC is a better explanatory measure. However, with FVC data, there is often uncertainty as to whether the measurement has followed a full inspiration and whether expiration reached a plateau.

The convention has been to correct measurements of FEV1 to a predicted measure based on normal values observed in someone of similar age, sex and height, who has never smoked and who has no respiratory symptoms. It is possible that the correction for height loses important aetiological information, given that greater body size is itself associated with better health and longevity.

Clinical implications

It is not clear whether measurements of lung function have clinical utility. While longitudinal data are desirable in indicating whether a current measurement has been stable or dynamic over time, there is currently no sound reason why such longitudinal data should be collected except in research studies. Most of the criteria required for screening have not been met.

There is currently no clinical intervention, other than smoking cessation, which has been shown to improve lung function, or to slow the process of decline.

Measurements of FEV1 add predictive value to cardiovascular disease risk scores, but usually in people who are already at high risk with risk scores in excess of intervention thresholds. Further analyses may identify subgroups of

people in which FEV1 data may have important positive or negative predictive value.

Further analyses could also determine whether FEV1 measurements might substitute for post code assessments of socio-economic deprivation, potentially removing this source of ecological fallacy from CVD risk estimation.

Public health monitoring

A crucial but unresolved question is whether lung function in Scotland is improving over time. Recent improvements in life expectancy in Scotland, as in most countries, could be due to changes in “constitution” or “resilience”, for which lung function could be an indicator, possibly reflecting influences across the life course. On the other hand, if lung function has not changed over successive generations, another explanation must be driving improvements in life expectancy.

There is a need for continued public health monitoring of lung function in Scotland by the Scottish Health Survey, to establish whether, in whom and why lung function is improving.

Research questions

There is also a need for further research to describe and explain the epidemiology of respiratory impairment, especially in non-smokers, with a view to identifying and evaluating measures to improve public health.

- Most Scottish studies have focused on FEV1 rather than *Forced Vitality Capacity*. There is evidence that FVC may be more important. Re-analyses of Scottish studies should address this issue, especially in never smokers.
- Existing datasets could be used to assess to what extent respiratory impairment is associated with *disease incidence and/or case-fatality*.
- Data from serial Scottish Health Surveys (SHeS) should be used to describe the *social patterning of lung function* in Scotland.
- Existing data could also be used to explore the *inter-relationship of height and lung function*. For example, two people might have the same % predicted FEV1, while one is short and the other tall. In general, it is better to be tall. Is it better to be tall with some respiratory impairment (<100% of predicted) or short with no respiratory impairment?

- Analyses of linked SHeS/SMR/GROS data should explore the *inter-changeability of measurements of lung function, serum cholesterol and postcode deprivation* (SIMD) in the prediction of cardiovascular risk. This work should also identify situations in which lung function measurements make a substantial difference to CVD risk.
- Existing Scottish *longitudinal studies of health in childhood and adolescence* (Growing up in Scotland) should include serial measures of lung function as these cohorts get older. Is breastfeeding associated with better long term lung growth? What is known about the determinants and timing of peak lung function?
- Studies could assess the importance of *muscular strength*, for example, as measured by grip strength, as a determinant of inspiratory and expiratory performance. Is the relatively increased inspiratory capacity acquired by swimmers associated with health benefits in later life?

Professor Graham Watt
MD FRCGP FFPH FRCP(Glas+Edin) FMedSci
Chair, Midspan Studies Steering Committee
graham.watt@glasgw.ac.uk
November 2011

Note

The full symposium report is available at www.gcph.co.uk/publications