Ageing and Breathlessness. What's Abnormal?

Christine Jenkins
Ageing and Breathlessness
What's Abnormal?

- Some epidemiology
- The ageing lung
- Defining breathlessness or dyspnea (AKA SOB)
- Measuring breathlessness
- Defining “abnormalities” in older populations
- Identifying population risk factors for dyspnea
- Prevalence of dyspnea in older people
- Preventable aspects of dyspnea
Australia and South Africa 2011

Australia
Total population 22.2m
- Australia’s life expectancy at birth - 84 years (females) & 79 years (males)
- > 2.9 million Australians (13.3% total pop) aged ≥ 65 years (2009)
- Increase in > 85 year olds has increased more than fivefold last 20 yrs
- 1 in every 6,000 Australians is aged 100 years or older

South Africa
Total population 49m
- Life expectancy at birth 49 years
- Median age 25 yrs
- 0-14 years: 28.5% (male 6,998,726/female 6,959,542)
  15-64 years: 65.8% (male 16,287,314/female 15,972,046)
  65 years and over: 5.7% (male 1,125,709/female 1,660,694) (2011 est.)
**Comparative Health Priorities**

**Australia’s health**
- Respiratory systems diseases are 3rd leading cause of death (behind CVD and cancer) for all > 65 yr old age groups
- COPD 4th leading cause of death
- Infectious diseases a rare cause of death
- TB incidence 6/100,000
- vs South Africa > 600/100,000

**South Africa’s Health**
- 5.6 million (2009) living with HIV-AIDS
- Infectious diseases food or waterborne diseases common causes of morbidity and death (bacterial diarrhea, hepatitis A, typhoid fever, schistosomiasis

**Case notifications**
Notifications continue to rise as case-finding and reporting improve

**TB**

<table>
<thead>
<tr>
<th>Year</th>
<th>Re-treatment</th>
<th>Relapse</th>
<th>New extrapulmonary</th>
<th>New ss-/unk</th>
<th>New ss+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
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<td>2005</td>
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</tbody>
</table>
Normal aging causes changes in lung structure and function.

Decreased
- static elastic recoil
- compliance of chest wall
- respiratory muscle strength
- respiratory response to hypoxia
- respiratory response to hypercapnia
- awareness of airway resistance
Lung parenchyma from

a) non-smoking 29 yr old

b) Lifelong non-smoking 100 yr old

“senile emphysema” = airspace enlargement *without* inflammation or destruction
Physiologic changes in respiratory function associated with ageing

Janssens et al ERJ 1999;13:197

Evolution of FEV1 and FVC as a function of age, average of data from 746 subjects, no cardiorespiratory symptoms, lifelong non-smokers, US
Sex differences in the perceived intensity of breathlessness during exercise with advancing age

Ofir et al JAP 2008;104:1583

Older females
Older males

Rating of dyspnea for VO2 of 20ml/kg/min
Perception of breathing difficulty in older people

- Older (vs younger) patients with asthma show
  - reduced awareness of changes in airway resistance
  - a reduced perception of airway narrowing, related to duration of disease
  - smaller changes on VAS score for given level of induced bronchoconstriction
  - a reduced propensity to “complain” or worry about SOB in narrative analyses, if longstanding asthma
  - $\Delta FEV_1$ in response to 200 mcg salbutamol is reduced in elderly
What is Dyspnea?

- A term used to characterise a subjective experience of breathing discomfort that consists of qualitatively distinct sensations that vary in intensity. The experience derives from interactions among multiple physiological, psychological, social and environmental factors and may induce secondary physiological and behavioural responses.”


- An abnormally uncomfortable awareness of breathing

  Harrisons Principles and Practice of Medicine
Differentiating between “normal” and “healthy”

- **Characteristics of the normal (Australian) ageing population**
  - Physical inactivity
  - Weight gain
  - Co-morbidities
  - Deconditioning

- More likely to be easily breathless BUT “normal”

- **Characteristics of a healthy ageing population**
  - Maintenance of physical activity
  - Stable weight
  - Minimal co-morbidity
  - No loss of fitness

- Less likely to be easily breathless BUT “Abnormal”
Measuring Tools for Dyspnea

Horses for courses
Measuring Tools for Dyspnea

1. Likert scale

Semantic scale
Good ------------------- Bad
Extremely Quite Slightly Neither Slightly Quite Extremely

Semantic Differential Scale
important -- unimportant
expensive ---- inexpensive
useful ---- useless
strong --- weak
quick ---- slow

2. VAS

SCALE A: Horizontal Visual Analogue Scale

How much shortness of breath are you having right now? Please indicate by marking the line. If you are not experiencing any shortness of breath at present, circle the marker at the left end of the line.

No shortness of breath Shortness of breath as bad as can be

3. Borg scales

Table 3. Revised Borg Scale For Grading Severity Of Dyspnea:

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Nothing at all</td>
</tr>
<tr>
<td>0.5</td>
<td>Very, very slight (just noticeable)</td>
</tr>
<tr>
<td>1</td>
<td>Very slight</td>
</tr>
<tr>
<td>2</td>
<td>Slight (light)</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
</tr>
<tr>
<td>4</td>
<td>Somewhat severe</td>
</tr>
<tr>
<td>5</td>
<td>Severe (heavy)</td>
</tr>
<tr>
<td>6</td>
<td>Very severe</td>
</tr>
<tr>
<td>7</td>
<td>Severe</td>
</tr>
<tr>
<td>8</td>
<td>Very severe</td>
</tr>
<tr>
<td>9</td>
<td>Panic level, maximal shortness of breath</td>
</tr>
</tbody>
</table>

4. MMRC

5. BDI/TDI
Modified MRC Dyspnea scale

- Statements about perceived breathlessness
  - None (or only on strenuous exercise) \( \rightarrow 0 \)
  - I get SOB when hurrying on the level or up a slight hill \( \rightarrow 1 \)
  - I walk slower than people of the same age walking on the level because of SOB; or \( \rightarrow 2 \)
  - I have to stop for breath when walking at my own pace on the level \( \rightarrow 2 \)
  - I stop for breath when walking at my own pace after a few minutes on the level or after walking 100 m \( \rightarrow 3 \)
  - I am too breathless to leave the house \( \rightarrow 4 \)
Descriptors of breathlessness in healthy individuals

1. I feel that I am suffocating
2. My chest feels tight
3. My breathing is heavy
4. I feel that I am smothering
5. My breath does not go in all the way
6. My breath does not go out all the way
7. I feel that I am breathing more
8. I feel that my breathing is rapid
9. My breathing requires effort
10. I cannot get enough air
11. I feel a hunger for air
12. My breathing is shallow
13. I feel out of breath
14. My chest is constricted
15. My breathing requires work
What is the prevalence of breathlessness in ageing normal populations?

In response to the perceived needs of an aging population, German municipalities have been experimenting with outdoor parks for their citizens. A new ‘playground’ for older people in Berlin’s Preussenpark is modelled on exercise areas created in China to keep older members of the population in good health.
Prevalence of respiratory symptoms related to COPD and asthma among middle aged and older adults

Abramson et al. Respirology 2002;7:325

<table>
<thead>
<tr>
<th>Symptom/history</th>
<th>No.</th>
<th>%</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortness of breath hurrying or walking uphill</td>
<td>1336</td>
<td>27.2</td>
<td>25.9–28.5</td>
</tr>
<tr>
<td>Shortness of breath walking with others of own age</td>
<td>505</td>
<td>10.3</td>
<td>9.5–11.2</td>
</tr>
<tr>
<td>Shortness of breath walking at own pace</td>
<td>246</td>
<td>5.0</td>
<td>4.4–5.7</td>
</tr>
<tr>
<td>Shortness of breath at rest</td>
<td>216</td>
<td>4.4</td>
<td>3.9–5.0</td>
</tr>
</tbody>
</table>

Random sample of 7005 adults (45 - 69 yrs)
Melbourne; postal survey using ECRHS screening questionnaire = 4906 (70%) participants. Commonest symptoms were exertional dyspnoea (27.2%) and wheezing (20.5%).

SOB % prevalence AGE 55+
Predictors of chronic breathlessness: a large population study
Bowden JA et al BMC Pub Health 2011;11:33

- Data collected from adult SA population health survey 2007 & 2008 (n = 5331). Participation rate 64.1%
- Face to face whole population sampling, respondents interviewed 60 – 90 mins in own homes, ~3000 p.a
- Specific Q’s can be commissioned: sought to ascertain relationships between SOB and lifestyle factors
- Breathlessness measured by mMRC and association with: smoking history, smoke-free housing, level of physical activity and BMI/obesity
- Obesity definitions: underweight < 18.5, healthy 18.5-25, overweight 25-30, obese > 30
Predictors of chronic breathlessness: a large population study
Bowden JA et al BMC Pub Health 2011;11:33

- 11.1% of respondents (15.0% of those aged ≥50) chronically had breathlessness that limited exertion
- Significant associations with chronic SOB for the whole population and only those ≥50 included:
  - increasing age
  - female gender
  - being separated/divorced/widowed
  - social disadvantage
  - smoking status
  - those without a smoke-free home
  - low levels of physical activity
  - obesity
Predictors of chronic breathlessness: a large population study
Bowden JA et al BMC Pub Health 2011;11:33

- Clear gradient by grade of SOB by which as severity of SOB increased,
  - BMI increased
  - Physical activity decreased
- In multivariate analyses adjusted for age, significant factors remaining were
  - physical activity (p < 0.001)
  - obesity (p < 0.001)
  - social disadvantage (p < 0.05)
- In adults classified as obese (1063), 18.1% experienced SOB compared to 8.7% who were not obese
- Adults > 50, SOB in 22.2% those who were obese versus 12.3% who were not
Predictors of chronic breathlessness : a large population study
Bowden JA et al BMC Pub Health 2011;11:33

Multivariate analysis for factors associated with prevalence of breathlessness (mMRC 2-4) for 2007 and 2008 for individuals aged 50+ in a face-to-face population survey

<table>
<thead>
<tr>
<th>Variable*</th>
<th>Levels</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Disadvantage</td>
<td>Most disadvantaged</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P &lt; 0.05</td>
<td>0.62</td>
<td>0.41-0.96</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.61</td>
<td>0.39-0.96</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.61</td>
<td>0.46-1.13</td>
<td>.15</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.72</td>
<td>0.30-0.77</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>Least disadvantaged</td>
<td>0.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>No activity</td>
<td>1</td>
<td></td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>P &lt; 0.001</td>
<td>0.61</td>
<td>0.42-0.90</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>Some activity but not sufficient</td>
<td>0.36</td>
<td>0.22-0.57</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Body mass index*</td>
<td>Healthy weight</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P &lt; 0.001</td>
<td>0.85</td>
<td>0.57-1.27</td>
<td>.52</td>
</tr>
<tr>
<td></td>
<td>Overweight</td>
<td>1.81</td>
<td>1.08-2.78</td>
<td>&lt;.05</td>
</tr>
<tr>
<td></td>
<td>Underweight</td>
<td>1.86</td>
<td>0.75-4.61</td>
<td>.18</td>
</tr>
</tbody>
</table>

*Other variables included in the analysis were as follows: gender (p = 0.10), marital status (p = 0.10), smoke-free home (p = 0.94), smoking history (p = 0.18)
Objective measures of exercise tolerance are not identical to breathlessness
Reference Equations for the 6-Minute Walk in Healthy Adults

Enright et al AJRCCM 1998;158:1384

- Administered the standardized 6-min walk test to 117 healthy men and 173 healthy women, aged 40 to 80 yr
- Measured SaO2, pulse rate, and dyspnea (Borg scale) before and at the end of the walk
- **Median distance walked was 576 m for men and 494 m for women**
- 6MWD was significantly less for men and women who were older and heavier, and for shorter men.
- The resulting gender-specific regression equations explained about 40% of the variance in the distance walked for healthy adults
Age, weight and height are independently associated with distance walked, but about 60% of the variance in 6MWD remains unexplained by the models.
Changes in six-minute walking distance during pulmonary rehabilitation in patients with COPD and in healthy subjects

Rejbi et al. JCOPD 2010;5:209

Logarithmic and linear fitting of the dependant variables for 26 patients with COPD (♦); mean age 61 (+/- 6) yrs, and 9 healthy subjects (▲) mean age 57 (+/-7) yrs
What does it matter, I don't need to rush now...

I was much worse when I was a kid....

Well I have gained a bit of weight .......

Doesn't everyone get a bit short of breath?
### Why patients see a GP

**Top 20 reasons for consultation**

Where is Dyspnea?

<table>
<thead>
<tr>
<th>Patient reason for encounter</th>
<th>Per cent of total reasons</th>
<th>Per 100 encounters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check-up</td>
<td>9.7</td>
<td>15.2</td>
</tr>
<tr>
<td>Prescription</td>
<td>8.0</td>
<td>12.6</td>
</tr>
<tr>
<td>Test results</td>
<td>5.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Cough</td>
<td>4.3</td>
<td>6.8</td>
</tr>
<tr>
<td>Immunisation and vaccination</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Throat complaint</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Back complaint</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Rash</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Upper respiratory tract infection</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Hypertension and high blood pressure</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Administrative procedure, not otherwise stated</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>1.2</td>
<td></td>
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<tr>
<td>Abdominal pain</td>
<td>1.1</td>
<td></td>
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<tr>
<td>Headache</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Skin complaint</td>
<td>0.9</td>
<td></td>
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<tr>
<td>Weakness or tiredness</td>
<td>0.9</td>
<td></td>
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<tr>
<td>Ear pain</td>
<td>0.9</td>
<td></td>
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<tr>
<td>Shoulder complaint</td>
<td>0.9</td>
<td></td>
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<tr>
<td>Knee complaint</td>
<td>0.8</td>
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</table>

**Doctor reason**

<table>
<thead>
<tr>
<th>Problem managed</th>
<th>Per cent of total problems</th>
<th>Per 100 encounters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>6.5</td>
<td>10.1</td>
</tr>
<tr>
<td>Check-up</td>
<td>4.3</td>
<td>6.7</td>
</tr>
<tr>
<td>Upper respiratory tract infection</td>
<td>4.0</td>
<td>6.1</td>
</tr>
<tr>
<td>Immunisation and vaccination</td>
<td>3.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Depression</td>
<td>2.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.6</td>
<td>4.1</td>
</tr>
<tr>
<td>Lipid disorders</td>
<td>2.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Arthritis</td>
<td>2.5</td>
<td>3.8</td>
</tr>
<tr>
<td>Back complaint</td>
<td>1.8</td>
<td>2.7</td>
</tr>
<tr>
<td>Acute bronchitis and bronchiolitis</td>
<td>1.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Oesophageal disease</td>
<td>1.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Asthma</td>
<td>1.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Prescription</td>
<td>1.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Anxiety</td>
<td>1.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Contact dermatitis</td>
<td>1.2</td>
<td>1.9</td>
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<tr>
<td>Urinary tract infection</td>
<td>1.1</td>
<td>1.7</td>
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<tr>
<td>Sleep disturbance</td>
<td>1.0</td>
<td>1.6</td>
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<tr>
<td>Test results</td>
<td>1.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Sprain and strain</td>
<td>0.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>0.9</td>
<td>1.4</td>
</tr>
</tbody>
</table>


2008-9 BEACH data 1000 GPs, > 100,000 consultations
Dyspnea and 8 year mortality amongst elderly men and women: PAQUID cohort

Tessier et al
J Int Med 2006; 260: 332–342

2792 subjects aged > 65 living in France; 935 died over 8 years; mortality RR 2 for SOB (≥3) vs no SOB
Breathlessness, phlegm and mortality: 26 years of follow-up in healthy middle-aged Norwegian men


1999 apparently healthy men aged 40–59 years 26 year follow up in Oslo Cumulative age-adjusted mortality according to combinations of respiratory symptoms

![Graph showing cumulative age-adjusted mortality over time with different combinations of respiratory symptoms](image-url)
Evaluation of dyspnea in a sample of elderly subjects in general practice

Pedersen et al IJCP 2007;61:1481

- Assessed diagnostic yield of 3 step examination algorithm in 4 Danish general practices
- Sent questionnaires to 662 subjects
- 555 responded & 37% (205) eligible
- studied 152 subjects, MRC dyspnea > 1, age 60-79
- STEP 1 Clin exam, Spirometry and ECG
- STEP 2 DLCO, Echo, Hb, TFT’s
- STEP 3 cardiac MRI
Evaluation of dyspnea in a sample of elderly subjects in general practice

Pedersen et al IJCP 2007;61:1481

- 53% subjects had dyspnea due to lung disease, diagnosed at steps 1 or 2, higher in women (42%) than men (29%)
- 21% had cardiac disease diagnosed at steps 1 or 2: 10% step 1, 7% step 2, 6% step 3
- 4% had deconditioning, no heart/lung
- 7% had no accountable cause
- History of chronic bronchitis +/- wheeze on exam had PPV 61-66% for COPD
- Negative smoking history had NPV of 90% for ruling out COPD
Summary
Breathlessness and Ageing: What is abnormal?

- Dyspnea is low on the radar of older people and their health providers but significantly impacts QoL.
- Dyspnea can be assessed objectively using reliable validated and easy to use scores and questionnaires.
- 6 MWD for Australians aged 45 – 85 averages 600m.
- Prevalence of mMRC level 3 dyspnea in the Australian community is around 10% and increases with age.
- Strong associations with preventable lifestyle factors:
  - Physical activity
  - Anxiety and depression
  - Obesity
  - Social disadvantage