Table 1 Sensitivity, specificity, PPV and NPV for CURB-65 and CURB-age criteria in 189 patients with CAP

	CURB-65 estimate (95% CI)	CURB-age estimate (95% CI)
Sensitivity	81.5% (61.9 to 93.7)	81.5% (61.9 to 93.7)
Specificity	64.2% (56.3 to 71.6)	74.1% (66.6 to 80.6)
PPV	27.5% (18.1 to 38.6)	34.4% (22.9 to 47.3)
NPV	95.4% (89.6 to 98.5)	96.0% (90.9 to 98.7)

PPV, positive predictive value; NPV, negative positive value; CAP, community acquired pneumonia.

improve the assessment of severity in community acquired pneumonia (CAP).

We therefore modified CURB-65 and formulated a new rule (CURB-age) where:

- the presence of new confusion scores 1;
- urea >7 mmol/l but ⩽11 mmol/l scores 1;
- urea >11 mmol/l scores 2;
- respiratory rate ⩾30/min scores 1;
- either diastolic blood pressure ⩽60 mm Hg or systolic blood pressure <90 mm Hg scores 1;
- age ⩾65 and <85 scores 1;
- age ⩾85 scores 2.

Since the maximum possible score becomes 7, we defined severe pneumonia as a score ⩾4 for the CURB-age criteria compared with ⩾3 for CURB-65.

The subjects were 189 patients (median age 75 years, range 17–96, 56.1% men) who were included in two prospective observational studies of CAP.[3] Detailed methodology has been reported previously.[3 5] Using CURB-65 there were 109 non-severe cases (57.7%) and 80 severe cases (42.3%) and by CURB-age criteria there were 125 non-severe cases (66.1%) and 64 severe cases (33.9%). There were 5 deaths in each of the non-severe groups and 22 deaths in each of the severe groups. We examined the sensitivity, specificity, positive predictive values (PPV) and negative predictive values (NPV) of 6 week mortality and their corresponding 95% Pearson-Clopper exact confidence intervals for both CURB-65 and CURB-age criteria (table 1). The CURB-age criteria showed a significantly higher specificity ($p = 0.0001$, McNemar test).

A simple modification improves the specificity and PPV without losing the sensitivity of CURB-65 criteria and without requiring any additional information. It is as simple as CURB-65 and provides higher accuracy in identifying those who died over SOAR and CURB-65 criteria with significantly higher specificity. We combined the data from two cohorts of patients with CAP from two time periods, with the second cohort being elderly patients only (⩾65 years). It is reassuring that the CURB-age criteria better identified severe pneumonia in this older cohort. In the study in which the CURB-65 criteria were developed and validated, the median age of patients was 64 years.[2]

Our findings have important clinical implications. The current BTS guidelines recommend that severe CAP should be treated with intravenous antibiotics. These are more likely to produce untoward side effects such as antibiotic-associated diarrhoea than oral antibiotics, especially in older adults, and their use should be limited to truly severe CAP in older patients. Although the number of patients in our study is comparable to the original validation cohort reported by Lim *et al*[2] (189 vs 214), larger studies are needed to test the validity of these modified criteria.

Phyo K Myint
Department of Medicine, Queen Elizabeth Hospital, King's Lynn, School of Medicine, Health Policy and Practice, University of East Anglia, and Department of Medicine for the Elderly, Norfolk and Norwich University Hospital, Norwich, Norfolk, UK

Ajay V Kamath
Department of Respiratory Medicine, Norfolk and Norwich University Hospital, Norwich, Norfolk, UK

Sarah L Vowler
Centre for Applied Medical Statistics, Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK

Brian D W Harrison
School of Medicine, Health Policy and Practice, University of East Anglia and Department of Respiratory Medicine, Norfolk and Norwich University Hospital, Norwich, Norfolk, UK

Correspondence to: Dr Phyo Kyaw Myint, Clinical Gerontology Unit, Addenbrooke's Hospital, Hills Road, Cambridge CB2 0QQ, UK; Pkyawmyint@aol.com

References

1 **Barlow G**, Nathwani D, Davey P. The CURB65 pneumonia severity score outperforms generic sepsis and early warning scores in predicting mortality in community-acquired pneumonia. *Thorax* 2007;**62**:253–9.
2 **Lim WS**, van der Eerden MM, Laing R, *et al*. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. *Thorax* 2003;**58**:377–82.
3 **Myint PK**, Kamath AV, Vowler SL, *et al*. Severity assessment criteria recommended by the British Thoracic Society (BTS) for community-acquired pneumonia (CAP) and older patients. Should SOAR (systolic blood pressure, oxygenation, age and respiratory rate) criteria be used in older people? A compilation study of two prospective cohorts. *Age Ageing* 2006;**35**:286–91.
4 **Kamath AV**, Myint PK, Vowler SL, *et al*. Is it time to rethink the urea criterion in CURB-65? *Eur Respir J* 2006;**27**:1321–2.
5 **Kamath A**, Pasteur MC, Slade MG, *et al*. Recognising severe pneumonia with simple clinical and biochemical measurements. *Clin Med* 2003;**3**:54–6.

Author's reply

We agree with Myint and colleagues that CURB-65 will not perform equally in all cohorts of patients. We have previously shown, however, that knowledge among junior and middle grade medical staff about how to perform and apply severity assessment criteria in patients with community acquired pneumonia (CAP) is poor.[1 2] This may have improved since the inclusion of CURB-65 in the British Thoracic Society (BTS) guidelines in 2004, but it is our anecdotal experience that severity assessment remains suboptimal. When implementing guidelines, there is a widely accepted paradigm that increasing complexity results in decreased adherence. While the modification proposed by Myint and colleagues may be a statistical improvement, the key question is: Will the improved performance characteristics outweigh the inevitable increased confusion and decreased use as a result of the increased complexity and yet another change to the recommended prognostic criteria for CAP?

Gavin Barlow
Castle Hill Hospital, Cottingham, East Yorkshire HU16 5JQ, UK; gavin.barlow@tesco.net

References

1 **Barlow GD**, Nathwani D, Davey P. Improving the management of community-acquired pneumonia: barriers to high-quality care in a United Kingdom teaching hospital. Poster presentation (P1134). *13th European Congress of Clinical Microbiology and Infectious Diseases*; May 2003, Glasgow, UK. *Clin Microbiol Infect* 2003;**9**(Suppl 1).
2 **Barlow G**, Nathwani D, Williams F, *et al*. Reducing door to antibiotic time in community-acquired pneumonia: controlled before and after evaluation and cost-effectiveness analysis. *Thorax* 2007;**62**:67–74.

Birth weight and adult lung function

In a recent paper published in *Thorax* Canoy and co-workers[1] concluded that babies with lower birth weight and poor infant growth may be at a higher risk of developing impaired adult pulmonary function. In contradiction to these findings, no association was found between birth weight and adult lung function or between birth weight and asthma symptoms in a Nordic-Baltic population studied by Laerum *et al*.[2] Studies of birth characteristics and respiratory outcomes give contradictory results as methods used in different studies vary. Although Canoy *et al*[1] showed some interesting findings in a large cohort study, it raises some methodological questions and thereby interpretation of the findings.

The authors state that data on potential confounders and mediating factors operating throughout the life course were prospectively collected. Many of the known early life variables and adult variables were taken into consideration in logistic regression analyses. Canoy *et al* have focused on the nutritional status of the mother and birth weight. However, I wonder whether some relevant factors known to influence weight during the first year of life were missing. For example, it is a known fact that children of diabetic mothers often have heavier babies (large for gestational age) at birth compared with other term babies. This has not been discussed in the paper. Furthermore, have the authors taken into account factors that could influence the development of weight during the first year? What about the nutritional status of the children or conditions that may lead to nutritional disorders during the first year? Did the authors consider other chronic childhood disorders that may impair growth? Only two measurements of weight (at birth and around 12 months of age) during the first year will hardly reflect the natural growth of the child over time.

The authors mention that weight gain during the first year was positively associated with lung function later in life, which remained significant after adjustments for

various potential confounders across the life course. What about children with respiratory symptoms early in life? Studies have shown that there is an association between initial airway symptoms and later lung function and respiratory illnesses,[3] and that subjects with asthma have persistent reduced lung function.[4] Finally, did the authors account for family history of asthma and/or atopy or allergic sensitisation? In my opinion, many confounders and factors that may have an effect on the outcome were not addressed adequately in this paper, so the conclusions drawn may not be relevant.

Chandra Sekhar Devulapalli
Department of Paediatrics, Ringerike Hospital, NO-3504 Hønefoss, Norway;
c.s.devulapalli@medisin.uio.no

Competing interests: None.

References

1 **Canoy D**, Pekkanen J, Elliott P, *et al.* Early growth and adult respiratory function in men and women followed from the fetal period to adulthood. *Thorax* 2007;**62**:396–402.
2 **Laerum BN**, Svanes C, Gulsvik A, *et al.* Is birth weight related to lung function and asthma symptoms in Nordic-Baltic adults? *Respir Med* 2004;**98**:611–8.
3 **Martinez FD**, Wright AL, Taussig LM, *et al.* Asthma and wheezing in the first six years of life. The Group Health Medical Associates. *N Engl J Med* 1995;**332**:133–8.
4 **Sears MR**, Greene JM, Willan AR, *et al.* A longitudinal, population-based, cohort study of childhood asthma followed to adulthood. *N Engl J Med* 2003;**349**:1414–22.

Impairment of the swallowing reflex in exacerbations of COPD

An exacerbation of chronic obstructive pulmonary disease (COPD) has a serious impact on disease progression and is associated with high medical costs, but the cause of about one-third of exacerbations cannot be identified.[1] Adequate protective reflexes in the airways play an important role in the prevention of aspiration of bacteria-containing oropharyngeal or gastric secretions. Impairment of these reflexes, such as the swallowing reflex, therefore represents a potential risk factor for exacerbations of COPD. We have conducted a cross-sectional survey to evaluate the prevalence of impairment of the swallowing reflex in patients with COPD and to determine whether this is a risk factor for COPD exacerbations.

Fifty clinically stable patients with COPD were enrolled from the outpatient clinic of Ishinomaki Red Cross Hospital, Ishinomaki, Japan. Patients who were current smokers and those with oral corticosteroid use, oral and pharyngeal cancer, previous head and neck surgery, neuromuscular disease and oesophageal disease were excluded. Twenty-five patients (22 men and 3 women) had at least one exacerbation during the previous year, while the other 25 patients (21 men and 4 women) were stable. In the exacerbation group the patients had 2.4 (range 1–10) exacerbations per year, and 20 patients (80%) required hospital admission. There was no significant difference between the stable group and the exacerbation group in age (mean (SE) 75.0 (1.3) years vs 77.2 (1.0) years), forced expiratory volume in 1 s (FEV_1) (mean (SE) 1.11 (0.11) l vs 1.07 (0.09) l), percentage predicted value of FEV_1 (mean (SE) 47.1 (3.7)% vs 50.1 (3.7)%) and the rate of home oxygen therapy (4% vs 20%). All patients were eating an entirely oral diet without complaining of dysphagia prior to enrolment.

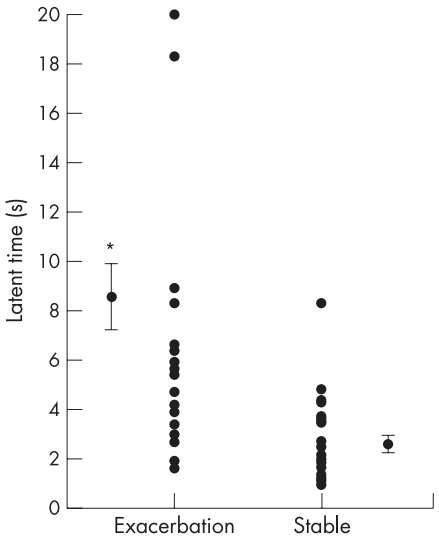

Figure 1 Comparison of latent time of the swallowing reflex in patients with exacerbations of chronic obstructive pulmonary disease and those with stable disease.

We evaluated the swallowing reflex on the basis of the latency of response to the onset of the swallowing action timed from the injection of 1 ml distilled water into the pharynx through a nasal catheter.[2] The mean (SE) latent time of the swallowing reflex was significantly longer in the exacerbation group than in the stable group (8.6 (1.3) s vs 2.6 (0.3) s, $p<0.001$; fig 1). We classified a response as normal or impaired according to whether the swallowing reflex was induced within 3 s of the injection. In the exacerbation group 22 of 25 patients (88%) exhibited an impaired response compared with 8 of 25 patients (32%) in the stable group ($p<0.001$). Impairment of the swallowing reflex was significantly associated with an exacerbation of COPD (relative risk 2.8, 95% confidence interval 1.5 to 5.0).

These results indicate that there is a high incidence of impairment of the swallowing reflex in patients with COPD and this is a risk factor for an exacerbation of COPD. To date, there are few published reports available on swallowing dysfunction in patients with COPD.[3–5] The impact of impairment of the swallowing reflex in COPD exacerbations has not been clarified. The findings of our study highlight a novel risk factor for exacerbations of COPD and raise the possibility that precautions against aspiration could be useful to prevent these exacerbations.

Acknowledgements

The authors thank Dr Naoya Fujino for data collection.

Seiichi Kobayashi
Department of Respiratory Medicine, Ishinomaki Red Cross Hospital, Ishinomaki, Japan

Hiroshi Kubo
Department of Geriatrics and Respiratory Medicine, Tohoku University School of Medicine, Sendai, Japan

Masaru Yanai
Department of Respiratory Medicine, Ishinomaki Red Cross Hospital, Ishinomaki, Japan

Correspondence to: Dr Seiichi Kobayashi, Department of Respiratory Medicine, Ishinomaki Red Cross Hospital, 71 Nishimichishita, Hebita, Ishinomaki, Miyagi 986-8522, Japan; skoba-thk@umin.ac.jp

doi: 10.1136/thx.2007.084715

Funding: None

Competing interests: None.

References

1 **Donaldson GC**, Wedzicha JA. COPD exacerbations. 1: Epidemiology. *Thorax* 2006;**61**:164–8.
2 **Ebihara T**, Sekizawa K, Nakazawa H, *et al.* Capsaicin and swallowing reflex. *Lancet* 1993;**341**:432.
3 **Stein M**, Williams AJ, Grossman F, *et al.* Cricopharyngeal dysfunction in chronic obstructive pulmonary disease. *Chest* 1990;**97**:347–52.
4 **Good-Fratturelli MD**, Curlee RF, Holle JL. Prevalence and nature of dysphagia in VA patients with COPD referred for videofluoroscopic swallow examination. *J Commun Disord* 2000;**33**:93–110.
5 **Mokhlesi B**, Logemann JA, Rademaker AW, *et al.* Oropharyngeal deglutition in stable COPD. *Chest* 2002;**121**:361–9.

Intravascular air and CT

Dr Ku and co-workers wrote an interesting article describing a patient with air emboli in the superior vena cava surrounding a central venous catheter (CVC) and bilateral pulmonary opacities recognised on contrast enhanced chest CT.[1] The round pulmonary opacity was noted on chest radiograph soon after insertion of the CVC. From these findings, they suggest that this is a rare case of venous air pulmonary infarction mimicking round pneumonia. However, further evidence should be obtained to support this assumption.

CT is highly sensitive for the detection of small amounts of intravascular air, which can be found in the central veins in up to 23% of patients on contrast-enhanced CT and it rarely results in symptoms unless there is a right to left shunt.[2–4] It is introduced during insertion of the venous catheter or more frequently accidental injection of air during intravenous injections (fig 1).

Normal lung tissue receives dual blood supply from pulmonary and bronchial arteries. Pulmonary infarct is infrequent after acute obstruction of the pulmonary artery because the bronchial circulation plays an important role

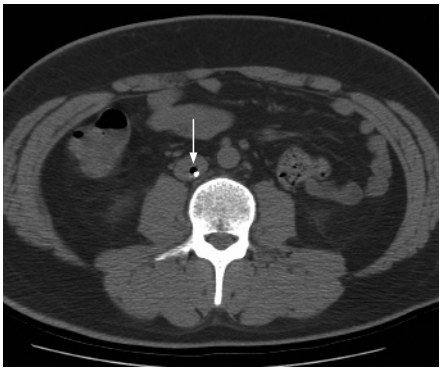

Figure 1 Air bubble trapped around the central venous catheter in the inferior vena cava (arrow) was incidentally noted on non-enhanced CT scan of the abdomen.