

# **PERCEPTIONS OF THE SAFETY AND EFFICACY OF NICOTINE AND NICOTINE REPLACEMENT THERAPY: A LITERATURE REVIEW**

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## Abstract

**Background:** Nicotine replacement therapy (NRT) is a proven efficacious and safe aid for smoking cessation. However, initiation of NRT use remains low, and among those who do use the products insufficient dosages and early termination are common. Poor utilisation rates may result from commonly held misperceptions about the safety and efficacy of nicotine and NRT.

**Method:** A literature review was conducted on published articles discussing smokers and ex-smokers perceptions of the safety and efficacy of nicotine and NRT. Articles were located via a database search, use of an internet search engine, as a result of being cited within another selected article, through an independent journal search, and through searches of New Zealand and overseas websites. Themes were extracted from all selected articles and the frequency with which they were identified in the articles was recorded. The themes were analysed as issues contributing to the under-utilisation of NRT.

**Results:** Twenty themes emerged from the review. The most commonly identified themes were knowledge deficits, prior NRT use, incorrect use of NRT, negative expectations of NRT, the view of willpower as the means to achieve abstinence, concerns about side effects and possible addiction to NRT, price, positive expectations and nicotine misperceptions.

**Conclusions:** The continued under-use of NRT appears to be sourced by negative expectations and safety concerns, which in turn result from knowledge deficits regarding nicotine and NRT products. Prior use of NRT and word-of-mouth appear to be the main formative source of smokers' expectations, and as such facilitating the correct usage of NRT products among those who do initiate use is crucial. Correct usage is more likely when smokers' knowledge about the role of nicotine and the safety and efficacy of NRT is more accurate.

## Introduction

Nicotine replacement therapy (NRT) is an efficacious aid for smoking cessation (Hughes et al 2003; Lancaster et al 2000; Shiffman et al 2002; Stead et al 2008), yet fewer than one in five smokers attempting to quit do so with the aid of an NRT product (Cummings and Hyland 2005). NRT is designed to reduce the physiological withdrawal symptoms experienced during quit attempts by replacing nicotine: the addictive chemical agent in tobacco products (Luty 2002). Use of NRT, with at least brief advice, increases the chance of successful smoking cessation by 50-70 percent, irrespective of setting or additional counselling support (Stead et al 2008). NRT is available as a transdermal patch, nasal spray, inhaler, gum, microtab, and lozenge. Comparative levels of effectiveness have been found for each of these NRT products (Lancaster et al 2000; Stead et al 2008). Efficacious pharmaceutical medications for smoking cessation are also available: namely bupropion, an antidepressant medication shown to assist cessation even in the absence of depression; the antihypertensive medication clonidine, efficacious yet of limited use due to side effects (Lancaster et al 2000; Luty 2002); and a recent addition showing promise, Varenicline: designed to reduce withdrawal, cravings, and the rewarding effects of continue tobacco use (Foulds 2006; Foulds et al 2004).

Minor adverse side effects associated with NRT have been reported and include skin sensitivity and irritation from the patch, gastrointestinal disturbance from the gum, mouth ulcers from the lozenge, and irritations at the sites of administration with the inhaler and nasal spray (Stead et al 2008). Such side effects may be difficult to distinguish from the nicotine withdrawal syndrome, which can include, for example, the common cold and mouth ulcers (Barrueco et al 2005; Ussher et al 2003). Although withdrawal symptoms after abrupt cessation of NRT can occur (Hughes 1989, cited in Luty et al 2002), the risk of becoming physiologically dependent on NRT is much lower than it is for cigarettes, due largely to the different route and slower delivery rate of nicotine into the body (Kozlowski et al 2007; OMA 1999; Zwar et al 2006). Therefore if one were to become dependent on an NRT product, overcoming this is likely to be much easier than overcoming an addiction to cigarettes, whilst the absence of the toxic compounds present in cigarettes renders NRT a far safer alternative (Kozlowski et al 2007; Luty et al 2002; OMA 1999; Stead et al 2008).

Indeed it is not the nicotine, rather the thousands of toxic constituents contained in tobacco products that generate the well-documented serious consequences to health (Hoffmann and Hoffmann 1997). The fundamental role of nicotine is that of addiction (Luty et al 2002); it is not carcinogenic or a cause of respiratory disease and although nicotine does affect the cardiovascular system, the main cause of smoking related heart disease results from the non-nicotine compounds of cigarettes (Hoffmann and Hoffmann 1997; OMA 1999; Zwar et al 2006).

NRT, therefore, does not cause cancer or lung disease (Kozlowski et al 2007), and there is no evidence of increased risk of heart disease or heart attack associated with its use (McRobbie 2001; OMA 1999; Stead et al 2008), even if using cigarettes and NRT concurrently (OMA 1999). Indeed concomitant use of NRT and cigarettes can facilitate smoking reduction and precede abstinence (Carpenter et al 2004; Etter et al

2002; Kunze 2000). The use of more than one NRT product at the same time is safe and appears to enhance efficacy (Stead et al 2008), and NRT can safely be used with adolescents (Zwar et al 2006), for those with high blood pressure, diabetes (NTCC 2007), and cardiovascular disease (Kozlowski et al 2007; Ministry of Health 2007c). Precautious use whilst pregnant or breastfeeding is deemed acceptable as the benefits of using NRT are presumed to outweigh the alternative health cost of continuing to smoke (Kozlowski et al 2007; Ministry of Health 2007c; Zwar et al 2006). Smoking cessation guidelines published by the New Zealand Ministry of Health recommend the use of NRT products by pregnant and breastfeeding women following a risk-benefit assessment and a preference for the intermittent use of oral NRT products over the patch (Ministry of Health 2007c).

Despite the existence of these safe and efficacious aids most quit attempts are made without the use of advice or a cessation product (Bansal et al 2004; Cummings et al 2004; Hammond et al 2004; Mooney et al 2006), and among those who do initiate NRT use compliance rates remain low (Bansal et al 2004; Hughes et al 2004; Shiffman et al 2003a; Shiffman et al 2003b; Thorndike et al 2002). One recognised barrier of use is the financial cost of NRT (Bansal et al 2004; Cummings and Hyland 2005; Curry et al 1998). Efforts to address this issue have been made, such as the free six-week trial of NRT for smokers of 10+ cigarettes per day sponsored by the New York City Department of Health and Mental Hygiene (Cummings and Hyland 2005), and the New Zealand government NRT subsidy of 92 percent, which has been available through the Quitline NRT Programme since 2000 (Grigg and Glasgow 2003; The Quit Group 2005; Ministry of Health 2006). Thirty-four thousand people received NRT through the New York trial (Kasid 2006), and 118,000 New Zealanders are reported to having used NRT accessed through the Quitline NRT Programme in first three years NRT became available (Dowden et al 2004). Despite the improved access to NRT resulting from the New Zealand subsidy, overall use rates during quit attempts remain low. The New Zealand Tobacco Use Survey 2006 revealed that only 26 percent of smokers who attempted to quit smoking during the 12 months prior to being interviewed used some form of cessation product (Ministry of Health 2007c). Taken together, these findings suggest that cost may not be the only factor undermining the use of this safe and effective tool.

Smokers may have doubts about the ability of NRT products to assist them (Balch et al 2004; Hammond et al 2004), or safety concerns particularly if their knowledge regarding the role of nicotine is limited or erroneous (Bansal et al 2004; Cummings et al 2004; Mooney et al 2006). Recent international studies have identified a range of counter-therapeutic beliefs, attitudes, and knowledge deficits regarding the use of NRT (Bansal et al 2004; Etter and Perneger 2001; Cummings and Hyland 2005; Cummings et al 2004; Hammond et al 2004; Mooney et al 2006). There is a need to compile and elucidate these identified perceptions so that public health messages and smoking cessation services can address these barriers (Juliano and Brandon 2004). The aim of the present study was to review published studies investigating smokers and ex-smokers perceptions (that is, their ideas, impressions, beliefs and general understandings) of the safety and efficacy of nicotine and NRT. Efficacy refers to the ability to produce the desired effect (how well the products work).

## Method

### *Databases*

A total of 14 databases (specified below) were searched between 29 December 2007 and 8 January 2008. Keyword entries were made across the 'abstract', 'all text', 'title, abstract, or keywords', and 'unselected' search fields where applicable and in various combinations. Combined and advanced searches were conducted where applicable. Keyword entries consisted of a range of terms entered in a variety of combinations, utilising the appropriate truncation facility, across each database. Keyword entries are listed below. The 14 searched databases yielded a combined total of 553 results, with each resultant article individually screened for pertinence to the review topic. Limitations on time of publication and language were not entered into the search criteria.

### *Searched databases*

- Medical Databases on EBSCOhost
  - Health Business Full-text Elite
  - Health Source Consumer Edition
  - Health Source Nursing/Academic Edition
- EBSCOhost selection
  - Academic Search Elite
  - Pre-CINAHL
  - CINAHL
  - Clinical Reference Systems
  - ERIC
  - Academic Search Premier
  - Psychology and Behavioral Sciences Collection
- Medline via Ovid
- PsychINFO via Ovid
- PubMed
- The Cochrane Library.

### *Keyword entries*

- Nicotine replacement therapy
- NRT
- Nicotine
- Patch
- Gum
- Smoking cessation
- Smoker
- Ex-smoker
- Smoker/s belief/s
- Belief/s
- Smoker/s perception/s

- Perception/s
- Misperception/s
- Incorrect
- Attitude/s
- Knowledge
- Aware
- Safety
- Efficacy
- Effectiveness
- Utilization
- Quit/ter/ting
- Concern/s/ed.

### ***Internet search engines***

Google Scholar and [www.google.com](http://www.google.com) were searched during 8 January 2008 and 9 January 2008.

#### *Search entries for Google Scholar*

- Public perceptions +nicotine replacement therapy.
- Users OR smokers perceptions +nicotine replacement therapy.

#### *Search entries for [www.google.com](http://www.google.com)*

- Peoples' perceptions on the safety and efficacy of 'nicotine replacement therapy'.
- Smokers' beliefs about 'nicotine replacement therapy'.
- NRT myths.
- Nicobrevin.

### ***Overseas websites***

The following 10 overseas websites were searched on 9 January 2008:

- <http://www.quit.org.au/browse.asp?ContainerID=1807>
  - Quit Victoria
- <http://tobacco.health.usyd.edu.au/site/supersite/resources/docs/index.htm>
  - Tobacco Control Supersite (University of Sydney)
- <http://www.naquitline.org/index.asp?dbid=1&dbsection=research>
  - North America Quitline Consortium
- [http://apps.nccd.cdc.gov/osh\\_pub\\_catalog/PublicationList.aspx](http://apps.nccd.cdc.gov/osh_pub_catalog/PublicationList.aspx)
  - Tobacco Fact File
- [http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/index\\_e.html](http://www.hc-sc.gc.ca/hl-vs/tobac-tabac/research-recherche/index_e.html)
  - Health Canada



- <http://www.quitsa.org.au/aspx/index.aspx>
  - Quit South Australia
- <http://www.globalink.org/tobacco/>
  - Globalink (global tobacco control)
- <http://www.cochrane.org>
  - Cochrane Collaboration
- <http://www.treatobacco.net/English/home/home.cfm.html>
  - Database and Education Resource for Treatment of Tobacco Dependence
- <http://www.tobaccoresearch.net/>
  - Global Tobacco Research Network.

### ***New Zealand websites***

On 12 January 2008, the following 4 New Zealand websites were searched:

- <http://www.quit.org.nz/page/index.php>
  - The Quit Group
- [www.ash.org.nz](http://www.ash.org.nz)
  - ASH
- <http://www.wnmeds.ac.nz/Research/index.html>
  - Health Promotion & Policy Research Unit
- <http://www.hsc.org.nz/publications.html>
  - Health Sponsorship Council
- <http://www.moh.govt.nz/publications>
  - Ministry of Health.

### ***Journals***

The following six journals were searched individually on 12 January 2008, using 'NRT' and 'nicotine' as the keyword search terms:

- Tobacco Control
- Nicotine and Tobacco Research
- Journal of Smoking Cessation
- Addiction
- Health Education Research
- Australia & New Zealand Journal of Public Health.

### ***Additional references***

Relevant citations within the selected articles obtained via all above-specified searches led to the location of additional articles, which were then screened for pertinence to the review topic; a further article was supplied by The Quit Group.



**Theme extraction**

Once all articles considered pertinent to the review topic were located, study findings reported within each article were extracted and compiled to form a list of issues and themes embedded within smokers and ex-smokers perceptions' of the safety and efficacy of nicotine and nicotine replacement therapies.

**Results****Reviewed articles**

A total of 42 articles were selected for extensive review on the basis of being deemed pertinent to the review topic. The main countries and age groups of the participants studied within these articles are displayed in Table 1.1. Twenty-three of the articles were located via the database search, six via an internet search engine (two for Google Scholar; four for www.google.com), and seven after being cited within the selected articles. One article was obtained via the overseas website search, two articles through a New Zealand website, two through the independent journal search, and one was supplied by The Quit Group. (To view a complete list of the 42 selected articles refer to Appendix A).

**Table 1.1**

*Percentage of reviewed articles discussing results from investigations conducted in each country and with each participant age group*

<b>Country</b>	<b>Participant Age</b>
United States 45%	Adult* 60%
United Kingdom 19%	Adolescent* 17%
Canada 12%	Elderly (65yrs +) 2%
Australia 10%	Unspecified 23%
New Zealand 7%	
Switzerland 5%	
Spain 2%	
Austria 2%	
Netherlands 2%	
Unspecified 2%	

*Note.* \* Age ranges were inconsistent across the 42 articles. Fifty-eight percent of the adult-population articles specified an age range of 18+. Age ranges among adolescent-population articles were the most inconsistent. No selected adolescent age range was repeated in more than one article.

## Themes

A total of 20 independent themes were extracted from the 42 reviewed articles. Table 1.2 reveals each theme as it relates to the participants' perceptions of NRT efficacy and perceptions of NRT safety. It also displays the frequency with which each theme was identified. The most commonly occurring issues were:

- Knowledge deficits
- Prior use of NRT products
- Incorrect use of NRT
- Negative expectations
- The idea of willpower as the necessary component of smoking cessation
- Price
- Adverse side effects of NRT
- Concerns of addiction to NRT
- Positive expectations
- Misperceptions of nicotine.

**Table 1.2**

*Identified issues and themes embedded within smokers and ex-smokers perceptions' of the safety and efficacy of nicotine and NRT*

Perceived Efficacy		Perceived Safety	
Identified Theme	% of the 42 articles identifying theme	Identified Theme	% of the 42 articles identifying theme
Knowledge deficits	40%	Knowledge deficits	40%
Prior use	38%	Prior use	38%
Incorrect use	36%	Incorrect use	36%
Negative expectations	33%	Negative expectations	33%
Willpower	31%	Adverse side effects	29%
Price	29%	Addictive	26%
Adverse side effects	29%	Nicotine misperceptions (overall)	21%
Positive expectations	26%	– Causes Cancer	– 14%
Awareness of product existence	17%	– Causes Heart disease/heart attack	– 10%
Level of tobacco dependency	14%	Concurrent smoking	19%
Advertising	14%	Advertising	15%
Light/ultra-light/low tar/filter	12%	Light/ultra-light/low tar/filter	12%
Level of interest	12%	Safety during pregnancy	10%
Motivation to quit	10%	Safety with diabetics	7%
Embarrassment	7%		

Each theme summarises the relevant findings, within and across the 42 articles, pertaining to review topic. These findings, as organised by their overriding theme, are now presented.

### *Knowledge deficits*

Knowledge deficits were more pronounced in older participants, the less educated, users of light/ultra-light cigarettes, and those with no prior NRT use (Bansal et al 2004). Six articles examined knowledge deficits concerning the health risks of cigarette smoking (Cartwright et al 2007; Cummings et al 2004; Grimshaw et al 2004; Kerr et al, 2006; Levinson et al 2006; NTCC 2007). Such deficits included the tendency to underestimate the risk of getting cancer and the benefit of quitting later in life, and the false belief that certain acts, such as exercise or the consumption of vitamins, could reverse the damaging effects of smoking (Cartwright et al 2007; Kerr et al 2006). In Cummings et al (2004), 39 percent, 53 percent, and 56 percent of participants gave incorrect responses to questions concerning the health risks associated with smoking, the content of cigarette smoke, and additives in cigarettes, respectively.

Etter and Perneger (2001) found a major lack of knowledge about NRT in the general public, with just three percent giving a correct answer to all six factual knowledge questions about NRT products and 55 percent giving no correct answer at all. Paul et al (2003) discovered large numbers of Australians were unaware of the potential benefits of using NRT, and Cummings et al (2004) reported deficits in knowledge concerning the means by which NRT products are presumed to work.

Other identified deficits were the notions that NRT use causes weight gain, cancer, heart attack, and that use among adolescent populations is unsafe (Cartwright et al 2007; Cummings et al 2004; NTCC 2007; Zwar et al 2006). In Cartwright et al (2007), two-thirds of adult participants believed or did not know if nicotine gum, patches, or lozenges can cause cancer; and the relative likelihood of patches causing a heart attack versus cigarettes causing a heart attack was unknown or answered incorrectly by 65 percent of participants in Cummings et al (2004).

### *Prior use*

Forty percent of smokers responding to an American survey reported ever having used any nicotine medication (Bansal et al 2004). Prior use of NRT products was more common among older smokers (Bansal et al 2004; Ministry of Health 2007c), those self-rating a higher level of dependence, participants who smoked a greater number of cigarettes per day, and those who perceived greater difficulty associated with quitting (Etter et al 2003). Prior use was less common among participants who perceived a higher level of safety risk or likelihood of increased dependence on cigarettes if smoking and using NRT products concurrently (Etter et al 2003). In New Zealand, no significant difference was found between Maori and non-Maori, or between genders, in the use of NRT products during the last quit attempt. Patches were used significantly more often by Maori (84.4 percent) than by non-Maori (64.2 percent) during previous quit attempts (Ministry of Health 2007c).

Prior *unsuccessful* use by either the participants themselves or others they had heard of was associated with negative views of NRT (Balch et al 2004; Levinson et al 2006; Molyneux et al 2006; White et al 2006; Wiltshire et al 2003). It was also listed as a reason for non-use (Paul et al 2003). Participants' *successful* prior use, however, improved levels of knowledge regarding nicotine and the safety and efficacy of NRT products (Bansal et al 2004; Cummings et al 2004; Etter et al 2003; Etter and Perneger 2001). Ones' own successful prior use also improved perceptions of the advantages and effectiveness of NRT (Etter and Perneger 2001; Hammond et al 2004; Juliano and Brandon 2004; Mooney et al 2006; Schneider et al 2005, Schneider et al 2006), and reduced concerns of the potential drawbacks and risks of harm (Mooney et al 2006). Perceptions of NRT advantages were greater among those who had previously quit for longer durations of time (Mooney et al 2006).

### *Incorrect use*

When NRT products are used, smokers often use inadequate quantities for an inadequate length of time (Cartwright et al 2007; Etter and Perneger 2001; Cummings and Hyland 2005; Hammond et al 2004; Schneider et al 2005, Schneider et al 2006; Mooney et al 2006; Paul et al 2003). The amount of information provided to over-the-counter users relative to the amount relayed during clinical trials may differ (Cartwright 2007). However, 86 percent of New Zealand participants of The Quit Group programme agreed or strongly agreed that they felt well informed about how to use NRT products (The Quit Group 2005). In contrast, in an Australian survey 41 percent of respondents reported receiving no instructions from a doctor or pharmacist regarding the use of the NRT product (Paul et al 2003). In Cartwright et al (2007), 76 percent of survey respondents stated they had not used the NRT products as directed by the label.

Former smokers are more likely than current smokers to have used the NRT product for a longer period of time (Paul et al 2003). Under dosing, but not over dosing is a common problem (Kunze 2000); use beyond the recommended period is rare (Hughes 1999). Several Latino adults participating in an American study did not know that prolonged use of NRT products poses minimal risk (Levinson et al, 2006). The low duration of NRT use is elucidated in the following findings:

- while the recommended duration of use is three months, the median duration of use among ever-users of NRT products was 15 days (Etter & Perneger 2001)
- more than 80 percent of Australian participants used the NRT products for less than six weeks; 61 percent of participants' use was for less than two weeks (Paul et al 2003)
- more than 80 percent of New Zealand participants of The Quit Group programme used less than eight weeks supply of NRT (The Quit Group 2005).

Some smokers use and prefer to use more than one NRT product at the same time (Schneider et al 2006; Paul et al 2003), however provision of information to users regarding concurrent use appears to be limited and conflicting: although combinations are recommended in USA treatment guidelines, instructions packaged within NRT products state that more than one NRT product should not be used at the

same time (Schneider et al 2006). New Zealand smoking cessation guidelines, in contrast, state that there is a moderate advantage and no safety concerns with the combined use of NRT products (Ministry of Health 2007c). Few Latino adults in an American study were aware that NRT products could be used concurrently with bupropion (Levinson et al 2006).

*Negative expectations*

Negative expectations of NRT were often found to derive from personal experiences or hearing of others' opinions or experiences of using NRT products (Balch et al 2004; Bansal et al 2004; Kerr et al 2006; Levinson et al 2006; Molyneux et al 2006; White et al 2006; Wiltshire et al 2003). Negative expectations regarding the effectiveness of NRT were discussed in nine of the 14 articles identifying negative expectations as a barrier (Etter and Perneger 2001; Grimshaw et al 2003; Hammond et al 2004; Juliano and Brandon 2004; Levinson et al 2006; McMenamin et al 2006; RWJF 2007; White et al 2006; Wiltshire et al 2003). In one study, with an adult Canadian population, findings revealed that less than one quarter of participants were optimistic that cessation assistance would increase their chances of quitting successfully (Hammon et al 2004), and in Switzerland a local investigation revealed just 16 percent of participants believed in the ability of NRT to help people quit (Etter and Perneger 2001). Some felt NRT was incapable of addressing the habitual or routine behaviours involved in the act of smoking (Wiltshire et al 2003). A negative expectation of NRT safety was also an identified issue (Balch et al 2004; Hebert, 2004; NTCC 2007).

*Willpower*

The number of smokers attempting to quit without help was found to far outweigh those who use a cessation therapy with proven efficacy (Willemsen et al 2006). Most adolescents indicated they would choose to quit alone (Leatherdale and McDonald 2005, Leatherdale and McDonald 2007), and 78 percent of adult smokers stated they would be as likely to quit on their own, as they would be if using some forms of help (Hammond et al 2004). Levinson et al (2006) found that most participants perceived smoking not as an illness rather a personal weakness, and thus felt it is willpower that determines quitting success.

*Price*

The issue of cost was referred to in 13 of the 42 articles (Balch et al 2004; Bansal et al 2004; Cummings and Hyland 2005; Grigg and Glasgow 2003; Grimshaw et al 2003; Hammond et al 2004; Hebert 2004; Kozlowski et al 2007; McMenamin et al 2006; Molyneux 2006; NTCC 2007; The Quit Group 2005; Wiltshire et al 2003). In one of these studies, it was the most frequently cited reason for not using either NRT products or bupropion (Bansal et al 2004). Cost is far less of an issue in the New Zealand context given the 92 percent government subsidy on the nicotine patch and nicotine gum (Cummings and Hyland 2005; Grigg and Glasgow 2003; Ministry of Health 2006; The Quit Group 2005).

*Adverse side effects*

Participants reported fear of known and unknown side effects from using NRT (Etter and Perneger 2001; Levinson et al 2006), and some claimed they would interpret unpleasant sensations as a worrisome signal to cease use (Levinson et al 2006). Adverse side effects of NRT products led to a discontinuation of treatment in most



cases even if the side effects were mild (Barrueco et al 2005; Levinson et al 2006). Participants exposed to a message warning against possible side effects associated with concomitant smoking and NRT use claimed this decreased their motivation to use NRT (Etter et al 2003). The combined use of bupropion with an NRT product was found to produce more adverse side effects (Barrueco et al 2005), and Schneider et al (2005) found that side effects and difficulties with use occurred more frequently with nicotine gum, inhalers, and nasal spray than with the nicotine patch.

Four of the articles documented symptoms that were believed by the participants to be adverse side effects of NRT. It was not stated within the articles whether any of these symptoms were investigated and found to be attributable to the nicotine withdrawal syndrome. Reported and 'heard of' symptoms, believed by participants to be side effects of NRT, occurring with the nicotine gum were unpleasant taste (Balch et al 2004; Schneider et al 2005), burning sensation in the mouth, turning the teeth yellow, (Balch et al 2004), mouth ulcers, nausea, addiction, cancer, heart problems (Bansal et al 2004), and excessive saliva (Schneider et al 2005). Skin problems, such as itchiness or rash, were reported for the nicotine patch (Balch et al 2004; Bansal et al 2005; Barrueco et al 2005), along with heart difficulties, nausea, and dizziness (Bansal et al 2004). The nicotine inhaler was reported to produce throat irritation (Bansal et al 2004; Schneider et al 2005), burning sensation in the mouth, coughing (Schneider et al 2005), addiction, and heart problems (Bansal et al 2004). Reported side effects associated with the nasal spray were nasal bleeding (Bansal et al 2004), throat irritation, runny nose, sneezing, and nasal irritation (Schneider et al 2005). Side effects reported with bupropion, were seizures, sleep disturbances, nausea and dizziness (Bansal et al 2004).

### *Addictive*

Many smokers fear that they will transfer their addiction to cigarettes for an addiction to NRT or prescription medications (Balch et al 2004; Hebert 2004; Kunze 2000; Levinson et al 2006; NTCC 2007). In Cartwright et al (2007) 76 percent of participants did not know whether NRT products were more addictive than cigarettes; and deficits of knowledge concerning the comparative addictiveness of NRT and cigarettes were also reported elsewhere (Cummings et al 2004; Etter et al 2003). The risk of addiction was the most commonly reported concern associated with the use of nicotine gum (Bansal et al 2004).

### *Positive expectations*

Positive expectations were found to derive from one's own successful experiences or hearing about others' successful experiences with NRT (Balch et al 2004; Etter and Perneger 2001; Hammond et al 2004; Juliano and Brandon 2004; Levinson et al 2007; Mooney et al 2006; Schneider et al 2005, Schneider et al 2006). Positive attitudes regarding the effectiveness of NRT were associated with a greater likelihood of making a quit attempt, of adopting the use of an NRT product during a quit attempt, and duration of use (Hammond et al 2004; McMenamin et al 2006; Etter and Perneger 2001).

Positive, more favourable attitudes toward NRT products are associated with a longer duration of NRT use, as is more accurate NRT knowledge (Etter and Perneger 2001; Mooney et al 2006).

*Nicotine misperceptions*

The belief that nicotine per se causes cancer was reported in six of the nine articles discussing nicotine misperceptions (Bansal et al 2004; Cartwright et al 2007; Cummings et al 2004; Etter et al 1998; Mooney et al 2006; Zwar et al 2006). Four of these nine articles identified the belief that nicotine is a cause of heart attacks or cardiovascular disease (Cartwright et al 2007; Etter et al 1998; Kerr et al 2006; Zwar et al 2006). Four of the articles discussed the perceived level of danger or toxicity of nicotine (Cartwright et al 2007; Cummings et al 2004; Kunze 2000; Zwar et al 2006). Cartwright et al (2007) found that 65 percent of adult participants believed or were unsure if the nicotine in NRT products was more dangerous than the nicotine in cigarettes (Cartwright et al 2007), and in Cummings et al (2004) 54 percent answered incorrectly or did not know whether the reduction of nicotine in cigarettes made them less dangerous.

*Concurrent smoking*

Many smokers feared that use of NRT products, especially the nicotine patch, while continuing to smoke is dangerous and may cause a heart attack (Balch et al 2004; Bansal et al 2004; Cartwright et al 2007; Etter et al 2003; Zwar et al 2006). Many Swedish participants believed concomitant NRT and cigarette use would increase the level of dependence on cigarettes (Etter et al 2003).

Ten percent of surveyed Australian NRT users reported continuing to smoke the same amount or a little less than usual while using NRT products (Paul et al 2003). One in four participants of a study conducted in Switzerland had previously used NRT to reduce their smoking (Etter et al 2003). In Etter et al (2003), participants who were exposed to a message suggesting the use of NRT products for the purpose of smoking reduction showed an increase in their motivation both to quit smoking and to use NRT products.

*Awareness of product existence*

Deficits in the awareness of the existence of NRT products in general was specifically noted in five of the seven articles referring to aspects of awareness (Gill et al 2005; Hammond et al 2004; Kerr et al 2006; Leatherdale and McDonald 2007; Willemsen et al 2006). In one of these studies, conducted in the United Kingdom with diabetic patients, 34 percent of participants had never heard of NRT (Gill et al 2005). Three of the seven articles found awareness of the nicotine patch and gum were greater than awareness of other NRT products (Balch et al 2004; Bansal et al 2004; Gill et al 2005).

*Level of tobacco dependency*

Study findings revealed that the higher the level of dependence the less accurate was the knowledge regarding the disease role of nicotine and the greater was the perceived need for treatment (Mooney et al, 2006). A study conducted in the United

Kingdom found that regular smokers had tried a broader range of cessation strategies than had occasional smokers (Grimshaw et al 2003), and findings from an American survey revealed that the more cigarettes an adult smoked per day, the more likely they were to have used cessation aids (NRT, antidepressants, and behavioural counselling) during their last quitting attempt (Cokkinides et al 2005). However, attitudes towards NRT were not associated with the number of cigarettes smoked per day or the number of years one had been smoking among participants of a study conducted in Switzerland (Etter and Perneger, 2001). Likewise, the majority of established adolescent smokers (versus experimenting and never-smokers) participating in an American study did not believe NRT was a sure way to quit (Al-Delaimy et al 2006).

### *Advertising of NRT*

Advertising of NRT products was found to comprise 17 percent of the stated reasons for using NRT among Australian participants (Paul et al 2003). However only one percent of recent quitters participating in a study conducted in the United States believed NRT advertisements had contributed to their success (Biener et al 2006). In Australia, NRT advertisements were not recalled by any of the successful quitters even though NRT and prescription medications were found to have contributed to 29 percent of all the quit attempts (Brennan et al 2007).

Among American adolescents who had not yet become established smokers, those who believed that NRT was a sure way to quit smoking showed greater confidence in their ability to quit smoking anytime; as this was not found to be associated with knowing a smoker (who might have relayed their experiences of using NRT products), the authors concluded that media advertisements may have contributing to these beliefs (Al-Delaimy et al 2006).

### *Use of light, ultra-light, low-tar & filter cigarettes*

Some smokers were found to be using 'light' cigarettes as an effort to quit smoking or reduce harm (Balch et al 2004; Leatherdale and McDonald, 2007). The inaccurate beliefs regarding light, low-tar, and filter cigarettes are reflected in an American study, which revealed that 91 percent of adult participants believed a person would need to smoke more than one ultra-light cigarette to receive the same amount of tar as a regular cigarette; 71 percent of the same participants believed filters make cigarettes less dangerous (Cummings et al 2004). Similar beliefs have been found to exist in the United States, Australia, the United Kingdom, and Canada, whereby 51 percent, 55 percent, 70 percent and 43 percent respectively of surveyed smokers believed that light cigarettes provide some form of health benefit compared to regular cigarettes (Borland et al, 2004). As a group, users of ultra-light cigarettes were found to be particularly misinformed about the safety and efficacy of NRT (Bansal et al 2004).

### *Level of interest*

Some contrary findings exist across studies with adolescents. On the one hand, adolescents were found to show little interest in using NRT products (Balch et al 2004), while on the other hand, the majority expressed interest once shown the products (Molyneux et al 2006), and NRT was the only formal cessation aid the majority of the adolescents stated they would consider using (Leatherdale and McDonald 2007). Reported reasons for not using NRT products among adult populations were: perceiving no personal need for NRT (Bansal et al 2004), preferring not to and not thinking of it (Paul et al 2003).

### *Safety during pregnancy*

The use of NRT while pregnant or breastfeeding was discussed in four of the 42 articles (Kozlowski et al 2007; NTCC 2007; OMA 1999; Zwar et al 2006), each of which spoke to convey facts regarding the precautionous use of NRT products in these circumstances as a safer alternative to smoking.

### *Motivation to quit*

Participants with higher levels of motivation to quit smoking demonstrated greater accuracy in their *knowledge* of NRT products but no relationship was found between their motivation to quit and their *attitudes* towards NRT (Etter and Perneger, 2001). High quit motivation was related to a higher perceived necessity for treatment, and lowered concerns regarding treatment per se (Mooney et al 2006).

### *Safety with diabetics*

Thirty-three percent of diabetic patients participating in a study conducted in the United Kingdom did not know whether NRT products were safe for them to use, and 18 percent believed they were not. Ten percent of these 18 percent had been told they were unsafe for diabetic patients by their general practitioner (Gill et al 2005). One smoker of 40 – 50 cigarettes per day disposed of their unused nicotine patches because the enclosed instructions prohibited use among those with diabetes (Kerr et al 2006).

### *Embarrassment*

Among adolescents in the United States, using the nicotine patch was considered embarrassing and the idea of nicotine gum inherently unappealing (Balch et al 2004). Embarrassment with use of the nicotine inhaler was consistently expressed among adults partaking in an American investigation, with appearance of the inhaler rated poorly and shallow puffing considered awkward (Schneider et al 2006). Gum was ranked highest for ease of use in public (Schneider et al 2005).

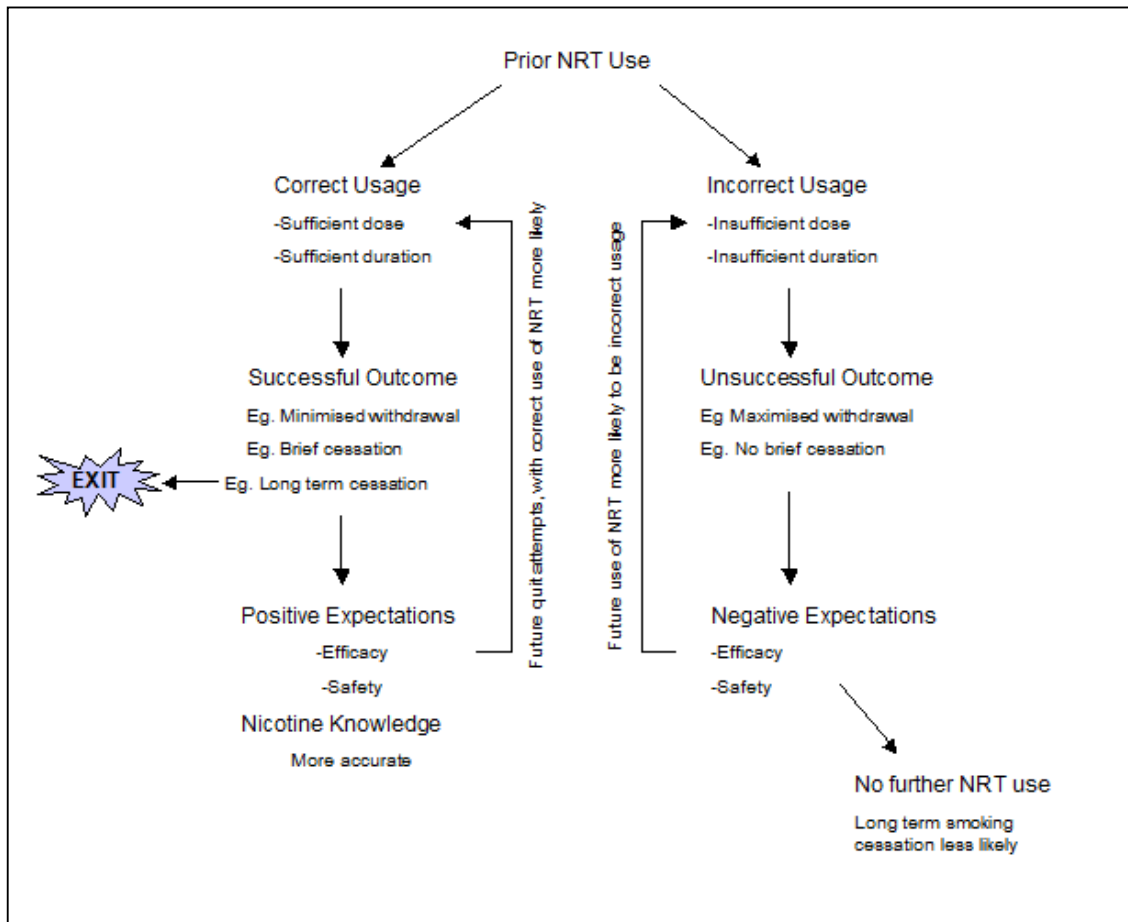
## Discussion

The literature review identified 20 themes related to smokers' and ex-smokers' perceptions of the safety and efficacy of NRT, which appear to restrict the initiation, dosing levels, and duration of NRT use during quit attempts. Some of the most commonly identified issues were:

- Knowledge deficits (e.g. Etter and Perneger 2001; Cartwright et al 2007),
- Prior NRT use (e.g. Bansal et al 2004; Mooney et al 2006),
- Incorrect use (e.g. Hammond et al 2004; Mooney et al 2006),
- Negative expectations of NRT (e.g. Balch et al 2004; Etter and Perneger 2001),
- The view of willpower as the predominant requirement for successful smoking cessation (e.g. Leatherdale and McDonald 2007; Levinson et al 2006)
- Concerns about side effects and possible addiction to NRT (e.g. Balch et al 2004; Levinson et al 2006),
- Misperceptions of nicotine (e.g. Cummings et al 2004; Zwar et al 2006).

Among these most frequently occurring themes is a subset of interrelated issues that appear to provide insight into the continued under-use of NRT. These interrelated issues will now be discussed.

The negative expectations many smokers seem to hold largely concern a perceived incapability of NRT to facilitate their ability to quit smoking (e.g. Etter and Perneger 2001; Hammond et al 2004). To a less frequent extent, these negative expectations also concern safety issues (e.g. Balch et al 2004; Hebert, 2004). The negative expectations appear to be sourced by prior use of NRT: prior use by either the smokers themselves or by others the smokers have heard about (e.g. Balch et al 2004; Bansal et al 2004). If the prior use has been successful (for example the smoker was able to stop smoking for a brief but meaningful period of time) then the smoker is more likely to form positive expectations of NRT (e.g. Etter and Perneger 2001), to use NRT again in the future (Hammond et al 2004), and to use NRT for a longer period of time (Mooney et al 2006). If the prior use is unsuccessful then the expectations formed are more likely to be negative (e.g. Balch et al 2004). Unsuccessful prior use seems more probable if the NRT products are being used incorrectly (Paul et al 2003). Incorrect use is common and usually takes the form of premature termination or insufficient doses (e.g. Etter and Perneger 2001; Cummings and Hyland 2005), and is triggered by even mild side effects ((Barrueco et al 2005; Levinson et al 2006). These forms of incorrect use probably reflect the safety concerns smokers hold about NRT, which in turn likely stem from knowledge deficits. Figure 1.1 displays the cyclical nature of these interrelated issues.



**Figure 1.1** A depiction of the cyclical interrelationship among some of the most frequently identified issues embedded in smokers and ex-smokers perceptions of the safety and efficacy of nicotine and nicotine replacement therapy.

The above analysis details the possible paths a smoker might move through once she or he has progressed beyond the first initiation of NRT use but it does not describe how the first occasion of NRT use, or lack thereof, might occur. In other words, how does a smoker enter into the above cycle, or what is it that is preventing a smoker from using NRT for the first time during a quit attempt?

The themes emerging from the literature review suggest that if a smoker is unaware that NRT products exist (e.g. Gill et al 2005), does not have any interest in the products (e.g. Paul et al 2003), or the financial cost of NRT is high (e.g. Balch et al 2004) then the likelihood of the first initiation of NRT use is poor. Additionally, the seemingly common view that willpower is the main determinant of successful smoking cessation (e.g. Leatherdale and McDonald 2006; Hammond et al 2004; Levinson et al 2006) may impede NRT use. If a smoker underestimates the extent to which smoking results from physiological dependence, and sees smoking instead as a personal weakness (Levinson et al 2006), then use of an aid designed to address the physiological component would logically appear futile and the smoker would instead

“I think that it’s a weakness, because I think we have a choice”  
 Levinson et al 2006: 168”

opt to quit alone; as indeed a great proportion of participants in the reviewed studies were found to do (e.g. Leatherdale and McDonald 2007; Hammond et al 2004; Willemsen et al 2006).

Additionally, any inaccurate knowledge regarding the constituents of cigarettes, and the perceived likelihood of adverse health consequences occurring, might also inhibit the commencement of NRT use. The literature review revealed that some smokers downplay the health risks associated with smoking and believe that they could take steps, such as introducing exercise or vitamins, to reverse any resultant poor health if it were to occur (Cartwright et al 2007). False understandings of cigarette

"I have little filters, they're called TarGard, and I use those ... because it would take the nicotine and the tar away from your cigarette"  
Levinson et al 2006: 170.

constituents can set smokers on a disillusioned path. The use of light, low-tar, or filter cigarettes was erroneously presumed by some smokers to be offering a form of health protection, or to be capable of helping them to reduce or quit smoking (Balch et al 2004; Cummings et al 2004; Leatherdale and McDonald, 2007). If smokers

believe that they are already taking steps to reduce the potential harm, and that the harm is unlikely to occur and is reversible if it does, then they are unlikely to perceive a need to take any further action.

Knowledge deficits regarding the role of nicotine were also a common issue (e.g. Etter et al 1998; Mooney et al 2006; Zwar et al 2006). Many believed or were unsure whether the nicotine contained in NRT products was more dangerous than the nicotine in cigarettes (Cartwright et al 2007), and they did not seem to know whether a reduction of nicotine in tobacco products reduced the levels of danger (Cummings et al 2004). Without accurate understandings of the role of nicotine, versus that of thousands of toxic additives contained in cigarettes (Hoffmann and Hoffmann 1997), concerns about the safety of using NRT products will most likely eventuate.

"Most smokers are misinformed about the health risks of nicotine and the safety/efficacy of nicotine medications"  
Bansal et al 2004: S303.

" I thought it was just the nicotine ... they're giving you. What good is that? I'm not putting anything on me with nicotine, you know. It's not quitting, it's like changing one for another"  
Levinson et al 2006: 169.

Indeed many fears were reported; namely, the concern that NRT is addictive (e.g. Hebert 2004; Kunze 2000), or could cause cancer, heart disease, or heart attack (e.g. Cartwright et al 2007; Zwar et al

2006), and that use while continuing to smoke, for adolescents (e.g. Zwar et al 2006), for people with diabetes (Gill et al 2005), and in pregnancy (e.g. Kozlowski et al 2007) was dangerous. The occurrence of mild side effects were also of concern to many smokers, who indicated that should they occur they would view this as a signal to discontinue use (Levinson et al 2006). Among some smokers who had previously used NRT, even minor side effects had led to premature termination (Barrueco et al 2005; Levinson et al 2006). This does seem to suggest that it is not the discomfort associated with these effects that is problematic for the smoker rather that the effect is interpreted as a signal of danger, which in turn could be resonating with pre-existing fears regarding the safety of NRT; fears that emerge from the inaccurate understandings.

"[Nicotine] wouldn't hurt you? Now that's the part I don't know about. What is nicotine, where does it come from?" Levinson et al 2006: 169.



As an aside, there appears to be an interesting irony, in that while many smokers seem to downplay the risks associated with smoking cigarettes (Cartwright et al 2007), they do not seem to do so when it comes to any potential risks associated with NRT (Balch et al 2004; Hebert, 2004; NTCC 2007). It would be interesting to know the extent to which, if at all, expressed concerns about using NRT stem from a desire to justify the continuation of an addiction one is at least partially reluctant to let go of.

If fears result from knowledge deficits then it would follow that those with fewer fears would have more accurate knowledge and be more likely to use NRT. The literature review revealed that among those with prior NRT use, knowledge was indeed more accurate (e.g. Bansal et al 2004; Etter and Perneger 2001). It remains unknown, however, whether the accurate knowledge results from the NRT use, or whether the NRT use was facilitated by more accurate knowledge. Future research investigating this would be worthwhile as it could elucidate whether targeting knowledge levels among never-users, as a means to initiate the first experience with NRT, is of more value than encouraging never-users to trial NRT in the hope that doing so will lead to improved levels of knowledge and reduced concerns about NRT safety. It may be that both approaches would be effective strategies.

Attitudes towards NRT did not seem to be related to either a smoker's level of motivation to quit or their level of dependence on nicotine (Etter and Perneger 2001). However, quit motivation and dependency level did appear to be related to levels of knowledge (Etter and Perneger 2001; Mooney et al 2006). Among those more highly motivated to quit, knowledge about NRT products was more accurate (Etter and Perneger 2001). They also showed a higher perceived need for treatment, while their concerns about the treatment per se tended to be comparatively small (Mooney et al 2006). It may be that because these smokers are more determined to quit they are more willing to try a product they don't necessarily view positively, regardless of any undesirable consequences (such as a risk to safety). Again, it is unclear whether their greater levels of knowledge regarding NRT safety and efficacy result from their experience of using the product or from efforts to learn about the products prior to use.

Smokers with greater levels of tobacco dependency demonstrated poorer accuracy of knowledge regarding nicotine (Mooney et al 2006). They tended to perceive a greater need for treatment, and to have tried a broader range of cessation strategies (Mooney et al 2006). It is possible that because these smokers feel more addicted to smoking, they believe they will not be able to quit without help therefore they try more approaches to cessation. However, perhaps their poor levels of knowledge regarding the role of nicotine, and probable resultant safety fears, interfere with the way in which they use NRT during their quit attempts. Indeed, as illustrated in Figure 1.1, negative expectations of NRT safety may result in a greater likelihood of using an insufficient dose or using NRT for an insufficient amount of time, thereby undermining its effectiveness. This theory is consistent with the finding that greater tobacco dependency was not associated with NRT attitudes (Etter and Perneger 2001) despite these smokers being more likely to have used NRT.

### ***NRT use in New Zealand***

As already stated, NRT in New Zealand is heavily subsidised by the Government as part of a wider scheme to provide a national programme to support those wishing to quit smoking (Dowden et al 2004). Eighty percent of the subsidised NRT is accessed through the Quitline NRT Programme, which is administered by The Quit Group, and the remainder through health providers who are registered with the Quit Cards programme administered by The Quit Group (The Quit Group 2005). The New Zealand Smoking Cessation Guidelines state that cessation support and medications found to work in the general population appear to be at least as effective for Maori, Pacific peoples, and Asian people (Ministry of Health 2007c). The Guidelines also state that NRT can be provided to:

- People with cardiovascular disease
  - In cases where a serious cardiovascular event has occurred in the past two weeks, a physician should be consulted
  - Oral NRT products (such as the gum, inhaler, microtab, and lozenge) are favoured
- Pregnant and breastfeeding women
  - Use is recommended only after the woman has been informed of and weighed up the risks and benefits of using NRT
  - Intermittent use of oral NRT products (such as the gum, inhaler, microtab, and lozenge) are preferable to the nicotine patch
- Young people aged 12 to 18 years
  - Provided they are dependent, rather than occasional, smokers
- Those awaiting surgery
- People with mental health disorders
  - Provided those taking medications for their mental illness are monitored to determine if their medications need to be reduced
- People who use addiction services
- People making repeat attempts to stop smoking
  - Choice of NRT product should be guided by learning from prior failures
  - A more intensive treatment may be required on a subsequent attempt
  - Treatment should be provided as soon as the smoker requests support.

Research has confirmed the government scheme and Quitline NRT Programme is a success (Dowden et al 2004). The findings from the present literature review, however, have identified a number of widespread misperceptions about the safety and efficacy of nicotine and NRT, which may be limiting the utilisation of NRT in New Zealand. Just over one-quarter New Zealand smokers making a quit attempt do so with the aid of a cessation product (Ministry of Health 2007c). It is possible that addressing the misperceptions identified in this literature review could improve this use rate. Intervention strategies targeting the identified misperceptions will now be discussed.

### ***Recommended intervention strategies***

The need to rectify the knowledge deficits held by many smokers is unquestionably evident and paramount. Smokers need to be informed about the role of the various constituents of cigarettes, with a particular need to clarify that the main consequence

of nicotine is one of addiction not cancer, heart disease, or heart attacks (Luty et al 2002; Hoffmann and Hoffmann 1997; OMA 1999; Zwar et al 2006). In New Zealand, the ability to identify common myths about nicotine is an expected competency of those working with the public to aid smoking cessation (Ministry of Health 2007c). The tendency for people to underestimate the *likelihood* of contracting illness through smoking has a continued need to be targeted, with an ongoing emphasis on the fact that many of the negative consequences are irreversible (Cartwright et al 2007).

Smokers need to know that NRT products exist and are affordable for them (Wiltshire et al 2006). Those working with the public to assist smoking cessation in New Zealand are expected to demonstrate knowledge of the cost of the available stop-smoking treatments (Ministry of Health 2007a). Cost was the one of the most frequently reported barriers of NRT use in the present literature review. This is not an issue in New Zealand where the substantial government subsidy of NRT products (Ministry of Health 2006) renders cost to be a very minimal obstacle indeed. However, it cannot be assumed that New Zealanders are aware that cost need not be a barrier for them. Therefore it may be worth investigating the current level of awareness among the New Zealand public regarding the availability of the subsidy, and whether this awareness needs to be raised.

“Unless this information is disseminated widely, it is likely that the proportion of ex-smokers who use NRT will remain low and, among NRT users, the dosage and duration of treatment will remain suboptimal”  
Etter 1998: 948

There is a need for widespread reporting of the scientific evidence of the safety and efficacy of NRT (Balch et al 2004; Etter 1998; Juliano and Brandon 2004; Kerr et al 2006; Kozlowski et al 2007; Kunze 2000; OMA 1999). Those working to assist smoking cessation in New Zealand are expected to demonstrate knowledge of the effectiveness of the available stop-smoking treatments (Ministry of Health 2007a). Accurate information needs to be relayed regarding the level of risk associated with addiction to NRT products, and emphasis placed on the relative risks of harm associated with using an NRT product versus using cigarettes (Etter 1998; Hughes et al 2003). In New Zealand, those with cardiovascular disease, co-existing medical conditions, who are pregnant, and users of mental health and addiction services may all be considered suitable for the use of NRT; NRT, following specialist advice, is considered a safer alternative to continued smoking (Ministry of Health 2007b).

The risks associated with concomitant smoking and NRT use need to be accurately clarified; smokers need to know that increased cardiovascular risk will not result from this (OMA 1999). In fact many studies have shown that concurrent use can be a means of reducing cigarette consumption and can be a first step toward complete abstinence (Carpenter et al 2004; Etter et al 2002; Kunze 2000). In the present literature review it was found that messages suggesting the use of NRT for smoking reduction were found to increase both the motivation to make a quit attempt and intentions to use NRT (Etter et al 2003). New Zealand Smoking Cessation Guidelines recommend NRT use for the purpose of reducing smoking prior to quitting (Ministry of Health 2007b).

It is important that when smokers do use NRT products, they are supported to use them correctly (Paul et al 2003). In New Zealand NRT use is recommended for 8 to 12 weeks by smokers of 10 or more cigarettes per day, with combined use of more

than one NRT product for those smoking more than 30 cigarettes daily (Ministry of Health 2007c), and the provision of multiple support and advice sessions, in conjunction with a full-eight week course of NRT, is recommended (Dowden et al 2004). In an Evaluation of the New Zealand Quitline NRT Programme it was not the norm for participants to receive the full eight week course of NRT treatment and the level of contact between Quitline Advisors and programme participants was found to be less than originally planned (Dowden et al 2004). As recommended in the above mentioned Evaluation (Dowden et al 2004), processes that better inform participants about the value of using NRT for the full eight weeks and which promote the value of keeping in contact with the Quitline Advisors are paramount. Because mild side effects often lead to early termination (Barrueco et al 2005; Levinson et al 2006), increased emphasis on the provision of information regarding expected side effects (and how to distinguish these from the nicotine withdrawal syndrome) as well as increased contact during periods of time when the side effects are most likely to occur could be particularly beneficial. The New Zealand Smoking Cessation Guidelines state that at least four follow up contacts providing support are required to best increase the chances of successful smoking cessation, and that this contact should be made at set times by the person providing the support (proactive support) rather than being made by the smoker (reactive support) (Ministry of Health 2007b).

“My grandad had some chewing gum, he said it was a waste of time”  
Molyneux et al 2006: 546

It is logical to infer from the results of the present literature review, that an incident of incorrect use may be damaging to the public's views of NRT.

Because the majority of smokers' and ex-smokers' expectations about NRT were formed on either their own prior use or prior use by others they have heard of (e.g. Balch et al 2004; Bansal et al 2004; Etter and Perneger 2001; Molyneux et al 2006), one smoker's incorrect use of an NRT product may go on to affect the chances of another smoker using NRT. This goes the other way, however, in that positive prior experiences with NRT, via word-of-mouth, should generate positive expectations among the public. In light of this, facilitating and encouraging the widespread sharing of NRT success experiences has great potential to improve the initiation of NRT use as well as the adequacy of dose and use duration. Finally, smokers may need to be reminded that there is a physiological component to their addiction and that smoking is not simply a personal weakness.

“If I'd seen it work for someone else I'd probably do it” Wiltshire et al 2003: 298.

To sum, the following intervention strategies are recommended:

- Continue to emphasise the irreversibility of many smoking related health consequences and to target the tendency for smokers to underestimate the likelihood of these consequences occurring
- Clarity to smokers that the main role of nicotine is one of addiction, and that it is the non-nicotine additives contained in cigarettes that are the main cause of smoking-related cancer and heart disease
- Provide accurate information regarding the relative risks of addiction and harm associated with NRT products versus cigarettes
- Educate the public about the inability of light, ultra-light, low-tar, and filter cigarettes to reduce levels of harm or assist smoking reduction

- Investigate the current level of awareness among the New Zealand public regarding the availability of the government subsidy for NRT patches and gum, and whether this awareness needs to be raised
- Conduct media campaigns to disseminate the scientific evidence regarding the efficacy of NRT
- Continue to facilitate and encourage NRT users to share their successful experiences with NRT
- Disseminate the scientific findings regarding the use of NRT with adolescents, diabetics, people with high blood pressure, cardiovascular disease, and whilst pregnant or breastfeeding
- Increase the emphasis placed on the provision of information regarding expected side effects of NRT use and how to distinguish these from nicotine withdrawal
- Prioritise contact between Quitline Advisors and NRT users during periods of time when NRT side effects are likely to first emerge
- Inform smokers that concurrent smoking while using NRT will not increase their cardiovascular risk
- Recommend the use of NRT products as an aid for smoking reduction prior to cessation
- Investigate the nature of the observed relationship between higher accuracy of knowledge and NRT use. Is it more effective for interventions to target the improvement of knowledge so as to facilitate NRT use, or to promote an initial trial of NRT so that improvements of knowledge will result?
- Remind smokers that smoking has a physiological component and is not merely a personal weakness. Share statistics demonstrating the rarity of quitting alone
- Disseminate the consumer statement provided in Appendix B.

## ***Conclusion***

The continued under-use of NRT products appears to be sourced by negative expectations regarding the ability of NRT to successfully facilitate smoking cessation, and fears about the safety of the products. These concerns appear to result from knowledge deficits regarding the role of nicotine and a lack of awareness about the scientific findings regarding the safety and efficacy of NRT products. Prior use and word-of-mouth may be the main formative source of smokers' expectations. As such facilitating the correct usage of NRT among those who do initiate use is crucial, as insufficient doses for inadequate durations can undermine the effectiveness of NRT and contribute to negative expectations among the public. Correct usage is more likely if smokers' knowledge regarding nicotine and NRT products is accurate.

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## Appendix A

### **List of all 42 articles selected for extensive review**

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## Appendix B

### ***A statement for NRT consumers designed by smoking research experts and clinical experts to address identified issues involved in the under-use of NRT***

#### *Statement for consumers*

“We hope the policy makers and health care professionals will read and make use of the information in the statement, because it addresses widespread misunderstandings of NRT. We encourage health communication specialists to use this statement to help develop communications on NRT use. We support the dissemination of this statement for non-commercial purposes on multiple websites or photocopying this statement for distribution, provided credit is given to the source and a link is provided to the journal home page at <http://www.sciencedirect.com/science/journal/0306460>.” Kozlowski LT et al. 2007: 2144.

#### *Outline of statement to consumers*

- 
1. NRT is one good *tool* to help you quit smoking. But NRT can't do all the work for you – you have to help – and it is not the only tool to help you stop smoking.
  2. Don't worry about the safety of using NRT to stop smoking: NRT is a safe alternative to cigarettes for smokers.
  3. Do be cautious about using NRT while pregnant.
  4. NRT is less addictive than cigarettes and it is not creating a new addiction.
  5. Stop using NRT only when you feel very sure you can stay off cigarettes.
  6. If the amounts of NRT you are taking do not help you stop smoking, talk with your health care provider about using (1) more NRT, (2) more than one type of NRT at the same time, (3) other smoking cessation medicines at the same time, or (4) telephone or in person advice on quitting tips.
  7. If NRT helps you stop smoking, but you go back to smoking when you stop using NRT, you should seriously think about using NRT again the next time you try to stop smoking.
  8. Make sure you are using the *gum or lozenge* in the best way:
    - Park the gum between your teeth for 2 – 3 min between chews – fast chewing doesn't allow the nicotine to be absorbed from the lining of the mouth and can cause nausea.
    - Don't drink anything (including coffee, orange juice, beer, wine, or sodas) for at least 15 min before and *nothing while using* nicotine gum or lozenge, so your mouth can absorb the nicotine.
    - Make sure you get the right amount of nicotine – people who smoke more than 10 cigarettes per day should use a 4 mg piece of gum or lozenge.
  9. Make sure you are using the *patch* in the best way:
    - *If you can't stop having a few cigarettes while using the patch, it is best to keep the patch on.* Don't let a few slips with cigarettes stop you from using the patch to quit smoking.
    - You may need to add nicotine gum or lozenges to help get over the hump or you may need to use more than one patch at a time. Talk to your healthcare provider about this.
  10. Do whatever it takes to get the job done – it is not a weakness to use medicine to stop smoking.
-