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### A smoking cessation program in the neonatal intensive care unit

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## A smoking cessation program in the neonatal intensive care unit

### Abstract

Background: Parental smoking remains a significant risk to the preterm infant both pre and post delivery. Pharmacologically supported interventions have been previously contraindicated in this group during the perinatal period and during breastfeeding. We designed an evidence-based intervention for use in our high-risk population. This report assesses our outcomes after one year. Method: Questionnaire administered a median of 6 months after intervention. Results: There was no significant difference between those participants who returned the survey ( $n = 42$ ) versus the group as a whole ( $n = 70$ ). A total of 33% ceased smoking,  $p < .0001$ . If no nonresponders ceased smoking then this gives an overall success rate of 20%,  $p < .0001$ . Successful quitters had been smoking for a mean of 11 (SD = 7) years. Self-reported light smokers ( $< 10$  cigarettes per day) were significantly more likely to quit ( $p < .01$ ). Purchase of follow-on nicotine patches was a significant predictor of success in quitting ( $p = .02$ ). If relapse occurred, it appeared to happen early and was mainly associated with current stressors. Conclusions: We have designed and applied a multidisciplinary intervention for parents and carers to be used in the perinatal period to decrease the postnatal risk for neonatal intensive care graduates. Our rates of successful smoking cessation are as good as, or better than, many published rates for opportunistic intervention. We suggest that randomised trials be focused on ways to further improve interventions at this time of opportunity for these infants and their families.

### Keywords

Smoking, neonate, nicotine replacement, premature, multidisciplinary

### Disciplines

Medicine and Health Sciences | Social and Behavioral Sciences

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# A Smoking Cessation Program in the Neonatal Intensive Care Unit

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**B**ackground: Parental smoking remains a significant risk to the preterm infant both pre and post delivery. Pharmacologically supported interventions have been previously contraindicated in this group during the perinatal period and during breastfeeding. We designed an evidence-based intervention for use in our high-risk population. This report assesses our outcomes after one year. *Method:* Questionnaire administered a median of 6 months after intervention. *Results:* There was no significant difference between those participants who returned the survey ( $n = 42$ ) versus the group as a whole ( $n = 70$ ). A total of 33% ceased smoking,  $p < .0001$ . If no nonresponders ceased smoking then this gives an overall success rate of 20%,  $p < .0001$ . Successful quitters had been smoking for a mean of 11 ( $SD = 7$ ) years. Self-reported light smokers ( $< 10$  cigarettes per day) were significantly more likely to quit ( $p < .01$ ). Purchase of follow-on nicotine patches was a significant predictor of success in quitting ( $p = .02$ ). If relapse occurred, it appeared to happen early and was mainly associated with current stressors. *Conclusions:* We have designed and applied a multidisciplinary intervention for parents and carers to be used in the perinatal period to decrease the postnatal risk for neonatal intensive care graduates. Our rates of successful smoking cessation are as good as, or better than, many published rates for opportunistic intervention. We suggest that randomised trials be focused on ways to further improve interventions at this time of opportunity for these infants and their families.

**Keywords:** smoking, neonate, nicotine replacement, premature, multidisciplinary

In the most recent household survey undertaken in Australia it was identified that approximately 22.9% of women aged 20–29 years and 21.8% of women aged 30–39 years are current smokers of nicotine (Australian Institute of Health and Welfare [AIHW], 2005), with approximately 20% continuing to smoke during pregnancy (McDermott, Russell, & Dobson, 2002). These rates vary between countries, with an estimated 12.6% of pregnant women in the United States (Center for Disease Control and Prevention [CDC], 2007) and 17% of United Kingdom women continuing to smoke during pregnancy (Information Centre, 2006). Smokers are likely to be overrepresented in the mothers of infants requiring neonatal intensive care (NICU), with the relative risk of admission to the NICU for these neonates

being increased by at least 20% compared to mothers who do not smoke (Adams et al., 2002). Conversely, the prevalence of smoking among mothers with premature infants ranges between 34% and 49% (Elder et al., 1999; Gennaro et al., 2001; Horta et al., 1997), but a significant number of fathers also smoke (Horta et al., 1997), so that the overall exposure of the NICU infant to environmental tobacco smoke from parents and carers may, in our experience, be as high as 75%.

Environmental tobacco smoke remains a significant risk for NICU graduates after leaving hospital, with higher rates of neonatal morbidity and mortality (Aligne & Stoddard, 1997; Cnattingius & Nordstrom, 1996; DiFranza & Lew, 1996). Increased rates for both respiratory disorders (Aligne & Stoddard, 1997; DiFranza &

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Lew, 1996; Lodrup Carlsen & Carlsen, 2001) and sudden infant death syndrome (SIDS; Aligne & Stoddard, 1997; Klonoff-Cohen et al., 1995) have been found in those neonates exposed to tobacco smoke both *in utero* and postpartum. Access to tobacco increases the risk of nicotine toxicity and access to smoking paraphernalia increases the risk of burns in young children (Aligne & Stoddard, 1997; DiFranza & Lew, 1996). Children whose carers smoke are also more likely to take up smoking later in life (O'Callaghan et al., 2006), with all the associated health risks.

In view of these significant risks to the infants leaving our NICU, we wished to find ways to reduce their rate of smoking exposure. At the time of our intervention, behavioural treatments were the recommended front-line treatment for nicotine dependence. Nicotine replacement could be used in the event that behavioural interventions were not successful. While only one form of nicotine replacement, inhalers (Nicorette® Inhaler, Pharmacia Pty Australia) was routinely approved for lactating women (New South Wales Health, 2002), inhalers were more expensive than other forms of nicotine replacement and only transdermal nicotine patches (Nicobate® Patches, GlaxoSmithKline Consumer Healthcare, Australia) were available in our hospital formulary at the time of our intervention.

### The John Hunter NICU Smoking Cessation Program

Smoking carers were identified by examining the antenatal history sheet, by questioning and by smell. We offered smoking carers of NICU infants 2 weeks supply of nicotine patches, with brief motivational counselling, supply of written smoking cessation information (QUIT kits, New South Wales [NSW] Department of Health, Australia) and QUIT program registration (NSW Department of Health, Australia) — a telephone counselling service to support smoking cessation. Motivational counselling (Miller & Rollnick, 1991) was largely provided by one of the authors (SW) a neonatal Clinical Nurse Consultant (CNC), supported by information, advice and clinical supervision by Drug and Alcohol staff (from within John Hunter Hospital). Nicotine patches were prescribed by a neonatologist (14–21 milligram patches, dependent on smoking history), with support from a pharmacist (KR), both of whom may also have provided brief motivational counselling. The CNC continued to follow up the family; either within the NICU, by telephone or within the routine neonatal outpatient clinic visits. Our aim in this study was to assess the smoking cessation outcomes after running the program for 12 months.

### Method

A standardised questionnaire (available on request) was mailed to 70 participants of the program, identified from hospital records. Data was also collected in routine

neonatal outpatient clinic visits and telephone contact was made for initial nonresponders.

Results were analysed using InStat (GraphPad, San Diego, California). A probability of  $p < .05$  was considered statistically significant. Proportions were analysed using Fisher's exact test. Proportion of successful cessation was compared to an assumed cessation rate of zero. Continuous data was described using medians or means depending on the normality of the data. Normally distributed continuous data was compared with unpaired  $t$  tests.

### Results

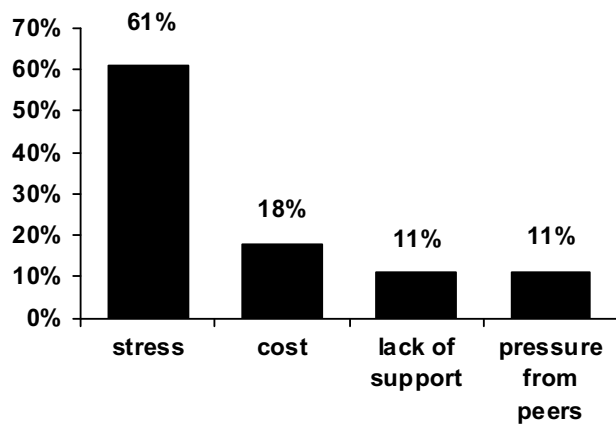
Questionnaires were returned from 42 (60%) respondents. The characteristics of those returning the survey appeared to be representative of the group as a whole: there was no significant difference between those participants who returned the survey versus the group as a whole with regards to gender (61.9% vs. 62.9%) or transdermal nicotine dose prescribed (73.8% received 21 mg/24 hr. vs. 78.6% 21 mg/24 hr). Although survey return rate was lower from the early part of the program compared to later (51% vs. 78%), this did not reach statistical significance.

At a median time of 6½ months after transdermal nicotine patch use (range 3–9 months) 14 (33%) of the respondents were not smoking (95% CI: 25–44%,  $p < .0001$ , compared to zero cessation). If it is assumed that none of the nonresponders ceased smoking then there was an overall success rate of 20% (95% CI: 16–24%,  $p < .0001$ , compared to no cessation).

Further analysis of associated factors could only be undertaken in those who returned a questionnaire. Successful use of the quitting program was not associated with sex of the smoker, dose received or whether the program was commenced in hospital or at home. Continuing smokers had been smoking for a mean of 13 years ( $SD = 7$  years) compared to 11 years for successful quitters ( $SD = 7$  years). This was not statistically different. Self-reported light smokers (<10 cigarettes per day) were significantly more likely to quit than those admitting to greater use ( $p < .01$ ).

Twenty-eight respondents remembered getting an information leaflet (67%); there was no statistical difference in this between successful quitters and those who were unsuccessful. A total of 75% of those responding thought the information was useful, but only one third of these gave up. Staff members recalled as providing advice were: neonatal nurse (90%), neonatologist (50%) and neonatal pharmacist (43%). Most felt that this was helpful (87%, 71% and 72% respectively) but a positive response was not associated with successful quitting.

Only 40% said that they had purchased the follow-up patches after the initial 2 weeks supply. A total of 64% of those who quit long term bought the follow-on patches compared to 25% of those who continued to



**Figure 1**

Factors stated as being involved in restarting or continuing smoking,  $n = 42$  (more than one factor may have been nominated by each individual).

smoke. Purchase of follow-on patches was a significant predictor of success in quitting ( $p = .02$ ).

Twenty-nine respondents (69%) quit initially, but 15 of these restarted; giving a relapse rate of 52%. Median time to relapse was 3 weeks, with a range of 0.5–12 weeks after the program started. Factors cited in restarting or continuing smoking are shown in Figure 1.

Although we have not assessed formally beyond the initial review, these families of sick infants are usually followed for at least the first year of life. During that time we are not aware of any of the initial successful quitters who have restarted smoking. Two further smokers, who failed to quit originally, have since ceased smoking, one with support alone and the other with a repeat transdermal nicotine patch program.

## Discussion

Several studies and Cochrane reviews have been performed investigating interventions for smoking behaviours in settings similar to ours with mixed findings (Hollis et al., 1993; Lancaster and Stead, 2005; Lumley et al., 2004; Rice and Stead, 2006; Rigotti et al., 2002; Woodward et al., 1987; Valanis et al., 2001). Small, but significant increases in cessation have been found for brief physician advice (Lancaster & Stead, 2004), with increased benefit from intensive intervention over minimal advice. Nursing interventions have also been shown to improve the odds for quitting (Rice & Stead, 2006). Intensive interventions for hospital inpatients are also successful in improving cessation rates (Rigotti et al., 2002). Importantly, none of these studies were specifically in the NICU setting. Our success rates at least equal, and exceed many of, the published rates for opportunist intervention (Hollis et al., 1993; Lumley et al., 2004; Woodward et al., 1987; Valanis et al., 2001). Provision of nicotine replacement treatment was not necessarily a feature of all unsuccessful interventions, indicating that use of nicotine replacement is an impor-

tant component of clinical practice. Participants of most opportunistic nicotine cessation research tend to be targeted as a result of their own health status. We have attempted to obtain empathic engagement with the smoker through a joint concern for the neonate admitted to the NICU. It is our belief that this may provide the 'window of opportunity' often cited in the drug and alcohol treatment literature (Miller & Rollnick, 1991). Our findings further demonstrate that the NICU can actively support smoking cessation as being a powerful force to influence the motivation to change.

A major limitation of this study was the reliance upon self-report of smoking status. Self-report has, however, been found to be a valid means of assessing smoking status (Patrick et al., 1994). Objective measures, such as cotinine or carboxyhaemoglobin, can be useful, but are expensive and time consuming. This was not a randomised controlled trial and our assumption of a negligible cessation rate without intervention may be invalid. In our experience, however, those that smoke throughout pregnancy are unlikely to quit after the birth of a baby and this has been found by others (Woodward et al., 1987; Valanis et al., 2001).

Our findings demonstrate that a smoke-free environment can be an aim for our NICU graduates, using evidence-based interventions. Efforts to encourage smoking cessation antenatally should continue but, in addition, the application of smoking cessation strategies for all smoking carers of neonates admitted to the NICU should be a routine component of postpartum care. We suggest that randomised trials be focused on ways to further improve interventions at this time of opportunity for these infants and their families.

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