British Thoracic Society
NIV Audit 2012 (national audit period 1 February – 31 March 2012)

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THE third BTS national acute non-invasive ventilation (NIV) audit continues to build on the preceding two and is the biggest yet. 130 hospitals have submitted data on 2490 patients, an increase of 14% on last year. Sincere thanks to Dr Craig Davidson, who stands down this year, for leading such a successful audit to date.

Patient characteristics

The average age in 2012 was 72 years (56% female). Of the 2490 patients, 42% were documented to have a poor performance status (very limited, or bed/chair-bound) prior to admission and a further 38% were limited, but self-caring. 26% had been treated with acute NIV previously.

COPD was the presumptive diagnosis in 70%, Obesity-hypoventilation in 9% and cardiogenic pulmonary oedema in 10%. However, spirometry measurements were available in only 22% patients in whom a diagnosis of COPD was listed. This limited use of simple diagnostic tests in respiratory patients is consistent with other studies and contrasts with the widespread utilisation of echocardiography in patients with suspected heart failure[1].

Oxygen-associated hypercapnia (toxicity) was felt to be implicated in 453 patients (18%), a slight reduction in comparison to 2011, but remaining significant nonetheless. Hospital teams appear to be more aware of the danger of excessive oxygen than in previous years (52% of the total in 2012 vs. 62% in 2011). More important is the real increase in pre-hospital oxygen toxicity. Ambulance services should provide acutely unwell COPD patients with 28% oxygen (unless in extremis). The importance of these universal recommendations is emphasised.

Outcomes

A notable finding across the three audits is the marked consistency of blood gas measurements. This year, median $PaCO_2$ at the start of NIV was 10.2 kPa, falling to 8.9kPa at 1–2 hours, and 8.3kPa by 4–6 hours. Median pH was 7.25 at the onset of NIV, 7.30 at 1–2 hours and 7.33 at 4–6 hours. Positive findings include the fact that fewer non-hypercapnic patients are being treated with NIV in a non-ITU setting (6.3% in 2012 vs. 8.4% in 2011). In addition, non-acidotic patients appear less likely to be treated with NIV (13.3% in 2011, 9.5% in 2012), suggesting increasing adherence to guidelines.

NIV was documented to be an effective therapy in 69% (68% in 2011). NIV failure was noted in 27%, and a further 2.7% failed NIV, but proceeded to intubation (Figure 1). In keeping with blood gas results, ventilator modes and settings were similar to previous audits. NIV was employed for an average of 15 of the first 24 hours at median pressure settings of IPAP 16.5 cmH_2O and EPAP 5 cmH_2O. As reported last year, such IPAP pressures are quite modest. This year, less than 10% patients reached an IPAP > 20 cmH_2O by the first hour and a further 9% received IPAP < 10 cmH_2O. Whether there is any link between ventilatory settings and outcome cannot be determined from the data available. However, the most common reason for NIV failure was a worsening $PaCO_2$ or conscious level (45%), suggesting a role for more aggressive early optimisation of ventilation. There is clearly a therapeutic window for some and it would be interesting to see if a shift towards increased IPAP in subsequent audits leads to an improved rate of NIV success.

The medical notes document a plan for NIV failure in 76%. In those recording a plan, NIV was the ceiling of therapy for 66% and there was a plan to proceed to intubation for 17%. Doctors below ST3 grade appear less likely to be making decisions about what to do if NIV fails (FY2 1.2%, ST1–2 3.3%, ST3+ 34.5%, consultant 38.9%, not recorded 21%). There remains a mix of speciality involvement in decision-making; respiratory in 45%, acute and general medicine in 38%, and intensivists in 12%.

Deaths due to a respiratory cause for the whole group were 26% (25% in 2011). Unsurprisingly, outcomes were poor in the group failing on NIV, in whom 74% died due to a respiratory cause. Intubation rates remain low (2.7% total vs. 3.8% in 2011 and 2.3% in 2010). However, outcomes following invasive ventilation were perhaps encouraging with respiratory mortality recorded at 33%. The reasons around the low rate of referral to ITU cannot be determined, but one hopes that therapeutic nihilism is not relevant here. The data does show that most patients failing on NIV with a prior plan for intubation do actually proceed to intubation. Whether a greater proportion should be considered is uncertain. Whilst prior performance status is only one of the factors considered, attention is drawn to the fact that 13% of the total group were unrestricted / restricted on strenuous exertion beforehand, and 38% were limited, but self-caring.

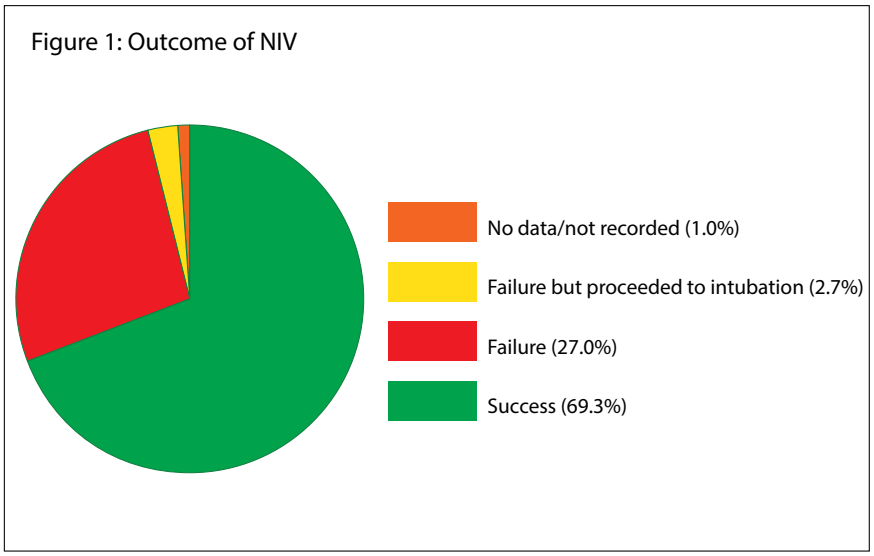
Regarding patient selection, those with probable pneumonia continue to receive acute NIV, with documentation of consolidation in 40%. Treatment intent appeared to be more active in this group, with NIV as the ceiling of therapy in a smaller proportion (52%). Outcome data is available this year and is in keeping with NCROP data. NIV failure was more likely in those with consolidation (34%) than those without (22%); death due to a respiratory cause was also considerably higher (34% vs. 18% without consolidation). The 2008 NCROP audit[2] reported the presence of pneumonia in 21% of NIV-treated patients, in whom the mortality was 30% and so our current audit data suggests movement in the wrong direction. If the decision would be to

intubate the patient in the event of NIV failure, then this writer feels that the presence of pneumonia should lead to careful consideration of the merits and pitfalls of applying NIV outside an ITU environment.

Median length of stay in this audit was 10 days. Respiratory follow-up was planned for a smaller proportion of patients this year (67%), despite the clear evidence showing high readmission rates and poorer outcomes in this group. Pulmonary rehabilitation was organised for 8%. On discharge, 10% (n= 248) were supported with domiciliary NIV, 32% (n = 534) were discharged home on LTOT and 16% (n = 242) of the total group were issued with an oxygen card. It is noteworthy that the median $PaCO_2$ on discharge was 7.2 kPa. We draw attention to the ongoing UK multi-centre clinical trial (HOT-HMV)[3], comparing domiciliary NIV vs. home oxygen treatment in COPD patients following acute acidotic respiratory failure.

On a positive note, outcomes on NIV in real life remain consistent with results from clinical trials. The 2012 audit tool remains available on the BTS website, enabling units to benchmark their own performance. We are very grateful to those who submitted data in the current audit and have made suggestions regarding the audit tool for 2013. I hope that everyone who participated will continue to provide such valuable data and encourage others to join. This audit identifies a number of areas where simple changes could potentially improve the delivery of care and patient outcomes; more spirometry, more careful consideration of the hypercapnic patient with consolidation, more rigorous decision-making in the event of NIV failure, more IPAP (perhaps), and more follow-up on discharge. Finally, please consider COPD patients for the HOT-HMV trial if available in a centre near to you. Let's make the 2013 audit one in which we can celebrate a notable improvement in service delivery!

Dr Mike Davies, October 2012



References

1. Torrubia-Fernandez MJ et al. An Med Interna 2008 25(5):222-225
2. Roberts CM et al. Thorax 2011 66(1):43-48
3. HOT-HMV trial details accessed at http://public.ukcrn.org.uk/search/StudyDetail.aspx?StudyID=8059