DOI:
10.1136/thoraxjnl-2016-209212

Document Version
Peer reviewed version

Outcomes from hospitalised acute exacerbations of COPD: a bundle of optimism?

William D-C. Man [1]

Ruth Barker [1]

Matthew Maddocks [2]

Samantha S. C. Kon [1, 3, 4]

1. NIHR Respiratory Biomedical Research Unit, Royal Brompton and Harefield NHS Foundation Trust and Imperial College, London, UK.

2. King's College London, Cicely Saunders Institute, London, UK.

3. The Hillingdon Hospitals NHS Foundation Trust, London, UK.

4. Hillingdon Integrated Respiratory Care Team

Correspondence to:

Dr William Man

Department of Respiratory Medicine, Harefield Hospital, Hill End Road, UB9 6JH

Tel: 01895 823737 Fax: 01895 828851

Email: w.man@rbht.nhs.uk

Exacerbations of COPD place enormous stress upon acute healthcare systems – they are one of the commonest causes of emergency hospital admission, and frequently result in readmission. Acute healthcare provision in England and Wales has adapted to deliver "front-door" efficiency, with the rise of acute physicians and an emphasis on seeing hospitalised patients quickly to improve safety and facilitate early discharge – an example of the popular healthcare improvement mantra that "every system is perfectly designed to get the results it gets". From this perspective, the results of the most recent national secondary care COPD audit are highly satisfying, demonstrating reduced inpatient mortality and length of stay (1). However, there is substantial national variation in acute care (1) and readmission rates remain worryingly high, with more than 60% of patients readmitted to hospital at least once in the year following discharge (2).

Outcomes from acute exacerbations of COPD are dependent on several factors beyond quality of care. These include the severity of the acute event, whether physiological derangements respond and improve to treatment during the admission (3), the baseline severity of respiratory disease in the individual, the influence of comorbidities and extra-pulmonary manifestations such as sarcopenia and frailty (4-7)), as well as the individual's self-management skills and resilience (8).

This is illustrated by the work from Hodgson *et al* in this issue of *Thorax,* which demonstrates that the National Early Warning Score (and supposed respiratory patient-specific variations) that identify acute physiological derangements, have only modest discrimination in predicting in-patient mortality in COPD (9). Measuring change in physiological derangements during an admission gives added information (3), whilst the composite DECAF score, which includes a baseline measure of respiratory disability

(extended MRC dyspnoea score) as well as clinical indicators of the admission severity (e.g. consolidation and acidaemia), show much better discrimination for in-hospital mortality (10).

It is difficult to entirely divorce what occurs during the acute inpatient stay with what occurs in the post-discharge period and beyond, and important to remember that even for a "revolving door" patient, much greater time is spent outside than inside the acute hospital setting. Furthermore, from the patient perspective, a hospitalisation is a devastating life-event with significant physical and psychosocial ramifications (11) that persist beyond the typical hospital stay following an acute exacerbation of COPD. To standardise and potentially improve the delivery of post-discharge care in COPD, there is growing enthusiasm for the role of discharge bundles to provide a structured *aide memoire* of evidence-based practices (12, 13) that can be delivered for all patients with a condition, irrespective of ward, specialty, or profession delivering care. Typically, a bundle should contain three to five practices that when performed collectively and reliably, improve patient outcomes. However, as is often of the case with interventions developed from quality improvement initiatives, the accompanying evidence has largely arisen from uncontrolled before- after study designs with an inherent high risk of bias.

The systematic review from Ospina *et al* in this issue of *Thorax* (14) is therefore welcome in collating current available evidence for discharge bundles in COPD. The authors were able to perform meta-analyses using data from randomised controlled trials, which demonstrated that discharge bundles were associated with fewer readmissions, albeit with no impact on health related quality of life or mortality. These findings are perhaps not as

optimistic as some would hope for, and certainly not as impressive as findings from trials and systematic reviews of post-hospitalisation pulmonary rehabilitation (15-18).

Ospina *et al* highlight several practical issues surrounding discharge bundles. Consensus is lacking as to the optimal number of components in a bundle, or which components are considered core and optional. There was significant heterogeneity in both the number and type of components, ranging from 2 to 12 components of 26 distinct interventions that were included within discharge bundles. Included studies often did not provide information on how the components of the bundle were generated or chosen. Some components would be considered good practice and common sense, e.g. assessing use of medications, but have not been rigorously tested in the post-discharge period. Remarkably, there was not a single common intervention across the discharge bundles described in the four randomised controlled trials included for meta-analysis for readmissions. This raises the issue of whether a "one size fits all" discharge bundle, appropriate for all patients and localities, can or even should be realised. A recent study in *Thorax* has shown that gait speed, a simple surrogate marker of frailty, measured on the day of hospital discharge showed excellent discrimination in predicting readmission in older patients with COPD (4). This demonstrates the large heterogeneity in readmission risk between individuals (3, 4), and distinct cohorts of patients with complex needs that might require increased and more individualised input than can be offered through a discharge bundle.

The implementation of discharge bundles can also be challenging. A recent retrospective study identified 28 different barriers, many of which related to staff resources and engagement (19). Patient-related factors, such as cognitive impairment or psychological distress, can also have a significant impact on implementation (11). Even with broad staff

and patient acceptance of a discharge bundle, there is little guarantee that the individual components can be actioned. For example, the recent snapshot audit of pulmonary rehabilitation services in England and Wales revealed very patchy provision of post-hospitalisation pulmonary rehabilitation. Even in local healthcare systems where a discharge bundle is in use and there are adequate pulmonary rehabilitation services, referral to and completion of post-hospitalisation pulmonary rehabilitation is disappointing (20).

Although the systematic review from Ospina *et al* demonstrates the potential value of discharge bundles, larger trials of higher methodological quality are required to strengthen the evidence base for their effectiveness. Discharge bundles are conceptually simple and attractive, but are unlikely to achieve their desired effects or full potential without greater consideration of the challenges associated with implementation. Dr. W. Edwards Deming, the American statistician and management consultant who was credited as the inspiration for the post-war Japanese economic recovery, believed that quality could be improved with costs reduced simultaneously by practising continual improvement and thinking of productivity as a system, not as individual components. Discharge bundles are only one component of a wider integrated system of care for COPD, and their true value perhaps lies in facilitating better integration between acute and chronic care for this patient population.

References

1. Stone RA, Holzhauer-Barrie J, Lowe D, Searle L, Skipper E, Welham S, et al. COPD: Who cares matters. National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Clinical audit of COPD exacerbations admitted to acute units in England and Wales 2014. National clinical audit report London: RCP, February. 2015.
2. Greening NJ, Williams JE, Hussain SF, Harvey-Dunstan TC, Bankart MJ, Chaplin EJ, et al. An early rehabilitation intervention to enhance recovery during hospital admission for an exacerbation of chronic respiratory disease: randomised controlled trial. BMJ. 2014;349:g4315.

3. Suh ES, Mandal S, Harding R, Ramsay M, Kamalanathan M, Henderson K, et al. Neural respiratory drive predicts clinical deterioration and safe discharge in exacerbations of COPD. Thorax. 2015;70(12):1123-30.
4. Kon SS, Jones SE, Schofield SJ, Banya W, Dickson MJ, Canavan JL, et al. Gait speed and readmission following hospitalisation for acute exacerbations of COPD: a prospective study. Thorax. 2015;70(12):1131-7.
5. Jones SE, Maddocks M, Kon SS, Canavan JL, Nolan CM, Clark AL, et al. Sarcopenia in COPD: prevalence, clinical correlates and response to pulmonary rehabilitation. Thorax. 2015;70(3):213-8.
6. Maddocks M, Kon SS, Canavan JL, Jones SE, Nolan CM, Labey A, et al. Physical frailty and pulmonary rehabilitation in COPD: a prospective cohort study. Thorax. 2016.
7. Greening NJ, Harvey-Dunstan TC, Chaplin EJ, Vincent EE, Morgan MD, Singh SJ, et al. Bedside assessment of quadriceps muscle by ultrasound after admission for acute exacerbations of chronic respiratory disease. Am J Respir Crit Care Med. 2015;192(7):810-6.
8. Bucknall CE, Miller G, Lloyd SM, Cleland J, McCluskey S, Cotton M, et al. Glasgow supported self-management trial (GSuST) for patients with moderate to severe COPD: randomised controlled trial. BMJ. 2012;344:e1060.
9. Hodgson LE, Dimitrov BD, Congleton J, Venn R, Forni LG, Roderick PJ. A validation of the National Early Warning Score to predict outcome in patients with COPD exacerbation. Thorax. 2016.
10. Steer J, Gibson J, Bourke SC. The DECAF Score: predicting hospital mortality in exacerbations of chronic obstructive pulmonary disease. Thorax. 2012;67(11):970-6.
11. Man WDC, Puhan MA, Harrison SL, Jordan RE, Quint JK, Singh SJ. Pulmonary rehabilitation and severe exacerbations of COPD: solution or white elephant? ERJ Open Research. 2015;1(2):00050-2015.
12. Hopkinson NS, Englebretsen C, Cooley N, Kennie K, Lim M, Woodcock T, et al. Designing and implementing a COPD discharge care bundle. Thorax. 2012;67(1):90-2.
13. Turner AM, Lim WS, Rodrigo C, Welham SA, Calvert JM. A care-bundles approach to improving standard of care in AECOPD admissions: results of a national project. Thorax. 2015;70(10):992-4.
14. Ospina M, Mrklas K, Deuchar L, Rowe B, Leigh R, Bhutani M, et al. A systematic review of the effectiveness of discharge care bundles for patients with chronic obstructive pulmonary disease. Thorax. 2016.
15. Man WD, Polkey MI, Donaldson N, Gray BJ, Moxham J. Community pulmonary rehabilitation after hospitalisation for acute exacerbations of chronic obstructive pulmonary disease: randomised controlled study. BMJ. 2004;329(7476):1209.
16. Puhan MA, Gimeno-Santos E, Scharplatz M, Troosters T, Walters EH, Steurer J. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2011(10):CD005305.
17. Seymour JM, Moore L, Jolley CJ, Ward K, Creasey J, Steier JS, et al. Outpatient pulmonary rehabilitation following acute exacerbations of COPD. Thorax. 2010;65(5):423-8.
18. Maddocks M, Kon SS, Singh SJ, Man WD. Rehabilitation following hospitalization in patients with COPD: can it reduce readmissions? Respirology. 2015;20(3):395-404.
19. Lennox L, Green S, Howe C, Musgrave H, Bell D, Elkin S. Identifying the challenges and facilitators of implementing a COPD care bundle. BMJ Open Respir Res. 2014;1(1):e000035.
20. Jones SE, Green SA, Clark AL, Dickson MJ, Nolan AM, Moloney C, et al. Pulmonary rehabilitation following hospitalisation for acute exacerbation of COPD: referrals, uptake and adherence. Thorax. 2014;69(2):181-2.