Title: Increasing hospital-wide delivery of smoking cessation care for nicotine dependent inpatients: a multi-strategic intervention trial

Short title: An intervention to increase hospital smoking care

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Abstract

Aims, design and intervention

Smoking care provision to inpatients is important in assisting smoking cessation and for management of nicotine withdrawal. Limited studies have reported the effectiveness of interventions designed to increase the hospital-wide provision of such care. A quasi-experimental matched pair trial, involving two intervention and two control hospitals, in NSW Australia, investigated whether a multi-strategic intervention increased hospital-wide smoking care provision.

Participants and measurements

Patient surveys (n=274-347 per experimental condition), medical notes audits (n=181-228) and health professional surveys (n=229-302), were used to collect outcome data at baseline and follow-up.

Findings

Significantly greater increases in intervention hospitals compared to control hospitals were found for patient reported offer of Nicotine Replacement Therapy (NRT) (intervention 34% vs control 12%), provision of NRT (16% vs 4%), and provision of written resources (11% vs 2%), and for the recording in medical notes of smoking management discussion (13% vs 3%), offer of NRT (24% vs 3%), and provision of NRT (21% vs 5%). Intervention group health professionals reported significantly greater increases in the mean estimate of patients who: had their smoking management

discussed (30% vs 17%); were offered or provided NRT (30% vs 18%); were asked their intent to smoke post-discharge (22% vs 10%); and were provided discharge NRT (21% vs 4%).

Conclusions

Implementation of a multi-strategic intervention is effective in increasing hospital smoking care delivery, particularly the provision of NRT. Research is required to identify methods to further increase the delivery of this and other forms of smoking care.

Keywords: smoking cessation, hospital, clinical practice, patient care management.

INTRODUCTION

Intervention with hospital patients who smoke has the potential to reduce the morbidity and mortality associated with tobacco.[1] Benefits of hospital patient cessation include reduced risk of disease, improved post-operative recovery, reduced length of stay and lower re-admission rates.[2-5]

A number of countries have comparable recommendations for the delivery of smoking cessation care to hospital patients,[6-8] including the assessment of all patients' smoking status, advising smokers to quit, assessing willingness to quit, assisting smokers willing to quit including NRT provision, and follow-up or referral to further cessation care. Guidelines also recommend the management of inpatient nicotine dependence irrespective of willingness to quit.[6;7] Despite such guidelines, levels of hospital smoking care remain inadequate.[9-11]

A multi-strategic approach to increasing hospital smoking care delivery is recommended including: systematic recording of smoking status, education and resources for staff, care delivery performance feedback, identification of staff to deliver care, inclusion of nicotine dependence pharmacotherapy on formularies, smoke-free site compliance, and management support.[6;8] Although review evidence suggests clinical practices can be changed using a range of strategies,[12-15] an examination of the literature identified no reviews that specifically examined the effectiveness of strategies in increasing hospital smoking care.

A number of controlled studies have addressed this issue.[16-26] Most studies employed multi-strategic interventions,[16-19;21-26] usually involving training, organisational change, reminder, and audit and feedback strategies, and reported variable effectiveness. Most studies were conducted in the US,[16;19-21;23;24] and addressed single units within a hospital or a single diagnostic category.[16-26] Few studies reported on NRT provision,[21;26] or referral.[21]

Given the limitations of previous studies, a trial in four hospitals was conducted in New South Wales (NSW), Australia to investigate the efficacy of a multi-strategic intervention in increasing the hospital-wide delivery of smoking care to nicotine dependent inpatients.

METHODS

Design

A quasi-experimental matched pair trial was conducted with two experimental and two control hospitals. Smoking care delivery was assessed by cross-sectional patient telephone interviews, medical notes audits of recently discharged patients, and cross-sectional surveys of health professionals. Data were collected prior to intervention implementation (baseline) and at the completion of the 12 month intervention (follow-up) at each hospital. Ethics approval was obtained.

Smoking care policy in NSW public hospitals

Smoking is banned in NSW hospital buildings and grounds.[27] Some health service areas have maintained external smoking areas.[28] NSW Health released The Guide for the Management of Nicotine Dependent Inpatients (The Guide) in 2002. The Guide contains smoking care recommendations similar to other guidelines,[6;29] and focuses on supporting inpatient abstinence. Inpatients can receive NRT including a three-day discharge NRT supply, free of charge.[7]

Participants

Hospitals

In NSW there are 21 regional acute-care hospitals (>5000 admissions per annum).[30] Two of these, in geographically separate health services, were allocated to the experimental condition because of links with one or more of the researchers. Six researchers were employed by the same health

services, but located separately in non-clinical health promotion units. Two control hospitals were matched to the intervention hospitals based on admissions per year, available beds, and estimated smoking care levels (from hospital manager report). All four hospitals had smoking areas.

Patients

Eligible patients were those who: were over18 years, stayed two or more nights, were not discharged to a nursing home or from a psychiatric bed, and had not experienced a stillbirth. Psychiatric patients were excluded as they have special needs likely to impact on the level of smoking care provided.[6;7] The ability to complete a survey in English, and having smoked more than 10 cigarettes per day (an indicator of nicotine dependence[26;31]) either at the time of their pre-admission visit or two days prior to admission, were additional eligibilty criteria applied at recruitment.

Health professionals

All nurses, doctors and allied health staff with patient contact were eligible, except those who exclusively cared for day-stay or special needs patients (eg. palliative care).

Experimental conditions

Intervention hospitals

Seven broad intervention strategy areas, detailed below, were based on strategies recommended by smoking care guidelines,[6;8;29;32] and clinical practice change reviews,[12;13;33-37] and addressed barriers to smoking care provision.[38] Both hospitals were provided AUS $30,000 (US $23,000) which funded hospital staff to undertake strategy implementation (eg. training, monitoring and feedback). Further, a research assistant (three days/week per hospital) supported implementation by minimising any administrative burden on hospital staff (eg. developed intervention tools and supported meetings). The research assistant did not provide smoking care.

Local consensus and adaptation

Six months prior to intervention commencement, advisory groups were formed at each hospital to develop and oversee a hospital-specific action plan. Although the broad intervention areas were constant between hospitals, the number and type of detailed strategies implemented varied. Both advisory groups comprised senior hospital representatives and research team members. There was consistent senior staff turnover at both hospitals and poor senior medical officer representation at one hospital.

Linking into existing hospital processes

Each hospital developed a local smoking care guideline. In both hospitals, NRT was included on the formulary to increase access, an NRT Standing Order and protocol facilitated NRT provision, and systems were developed to facilitate NRT provision to pre-surgical patients during the pre-admission visit (patients received two weeks free supply of NRT). Other pharmacotherapies, such as bupropion and varenicline, were not included in procedural documents as their initiation is more applicable to outpatient settings.[141] One hospital systematised charting of on-ward NRT during the pre-surgical visit, and used a fax-referral system to refer inpatients to the NSW Quitline.

Training

Nurses received group training sessions. One hospital provided each nurse four half-hour training sessions. The other hospital provided each nurse one half-hour session. A planned role-play component was not undertaken at either hospital. An estimated 50-70% of nurses in both hospitals working within the training period received some training. Junior medical officers received brief one-on-one training and group training . Senior medical officers and allied health staff received an

information package. Information folders were placed on wards. The program was presented at Grand Rounds. One hospital included training on ward-based computers.

Prompts and reminders

In both hospitals, a prompt sticker was developed for the medical notes of patient smokers, including an assessment of dependence and prompts for further smoking care. Poor sticker compliance at one hospital led to the amendment of an existing medical form to provide a similar function. A bedside care flowchart at both hospitals, and an on-ward computer screen saver at one hospital were implemented.

Monitoring and feedback of compliance

On one day of each month within the intervention period, the medical notes of all current inpatients were audited for smoking care notation. Monthly electronic pharmacy data regarding NRT provision was also obtained. For each hospital, monthly peer comparison results by ward were provided to the advisory group, nurse managers and ward nurses.

Management support

A memo from the senior manager was provided to staff outlining the program. Management in both hospitals funded two whole-of-hospital staff lunches to promote the program, and subsidised the provision of staff NRT.

Communication

Staff at both hospitals were advised of program progress via training and feedback sessions, and noticeboard and hospital newsletter articles. Patients were advised of the smoking care available via

a mail-out to pre-booked patients, on-ward fact sheets, amendments to inpatient booklets, and on-ward posters. The program was promoted through local television and newspapers.

Control hospitals

The control hospitals implemented The Guide as per their usual approach to implementing a guideline disseminated by NSW Health.

Measures and procedures

Smoking care outcomes

Patient survey

Interviewers attempted to contact eligible patients one week post-discharge. Patients who reported smoking more than 10 cigarettes per day either at preadmission or two days prior to admission, and could complete the survey in English, were recruited. At each hospital, recruitment of patients was undertaken over a four to six month period at baseline and follow-up.

Patients completed computer assisted telephone surveys which assessed recall of 11 smoking care practices received either during the pre-admission visit or during admission (yes, no/unsure). Seven patient demographic and clinical descriptors were collected via the survey and a further five descriptors were obtained from electronic hospital records.

Medical notes audit

One clinical auditor recorded smoking care notation on any form contained within a patient's medical notes. Nine smoking care variables were assessed. Reliability was examined by re-auditing 20% of follow-up notes.

Health professional survey

A pen and paper survey was implemented across all shifts over three days. Respondents indicated on a scale (0-100%) the proportion of their patients they provided each care practice during the previous three months. Thirteen smoking care practices were collected. Screening questions ensured questions irrelevant to particular health professionals were not answered. The baseline and follow-up surveys generally represented a similar sample of health professionals.

Sample size

A sample of 240 patients per experimental group was estimated to be sufficient to detect a difference of 13% between intervention and control groups for each smoking care practice reported by patients (50% baseline prevalence, α=0.05, power=80%). An assumed 60% consent rate to the notes audit was estimated to be sufficient to enable a 16% difference to be detected. A sample of 240 health professionals (assumed 60% reponse rate) was estimated to be sufficient to detect a 9% difference in the mean proportion of patients reported to have received each care practice (standard deviation of 0.35). These estimates assumed no baseline differences in care between groups.

Analysis

Sample characteristics

Patient survey and notes audit, and health professional survey samples were examined for differences between intervention and control hospitals regarding participant descriptors at baseline and follow-up. Comparisons were undertaken using chi-square analyses.

Smoking care outcomes

For the patient survey and medical notes audit data, a logistic regression was undertaken for each smoking care practice to examine change in smoking care from baseline to follow-up in intervention

hospitals compared to control hospitals. The standard regression was adjusted for possible clustering effects at the hospital level by using the Generalized Estimating Equations approach.[39;40] An exchangeable working correlation matrix was assumed and a robust variance estimator was employed.[40] For the health professional survey data, the standard general linear regression model was adjusted for possible clustering effects by using a mixed model procedure. All regression models included the variable 'hospital pair', and patient or health professional characteristic variables found to differ between intervention and control hospitals. To account for baseline levels of care delivery, an interaction term between experimental condition and time was included in the regression model. Change in care delivery was determined to be significantly different in intervention hospitals compared to control hospitals if the interaction term was significant in the model ($p \leq 0.01$ used because of multiple testing).

All analyses were undertaken using SAS Version 9.1.[41]

RESULTS

Hospital, patient and health professional samples and characteristics

Consent rates (consenters/consenters+non-consenters+non-contacted) to the patient survey ranged from 71% to 77% (n=2430-3117) per condition at baseline and follow-up. The smoking rate of patients consenting to the survey ranged from 20% to 21%, a rate similar to the general NSW population.[30] Eleven percent to 12% of consenting patients (n=274-347) were nicotine dependent (smoked more than 10 cigarettes per day), and as such were recruited to the study. Of those nicotine dependent patients, 62% to 66% consented to the notes audit per condition at baseline and follow-up (n=181-228). Consent to the health professional survey ranged from 56% to 62% per condition at baseline and follow-up (n=229-302). Higher consent rates were obtained for nursing (62%-67%) and allied health staff (50%-71%) compared to medical officers (32%-40%).

Characteristics of the patient and health professional samples are provided in Table 1. Intervention and control patients consenting to the audit were similar, with the exception of intervention patients being more likely to be surgical patients (p=0.02) and Australian born (p=0.001) at baseline, and to have stayed less than five days (p=0.02) at follow-up.

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Insert Table 1 here

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Smoking cessation care outcomes

Patient reported care

Of the 11 care practices assessed, three were found to have a significantly different change in care delivery in intervention compared to control hospitals (see Table 2). There was a greater increase in patients reporting being offered NRT (p=0.001), being provided NRT (p<0.01), and being provided written resources ($p\leq$0.0001) from baseline to follow-up in the intervention group. The intervention group increased 34% for offered NRT, 16% for provided NRT, and 11% for provided written resources compared to 12%, 4%, and 2% respectively in the control group.

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Insert Table 2 here

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Notes audit recorded care

The reliability of auditing was acceptable with a prevalence and bias adjusted kappa of 0.64 to 1.00 (perfect agreement 82% to 100%) per hospital.[42] Of the nine care practices assessed, three were found to have a significantly different change in care delivery in intervention hospitals compared to

controls (see Table 2). There was a greater increase in care recorded from baseline to follow-up in the intervention group for: management of smoking discussed ($p<0.01$); offered NRT ($p=0.0001$) and; provided NRT ($p=<0.001$). The intervention group increased 13% for management discussed, 24% for offered NRT, and 21% for provided NRT, compared to 3%, 3%, and 5% respectively in the control group.

Health professional reported care

Of the 13 care practices assessed, four were found to have a significantly different change in care delivery in intervention compared to control hospitals (see Table 3). There was a greater increase in the mean estimate of patients provided care from baseline to follow-up in the intervention group for: management discussed ($p<0.01$); offered or arranged NRT ($p<0.01$); asked intention to smoke post-discharge ($p=0.01$) and; provided discharge NRT ($p\leq0.0001$). The intervention group increased 30% for management discussed, 30% for offered or provided NRT, 22% for asked intention to smoke post-discharge, and 21% for provided discharge NRT compared with 17%, 18%, 10%, and 4% respectively in the control group.

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Insert Table 3 here

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DISCUSSION

To our knowledge, this study is the first controlled trial to examine the effectiveness of an intervention in increasing hospital-wide provision of a range of recommended smoking cessation care practices across more than one hospital. The study demonstrated the multi-strategic intervention was effective in increasing the provision of a number of key aspects of smoking care. The study provides evidence that improvement in the routine provision of these aspects of smoking care is

achievable on a whole-of-hospital basis. Further, it describes feasible clinical practice change strategies that may be used to realize such improvements.

A consistent effect was found across all three data collection methods for the offer and provision of inpatient NRT.[6;7;29;43;44] Such a finding is of value as the provision of NRT is a central element of care recommended to be provided to hospitalised smokers.[6-8;29;32;45] NRT can assist patients to initiate a cessation attempt and to cope with nicotine withdrawal in the smoke-free environment, irrespective of their willingness to quit permanently.[32;46] The effect across all three data collection tools demonstrates the strength of the intervention effect for these care practices.

Significant improvement on four other care practices was demonstrated for specific data collection tools. Disparity in smoking care levels between measurement tools has been previously reported.[47;48] Although patient report is suggested to over-estimate smoking care delivery levels,[47;49] it is considered a reliable and feasible method of assessing such care in hospitals.[47] As such, the positive finding regarding the provision of written resources suggests a beneficial change in care. Medical notes audit is likely to underestimate care levels.[47;49;50] Despite this, the increased discussion of smoking management demonstrated when measured by notes audit suggests a beneficial change in clinical practice, even if simply in the recording of a practice not commonly noted in medical records.[47;50] The positive outcomes found in discussion of smoking management, asking intention to smoke post-discharge, and provision of discharge NRT when measured by health professional report also suggests a change in clinical practice. However, given previous research suggests health professionals over-report smoking care,[48;51;52] such findings should be interpreted cautiously.

Although the positive outcomes are encouraging, the resultant care levels remained less than optimal. Despite NRT being appropriate for most patients,[44;53] the increase in its provision resulted

in only 23% of patients reporting being provided NRT. In a previous study undertaken in a hospital pre-surgical clinic, Wolfenden et al[26] found patient reported NRT provision increased by a much larger 74% to a level of 82%. Wolfenden et al[26] utilised a touch-screen computer to assess patient suitability for NRT and to prompt NRT provision in the clinic and on-ward. These contrasting results suggests interventions that more directly address the systems of care may produce higher levels of practice change.[11;36;54] Specifically, it suggests that information technology may be particularly important.[48;55]

Although this study focussed on clinical practice change rather than patient cessation, the study's failure to increase the provision of other elements of care, particularly care related to post-discharge, likely impacted on its ability to increase the number of patients permanently quitting.[43;56] From this perspective, and in comparison to the consistent effects found for NRT provision, the limited evidence of an effect on care related to discharge, and the lack of effect on other elements of smoking care requires further consideration.

NRT provision may have been more easily increased because medication prescription is a common and accepted component of clinical care, and is considered by health professionals to assist the clinical need to relieve withdrawal.[46] Compared to NRT provision, other smoking care practices may be less familiar and acceptable to clinicians, and therefore more difficult to change.[57] For example, advising a patient to quit is often perceived as confrontational.[58] Training in how to interact with patients through case studies and role-play may overcome such a barrier.[59;60]

Potentially, some intervention strategies may have impacted differentially across smoking care practices. For example, the ready availability of electronic NRT prescribing data meant its monitoring and use as feedback was relatively easy to implement. In contrast, the manual auditing of

patient medical records for notation of other aspects of smoking care for performance monitoring was time consuming and difficult to maintain for clinical staff. Further, such data was able to be dismissed by clinicians as attributable to poor recording rather than care not being provided.[61] Patient exit or bedside interviews may be more efficient and effective when collecting smoking care data as the basis for performance feedback.[47;48;62]

Further, as the study accommodated the local context of the two intervention hospitals, the standard of each strategy varied, and in some instances may not have reached a level necessary to achieve an impact. For example, the ability of either hospitals' training approaches to increase staff knowledge and skill regarding smoking care is unknown. The hospitals were not required to demonstrate the outcomes of training in either knowledge or practice terms. In future studies, it is recommended that outcome standards for each intervention strategy be established.[63;64;65] In the case of training, this may be accomplished through competency testing.[66]

The intensity of strategy implementation, in terms of reach and frequency, may also have contributed to the differential study outcomes. For example, as few as 50% of nurses received some smoking care training. Further, the management support strategy was hampered by changeover in management positions, particularly senior medical officers. Senior manager engagement may have been enhanced by the extension of existing strategies to include senior medical officers. Academic profiling (educational outreach plus peer-comparison feedback) has been suggested to enhance such engagement.[61]

The study findings should be considered in light of a number of study limitations. First, a quasi-experimental design was used, and although not the strongest design available, it was considered appropriate for an effectiveness trial regarding routine care delivery.[57] Hospitals were matched on

important indicators, three data collection tools were used to demonstrate outcome consistency, and appropriate analyses were used to mitigate potential design bias. Second, smoking more than 10 cigarettes per day was used as an indicator of dependence. Although alternative brief and validated indicators are available,[67;68] this measure was preferred by hospital staff. Third, the researchers had some links with intervention hospitals. This was expected to impact minimally on study outcomes as the researchers had no authority regarding care provision. Fourth, only limited detailed data was collected regarding intervention strategy implementation. However, given the challenges of 'real world' intervention implementation using a hospital advisory group to design and drive the intervention, and hospital staff rather than research staff to implement the intervention, the level of data could be considered reasonable. Last, the intervention was undertaken in medium-sized, regional hospitals and it is unclear if the findings are applicable to other facilities.[69]

This study demonstrated that significant gains can be made in the routine provision of smoking care in hospitals. Despite this, further initiatives are required to advance levels of NRT provision and other smoking care practices, particularly those related to post-discharge. The findings of this study indicate a multi-strategic and organisationally supported approach to the dissemination of clinical care guidelines is required if their intended benefits are to be achieved. The outcomes suggest the need to adopt a more rigorous approach to the design, monitoring and reporting of intervention delivery.[64;65;70] Further research is required to determine the effectiveness of multi-strategic interventions when greater intervention quality and implementation adherence is obtained.

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Table 1: Summary of participant descriptors n(%)

Descriptor	Intervention Hospitals		Control Hospitals	
	Baseline	Follow-up	Baseline	Follow-up
Patient survey	**n=343**	**n=347**	**n=274**	**n=347**
Gender				
Female	173(50)	188(54)	147(54)	201(58)
Age**				
18-34	97(29)	97(28)	68(25)	70(20)
35-54	145(42)	129(37)	114(42)	172(50)
55-75	84(24)	112(32)	81(30)	91(26)
75+	17(5)	9(3)	11(4)	14(4)
Length of Stay (days)				
2-4	218(64)	227(65)	158(58)	210(61)
5-10	102(30)	88(25)	87(32)	111(32)
10+	23(7)	32(9)	29(11)	26(7)
Ward of Discharge*				
Medical	64(19)	65(19)	78(29)	77(22)
Surgical	195(57)	194(56)	123(45)	176(51)
Maternity	57(17)	53(15)	52(19)	43(12)
Other	27(8)	35(10)	21(8)	51(15)
Education				
Up to completion of year 10	233(68)[a]	214(62)	177(65)[f]	255(65)[a]
Completed high school	26(8)	17(5)	25(9)	24(7)
Trade certificate	62(18)	98(28)	52(19)	75(22)
University	21(6)	18(5)	15(5)	22(6)
Employment				
Full time	85(25)[b]	87(25)	51(19)[b]	92(27)[b]
Home duties	61(18)	70(20)	61(22)	68(20)
Retired	62(18)	61(18)	58(21)	58(17)
Other	134(39)	129(37)	103(38)	128(37)
Country of Birth***				
Australia	322(94)[b]	318(92)	233(85)[b]	295(85)[b]
Aboriginal or Torres Strait Islander	26(8)[c]	22(6)	20(7)[b]	27(8)[b]
Marital Status				
Married/De facto	192(56)[b]	190(55)	135(49)[a]	184(53)[c]
Cigarettes smoked				
11-20	180(52)	179(52)	159(58)	194(56)
21-30	110(32)	113(33)	79(29)	106(31)
31 or more	53(15)	55(16)	36(13)	47(14)
Quit attempts in past 12 months**				
none	209(61)	191(55)	168(61)	216(62)
one	50(15)	56(16)	37(14)	56(16)
two or more	84(24)	100(29)	69(25)	75(22)

Descriptor	Intervention Hospitals		Control Hospitals	
	Baseline	Follow-up	Baseline	Follow-up
Smoking related disease[e]	144(42)[c]	145(42)[e]	104(38)[g]	149(43)[e]
Health professional survey	**n=243**	**n=229**	**n=264**	**n=302**
Gender				
Female	210(86)	199(85)[c]	228 (86)[b]	251 (83)[b]
Age				
20-29	63(26)	45(19)[e]	66(25)[c]	72(24)[d]
30-39	64(26)	66(28)	72(27)	77(25)
40-49	81(33)	82(35)	94(35)	101(33)
50+	36(15)	39(17)	31(12)	47(16)
Health professional Type				
Nurse	191(78)[b]	185(79)[f]	211(80)[b]	246(81)[e]
Doctor	27(11)	28(12)	29 (11)	31(10)
Allied Health[f]	25(10)	17(7)	24(9)	23(8)
Hours Worked				
Full time	155(64)	146(62)[e]	174(66)[b]	186(61)[c]
Part-time/Casual	89(36)	86(37)	90(34)	115(38)
Shifts worked				
Days	70(29)	61(26)[d]	74(28)[b]	81(27)[a]
Nights/Rotation	174(72)	168(73)	190(72)	218(72)
Ward most frequently worked***				
Emergency	46(19)[b]	42(18)[d]	43(16)[b]	56(19)[b]
Medical	67(28)	73(31)	65(25)	86(28)
Surgical	46(19)	47(20)	37(14)	30(10)
Maternity	30(12)	25(11)	21(8)	27(9)
Other	54(22)	42(18)	98(37)	103(34)
Smoking status				
Current smoker	42(17)	46(20) [b]	47(18)[c]	50(17)[b]
Ex-smoker	65(27)	64(27)	68(26)	72(24)

*significant difference between intervention and control groups at baseline.
**significant difference between intervention and control groups at follow-up.
***significant difference between intervention and control groups at baseline and follow-up.
[a] four missing.
[b] one missing.
[c] two missing.
[d] six missing.
[e] three missing.
[f] five missing.
[g] twelve missing.
[e] a disease was classified as smoking-related based upon the International Statistical Classification of Diseases and Related Health Problems (ICD-10-AM).[71]
[f] allied health included staff such as physiotherapists, drug and alcohol counsellors and dieticians.

Table 2: Proportion of patients provided smoking care as measured by patient report and medical notes audit in intervention and control hospitals at baseline and follow-up[a, b,]

Smoking care practice	Intervention hospital patients		Control hospital patients		*p* value[c]
	Baseline n(%)	Follow-up n(%)	Baseline n(%)	Follow-up n(%)	
Smoking status identified					
patient report	272(79)	297(86)	214(78)	275(79)	0.22
notes audit[e]	200(93)	198(94)	151(93)	199(97)	-
Informed cannot smoke					
patient report	105(31)	140(40)	94(34)	140(40)	0.64
Management discussed[f]					
patient report	122(36)	200(58)	95(35)	160(46)	0.31
notes audit	14(7)	43(20)	23(14)	36(17)	<0.01
Offered NRT					
patient report	58(17)	178(51)	53(19)	108(31)	0.001
notes audit	15(7)	65(30)	18(11)	28(14)	0.0001
Provided NRT					
patient report	25(7)	81(23)	22(8)	43(12)	<0.01
notes audit	15(7)	60(28)	15(9)	28(14)	<0.001
Monitored withdrawal					
patient report	48(14)	68(20)	30(11)	52(15)	0.79
notes audit	7(3)	1(<1)	3(2)	3(1)	0.22
Advised to quit for good					
patient report	168(49)	192(55)	121(44)	176(51)	0.79
Provided written resources					
patient report	50(15)	90(26)	37(14)	55(16)	<0.0001
notes audit[e]	1(<1)	15(7)	4(2)	4(2)	-
Asked intent post-discharge					
patient report	24(7)	35(10)	19(7)[d]	36(10)	0.89
notes audit[e]	0(0)	2(1)	14(9)	3(1)	-
Advised discharge support					
patient report	13(4)	37(11)	13(5)[d]	33(10)	0.30
notes audit[e]	0(0)	0(0)	7(4)	2(1)	-
Provided discharge NRT					
patient report	3(1)	16(5)	5(2)[d]	7(2)	0.08
notes audit[e]	2(1)	5(2)	7(4)	1(<1)	-

[a] at baseline no difference between the intervention and control patient reported smoking care. At baseline higher levels of management discussed (p=0.01), asked intent to smoke post-discharge (p=<0.0001), post-discharge NRT (p=0.03) and advice to seek post-discharge support (p=0.02) in control hospitals compared to intervention hospitals when measured by notes audit.

[b] 2-11 medical notes were not available for audit per hospital at baseline and follow-up.

[c] p value of logistic regression interaction term, $p \leq 0.01$ was considered significant.

[d] one missing.

[e] smoking care practice could not be analysed because of insufficient numbers in some cells.

[f] management of smoking could include abstinence, abstinence plus NRT or continued smoking in a designated area or off site.

[g] a 24 hr, 21mg NRT patch was routinely provided to patients. Combination therapy could be provided at the discretion of the medical officer.

Table 3: Comparison of health professional reported mean proportion of patients provided smoking care in intervention and control hospitals at baseline and follow-up[a]

Care item	Intervention %(SD)		Control %(SD)		*p*
	Baseline[b]	Follow-up[c]	Baseline[d]	Follow-up[e]	value[f]
Aware smoking status	52(36.8)	61(34.8)	54(37.8)	57(36.5)	0.17
Record smoking status	33(39.3)	48(40.4)	33(40.7)	47(39.3)	0.42
Assessed dependence	28(36.9)	45(39.9)	30(39.0)	40(38.6)	0.06
Recorded dependence	26(35.6)	41(40.0)	24(36.0)	36(38.3)	0.32
Discussed management [g]	17(27.3)	45(36.5)	21(31.9)	38(36.9)	<0.01
Advised to quit	31(37.9)	47(39.4)	29(37.4)	43(39.0)	0.61
Offered and/or arranged NRT	7(16.6)	37(41.2)	13(26.8)	31(39.0)	<0.01
Monitored withdrawal	13(24.1)	30(36.0)	15(27.8)	24(33.9)	0.05
Recorded withdrawal	11(22.9)	23(33.7)	12(25.0)	22(33.6)	0.50
Asked intention discharge	9(20.8)	31(36.5)	10(22.6)	20(30.7)	0.01
Advised support discharge	14(26.0)	37(38.2)	17(30.1)	29(36.0)	0.05
Treatment in discharge plan	3(13.2)	14(29.3)	3(11.3)	8(21.3)	0.08
Provided NRT discharge	2(9.5)	23(35.8)	7(19.6)	11(25.0)	<0.0001

[a] at baseline health professional survey found higher levels of offering of NRT (p=0.01) and provision of post-discharge NRT (p=0.01) in control hospitals compared to intervention hospitals.

[b-e] sample sizes varied because not all questions were relevant to all health professionals or questions were unanswered.

[b] sample size 139-241.

[c] sample size 138-228.

[d] sample size 180-263.

[e] sample size 156-297.

[f] p value of logistic regression interaction term, $p \leq 0.01$ was considered significant.

[g] management of smoking could include abstinence, abstinence plus NRT or continued smoking in a designated area or off site.