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Intervention with brief cessation advice plus active referral for proactively recruited community smokers: a pragmatic cluster randomized controlled trial

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Key points

Question Is brief smoking cessation advice, plus active referral to cessation services, effective for community smokers?

Findings In this cluster randomized controlled trial, we found that a combined brief intervention delivered by volunteers had more effect on smoking cessation at 6 months than brief general advice only

Meaning A combined brief intervention of smoking cessation advice and active referral can be used in community settings to recruit smokers and help them to quit.

Abstract

Importance Most smoking cessation (SC) clinics are costly, passive and underused.

Objective To compare the SC effect of a combined intervention involving brief model-guided SC advice plus active referral to SC services (active referral group) with those of brief model-guided SC advice only (brief advice group) and general SC advice only (control group).

Design A single-blinded, 3-arm pragmatic cluster randomized controlled trial.

Setting General community in Hong Kong.

Participants 1226 adult daily smokers proactively recruited to participate in the Quit-to-Win Contest held in 2015.

Intervention Participants were randomly allocated to the active referral (n=402), brief advice (n=416), and control (n=408) groups. Brief telephone counseling was offered to the active referral and brief advice groups at 1 and 2 months. Interventions were delivered by SC ambassadors who had undergone a brief training.

Main Outcomes and Measures The primary outcome was the self-reported past 7-day point prevalence of abstinence (PPA) at 6 months. The secondary outcomes were carbon monoxide-validated abstinence, smoking reduction, and SC service use.

Results The response rate was 68.2% at 3 and 72.3% at 6 months. The corresponding PPAs were 18.9% and 17.2% in the active referral group, higher than in the brief advice (8.9%, 9.4%; both $p \leq .001$) or control groups (14.0%, 11.5%; $p < .05$ at 6 months). Compared with the other 2 groups, the active referral group had significantly higher validated abstinence rates (10.2% at 3 months and 9.0% at 6 months, all $p < .05$) with odds ratios (95% CI) of 2.84 (1.57–5.15) and 2.61 (1.46–4.68) at 3 months, and 1.85 (1.06–3.23) and 1.81 (1.04–3.16) at 6 months, respectively. The SC service use rate was significantly higher in the active referral group (25.1%) than in either brief advice (2.4%) or control groups (3.4%) at 6 months ($p < .01$).

Conclusions and relevance An intervention involving brief advice and active referral delivered to smokers in the community by volunteers can increase quitting in places where SC services are available but underused.

(326/350 words)

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Smoking cessation (SC) services providing evidence-based interventions improve quitting substantially, but only 16% of smokers ever use SC services worldwide.[1] US quitlines cover approximately 1–2% of smokers, and only 3.0% of daily smokers in Hong Kong ever use SC services and nearly all the remainder (95%) have no interest in seeking help.[2] As part of clinical SC guidelines (e.g., 5As, 5Rs),[3] referring smokers to SC services is usually effected by passive methods (e.g., asking and motivating smokers to go to SC services). Low-cost and effective methods are needed to increase the usage of SC clinics or quitlines, and thus quit rates.[4,5]

Active referral, which connects smokers with SC service providers and allows smokers to choose their preferred method of assistance, may increase both SC usage and quit rates. One systematic review has shown the effectiveness of proactive telephone counseling in increasing quit rates.[6] Trials have mainly focused on evaluating the effects of referring smokers to national or state-level quitlines,[7-11] and some have assessed the effects of cold calls and transferring information from electronic medical records to SC quitlines.[12-14] Most such studies have been conducted in clinical settings (hospitals or clinics),[7,10,13,14] some in community health centers,[8,11]and one with quitline callers.[9] The Ask-Advise-Connect trial in the US showed that nurses or medical assistants in primary care clinics who have had a short period of training could effectively refer smokers to quitline services.[15] A recent large trial (N = 6400) found that counselors in primary care clinics actively referring smokers to SC services increased 6-month prolonged abstinence at 1-year follow-up compared with usual care (odds ratio 1.27, 95% CI 1.03–1.57).[16]

We performed a randomized controlled trial (RCT) of the efficacy of using trained volunteers to actively refer community smokers to smoking cessation services.

Methods

Study design

This was a single-blinded, pragmatic cluster RCT (cRCT) conducted within the 'Quit-to-Win' (QTW) Contest (Appendix 1) organized by the Hong Kong Council on Smoking and Health (COSH).[17-19]. Sixty-six recruitment sessions were held from June to September 2015 in community sites (e.g., housing estates, shopping malls, public transport centres) throughout Hong Kong. A total of 1347 smokers were recruited, with 1226 providing written informed consent randomly assigned to the active referral, brief advice only or control groups (Figure 1). Ethical approval was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW15-332). The research protocol has been published elsewhere.[20]

Study setting and participants

University students (health-related) and volunteers from non-governmental organizations were trained as SC ambassadors in a half-day workshop (Appendix 1). People smoking near the recruitment sites were invited by the ambassadors using a 'foot-in-the-door' approach (Appendix 1).[21] Eligible participants were adult smokers (aged ≥ 18) who had smoked at least 1 cigarette a day in the past 3 months, exhaled carbon monoxide (CO) ≥ 4 ppm, expressed the intention to quit or reduce smoking, had a local phone number for follow-up, were not participating in other SC programs, and were physically and mentally fit to communicate in Cantonese. Smokers consuming ≥ 1 cigarette daily with exhaled CO ≥ 4 ppm were included, as light smokers covered half of the overall smokers in Hong Kong.[2,22] Recruitment sessions were randomized with a block size of 3, 6 or 9 to ensure a similar number of activities for each cRCT group. The cRCT was single-blinded, i.e. all outcome assessors were not aware of the group allocation at the follow-up assessment, and statistical analysts were also blinded to the group allocation.

Active referral group

Participants received brief SC advice and were actively referred to SC services. The advice was given using the structured model 'AWARD' (Appendix 1), face-to-face at baseline and with a 1-minute telephone follow-up. The AWARD model had been previously validated in trials conducted with community smokers.[17-19] The details of these providers' services have been reported elsewhere.[20] The ambassadors introduced the SC services to participants and actively referred them to the chosen SC provider. Participants gave their consent and provided contact details (names and telephone numbers), which were sent to the service providers by COSH within a week of recruitment. Participants received proactive telephone calls from the service providers with cessation counseling or for booking an appointment at an SC clinic. Participants not yet ready to book an SC service were encouraged to make an early appointment when they did became ready, and received assistance at follow-up. All participants received a pocket-sized information card containing brief information (e.g., hotline, address and operational hours) on and the highlights (e.g., provision of assistance by experienced, professional SC nurses or physicians) of each SC service.

Brief advice only group and control group

Participants in the brief advice group received the AWARD-guided advice and the same health warning leaflet as the active referral group. They were not actively referred but were motivated to book an appointment with SC service providers by themselves (the R of AWARD). The control group received minimal (30 seconds) general SC advice and a 12-page self-help booklet, which had been routinely used in the QTW Contests. Neither group received the information card from the service providers. The brief advice only group received follow-up boosters after 1 and 2 months, by means of short telephone calls, with advice on the harm caused by smoking and reinforcing quitting. The control group did not receive any boosters at follow-ups.

Outcome measures and statistical analysis

Participants who reported not smoking (even a puff) in the past 7 days at 3 and 6 months were biochemically validated using the exhaled CO (< 4 ppm) and saliva cotinine (< 10 ng/ml) tests (Appendix 1). Primary outcomes included self-reported 7-day point prevalence abstinence (PPA) at 6 months regardless of whether SC services had been used. Secondary outcomes included SC service use, biochemically validated smoking abstinence and at least a 50% reduction in daily cigarette consumption since the baseline. Sample size calculation was based on previous QTW contests, which provided interventions similar to the control group in the present study, with a past 7-day PPA of approximately 10.0% at 3 months.[17,23,24] The effect size was estimated according to a previous RCT on the active referring of smokers during general practitioner visits to SC service providers (quit rate of intervention group: 12.3%, control: 6.9%).[10] To detect a significant difference of quit rate between the intervention and control groups with a power of 80% and significance level of 5%, 284 participants were needed per group. After adjusting for the clustering effect (an intra-cluster correlation coefficient of 0.005) and accounting for a retention rate of 70% at follow-ups, 1291 participants were needed for the 3 groups.

Intention-to-treat (ITT) analysis was performed by assuming that participants lost to follow-up were active smokers with no changes in their habit. Analysis was based on *a priori* plan.[20] Logistic regression was used to estimate the crude odds ratio (OR) for past 7-day PPA, validated abstinence, smoking reduction and use of SC services. A generalized estimating equation (GEE) model was used to calculate adjusted odds ratios (AORs) for past 7-day PPA and validated abstinence after adjusting for the clustering effect and baseline socio-demographic characteristics which showed a significant difference. To handle the missing data at 6 months (26.2%) used in the fully adjusted model, multiple imputation (MI) methods were adopted (Appendix 1). Even a participant was not able to be contacted at 3-month by a maximum of 7 calls and 1 voice message, the participant was still included in the follow-up list at 6-month.

We recorded the cost of each intervention, including direct operating expenses such as staff salaries and the materials used for SC ambassador training, recruitment, intervention delivery and telephone

booster. However, the costs did not include interventions provided by SC services or the incentives provided in the QTW Contest. The cost per person of providing brief advice plus active referral, brief advice only and minimal general cessation advice was calculated by dividing the total cost by the number of smokers in each group.

Results

Participant characteristics

A total of 1226 participants (84.8% male, mean age 42.8 years) were randomly assigned to the active referral (n = 402), brief advice (n = 416) or control groups (n = 408). Baseline socio-demographic characteristics, smoking behavior, quitting behavior and self-efficacy in quitting were similar (Table 1), except in the control group, which had more men and more participants of a primary or lower educational level than the other groups ($p < .05$). Overall retention rates (Figure 1) were 68.2% at 3 and 73.8% at 6 months, and were much the same in all 3 groups (χ^2 $p > .05$). Similar characteristics were found in participants who were successfully followed or missing at 6 months. (not shown in tables)

SC outcomes

The active referral group had significantly higher past 7-day PPA than the brief advice group at 3 (18.9% vs. 8.9%, $p < .001$) and 6 months (17.2% vs. 9.4%, $p = .001$) (Table 2). The active referral group also had a significantly higher PPA than the control group at 6 months (17.2% vs. 11.5%, $p = .001$), which was marginally significant at 3 months (18.9% vs. 14.0%, $p = .07$). The control group had a higher PPA at 3 months (14.0% vs. 8.9%, $p = .03$), which became non-significantly different at 6 months (11.5% vs. 9.4%, $p = .36$), than the brief advice group. The active referral group had significantly higher validated abstinence rates at 3 (10.2%) and 6 months (9.0%) than the brief advice (3.8%, 5.0%) and control (4.2% and 5.1%) groups (all $p < .05$). The rates of smoking reduction (excluding participants who reported no smoking in the past 7-days) were generally similar among all 3 groups at follow-ups. The active referral group consistently reported using SC services more than those in the brief advice only group (all $p < .001$) and in the control group (all $p < .001$) at all follow-ups.

Compared with the control group, the active referral group had a significantly higher self-reported 7-day PPA at 6 months with an AOR (95% CI) of 1.59 (1.03–2.47) in the GEE model and 1.64 (1.08–2.48) in the MI model (Table 3). Similar corresponding AORs (95% CI) of 1.79 (0.95–3.35) and 1.80 (1.06–3.05) were observed for validated abstinence. The brief advice group had consistent non-significant lower odds (AORs: 0.75 to 0.99) of self-reported 7-day PPA and validated abstinence than the control group in both models.

Use of SC services

Among the 351 (87.3%) participants in the active referral group who had chosen SC services, 71.5% received proactive calls from the providers and 29.1% used the services (Table 4), which included individual face-to-face counseling (61.8%), prescribed cessation medication (e.g., Varenicline) (42.2%), nicotine replacement therapy (NRT) (40.2%), Chinese acupuncture (23.5%), telephone counseling (21.6%) and group counseling (7.8%) (Table 4). The main reasons for not using any SC services at all were a busy personal schedule (53.7%), time mismatches with the services (46.3%), lack of interest in them (10.1%) or perceiving them as not useful (10.1%).

Cost of interventions

The operating costs associated with the training (US $408), recruitment (US $24,569), and telephone booster (US $232) came to a total of US $25,209 (Data not shown in the tables). The average costs for a smoker to receive the brief SC advice plus active referral, brief advice only or general cessation

advice were US $21.3, US $20.0 and US $20.4, respectively. The group differences in costs were mainly the result of participants receiving different materials (referral card, health warning leaflet, self-help booklet) and the additional staff salary for transferring smokers' information to SC providers (active referral group only).

Discussion

We found significantly higher self-reported and biochemically validated abstinence rates for the combined brief cessation advice plus active referral to SC services than for the brief advice only or very brief cessation advice, in smokers proactively recruited in the community. Robust findings were observed across different outcomes - self-reported abstinence, validated abstinence and SC service use at 3 and 6 months, in both crude and adjusted models accounting for missing data. The self-reported and biochemically validated abstinence rates were higher than our previous trials conducted within the Hong Kong QTW contest, which used different interventions such as text messaging, financial incentives and 'cut-down-to-quit'.[17-19] The beneficial effects of active referral are in line with studies conducted in hospitals and primary care clinics, which referred smokers to quitlines.[7,10,13,14] The effect size of the self-reported PPA at 6 months of the brief advice plus active referral (vs. control) in our study (AOR = 1.59) is similar to the 6-month prolonged quitting (OR = 1.27) in a trial assessing the effect of active referral for patients proactively recruited by using details from their medical records,[16] although these studies were not directly comparable given the differences in SC services, smoker characteristics and intervention components.

The active referral group might have had a higher quit rate than the other 2 groups because of using SC services, which are generally effective in increasing quitting. Higher quit rates were also reported by other Hong Kong SC services, ranging from 18.4 to 35.9% at the 52-week follow-up.[25-27] Many participants had received cessation medications (e.g., Varenicline) or NRT, which can double the quit rate achieved through standard counseling. Our subgroup analyses found that the quit rate was highest among smokers who sought SC services (30.4%, n = 102), compared with the smokers who consented but did not use the services (10.8%, n = 249). The latter had a quit rate similar to those of the brief advice (9.4%) and control groups (11.5%) ($p > .05$).

We found that the on-site brief advice using the AWARD model plus a health warning leaflet (brief advice only group) did not have any additional effect on study outcomes compared with the control group. Our previous trial in QTW 2010, using brief SC advice but with a more comprehensive SC self-help booklet, produced more beneficial effects on quitting than in the control group.[24] This suggests that the single leaflet is as effective as the booklet, but will be cheaper to distribute widely in community cessation campaigns.

The present trial has provided new evidence on the benefits of using trained healthcare students and community volunteers to actively refer community smokers to smoking cessation services.[20] Trained SC ambassadors can reach a large number of smokers in a short period of time to deliver brief interventions at low cost. Other studies have also shown the feasibility and acceptability of community workers assisting smokers to quit.[28,29] Second, the active referral intervention was shown to be acceptable to most smokers, as many consented to be referred (87.3%, 351/402), and 29.1% (102/351) used the chosen services. Third, by adopting a brief training and intervention design, we found that the cost of the combined intervention of brief advice plus active referral was comparable to the other 2 options without active referral. More importantly, the brief intervention can be applied in different settings. For example, previous studies have found that smokers attending social and community services accepted brief SC advice up to an average of 3.8 minutes at the first visit.[29,30] Because of limited resources, many health organizations cannot support an intensive intervention,[31] but using briefly trained volunteers for the active referral of smokers to existing SC services makes for an effective low-cost intervention, and is thus a valuable alternative way of encouraginbg people to quit.

This study had several limitations. The trial was held within the QTW Contest, which provided small financial incentives that may increase smokers' acceptance of and compliance with SC treatment.[32,33] Because all 3 groups were to receive the same small incentives, any effects on treatment would have balanced each other. Given the pragmatic trial design, we did not aim to describe the effects of the different components of the combined intervention on the active referral group. However, the results were consistent when the active referral group was compared with either the control or brief advice groups. We received no information about the reasons for lack of contact with service providers (100 out of 351). Future studies should be better designed to increase successful connections between smokers and service providers (e.g., more flexible times for calling back). The retention rate at 6 months (72.3%) was comparable to other similar community and clinical trials on smoking cessation. Similar characteristics were observed in participants who were successfully followed or missing at 6 months. Moreover, the intention-to-treat yielded conservative findings that were comparable to those using multiple imputation. The actual sample size (N = 1,226) was less than expected (N = 1,291) with a *post-hoc* power analysis of 73.1% based on the quit rates between the active referral and control groups at 6 months. We did not use a random sampling method for participant recruitment to avoid 'contamination' of the intervention among participants in the same recruitment setting. While the sample was restricted to those in the recruitment sites, all districts in Hong Kong were included, and the overall socio-demographic characteristics and smoking behavior were similar to those of smokers in the general population. However, the results may not be generalizable to other countries where smokers show different cigarette consumption behavior. Our findings may also not be applicable to countries without free and accessible SC services.

Conclusion

Brief advice combined with active referral to smoking cessation services delivered by volunteers to community smokers can increase quitting at 3 and 6 months in locations where SC services are available but underused.

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Author contributions: Man Ping Wang, Yi Nam Suen and Yongda Wu conducted the data analysis. Man Ping Wang had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Conflict of Interest disclosures: All authors reported no conflict of interest.

References

1. World Health Organization. Tobacco Free Initiative. 2015; http://www.who.int/tobacco/en/. Accessed March 28, 2017.
2. Census and Statistics Department. *Thematic Household Survey, Report No.59: Pattern of Smoking.* Hong Kong SAR: Hong Kong SAR Government;2016.
3. Fiore M. *Treating tobacco use and dependence: 2008 update: Clinical practice guideline.* Diane Publishing; 2008.
4. Borland R, Segan CJ. The potential of quitlines to increase smoking cessation. *Drug and alcohol review.* 2006;25(1):73-78.
5. Bentz CJ, Bayley KB, Bonin KE, Fleming L, Hollis JF, McAfee T. The feasibility of connecting physician offices to a state-level tobacco quit line. *American journal of preventive medicine.* 2006;30(1):31-37.
6. Tzelepis F, Paul CL, Walsh RA, McElduff P, Knight J. Proactive telephone counseling for smoking cessation: meta-analyses by recruitment channel and methodological quality. *J Natl Cancer Inst.* 2011;103(12):922-941.
7. Murray RL, Coleman T, Antoniak M, et al. The effect of proactively identifying smokers and offering smoking cessation support in primary care populations: a cluster-randomized trial. *Addiction.* 2008;103(6):998-1006; discussion 1007-1008.
8. Rigotti NA, Bitton A, Kelley JK, Hoeppner BB, Levy DE, Mort E. Offering population-based tobacco treatment in a healthcare setting: a randomized controlled trial. *American journal of preventive medicine.* 2011;41(5):498-503.
9. Borland R, Balmford J, Segan C, Livingston P, Owen N. The effectiveness of personalized smoking cessation strategies for callers to a Quitline service. *Addiction.* 2003;98(6):837-846.
10. Borland R, Balmford J, Bishop N, et al. In-practice management versus quitline referral for enhancing smoking cessation in general practice: a cluster randomized trial. *Fam Pract.* 2008;25(5):382-389.
11. Shelley D, Cantrell J. The effect of linking community health centers to a state-level smoker's quitline on rates of cessation assistance. *BMC Health Serv Res.* 2010;10:25.
12. Tzelepis F, Paul CL, Wiggers J, et al. A randomised controlled trial of proactive telephone counselling on cold-called smokers' cessation rates. *Tob Control.* 2011;20(1):40-46.
13. Sherman SE, Takahashi N, Kalra P, et al. Care coordination to increase referrals to smoking cessation telephone counseling: a demonstration project. *Am J Manag Care.* 2008;14(3):141-148.
14. Tindle HA, Daigh R, Reddy VK, et al. eReferral Between Hospitals and Quitlines: An Emerging Tobacco Control Strategy. *American journal of preventive medicine.* 2016;51(4):522-526.
15. Vidrine JI, Shete S, Cao Y, et al. Ask-Advise-Connect: a new approach to smoking treatment delivery in health care settings. *JAMA Intern Med.* 2013;173(6):458-464.
16. Fu SS, van Ryn M, Sherman SE, et al. Proactive tobacco treatment and population-level cessation: a pragmatic randomized clinical trial. *JAMA Intern Med.* 2014;174(5):671-677.
17. Chan SS, Wong DC, Cheung YT, et al. A block randomized controlled trial of a brief smoking cessation counselling and advice through short message service on participants who joined the Quit to Win Contest in Hong Kong. *Health education research.* 2015;30(4):609-621.

18. Cheung YT, Wang MP, Li HC, et al. Effectiveness of a small cash incentive on abstinence and use of cessation aids for adult smokers: A randomized controlled trial. *Addictive behaviors.* 2017;66:17-25.
19. Wang MP, Li WH, Cheung YT, et al. Brief advice on smoking reduction vs. abrupt quitting for smoking cessation in Chinese smokers: a cluster randomized controlled trial. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco.* 2017.
20. Suen YN, Wang MP, Li WH, et al. Brief advice and active referral for smoking cessation services among community smokers: a study protocol for randomized controlled trial. *BMC Public Health.* 2016;16:387.
21. Freedman JL, Fraser SC. Compliance without pressure: the foot-in-the-door technique. *Journal of personality and social psychology.* 1966;4(2):195-202.
22. Verification SSoB. Biochemical verification of tobacco use and cessation. *Nicotine & Tobacco Research.* 2002;4(2):149-159.
23. Chan SCC, Wong DCN, Cheung DYT, et al. *"Quit to Win 2012" and smoking cessation.* Hong Kong SAR: Hong Kong Council on Smoking and Health;2014.
24. Chan SSC, Wong DCN, Lau LMM, Lai VWY, Lam COB, Lam TH. *"Quit to Win 2010" and smoking cessation.* Hong Kong SAR: Hong Kong Council on Smoking and Health;2013.
25. Chan SS, Leung YP, Chan CH, Lam TH. *An evaluation study of the Integrated Smoking Cessation Services of Tung Wah Group of Hospitals.* Hong Kong SAR, China 2011.
26. Wang YY, Liu Z, Wu Y, et al. Acupuncture for Smoking Cessation in Hong Kong: A Prospective Multicenter Observational Study. *Evidence-based complementary and alternative medicine : eCAM.* 2016;2016:2865831.
27. Li WH, Chan SS, Wang MP, et al. An Evaluation of the Youth Quitline Service Young Hong Kong Smokers. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine.* 2017.
28. O'Brien J, Salmon A, Geikie A, Jardine A, Oakes W. Integrating smoking care in community welfare agencies to reach disadvantaged people: Findings from the Smoking Matters Project. *Health Promot J Austr.* 2010;21(3):176-182.
29. Bryant J, Bonevski B, Paul C, Hull P, O'Brien J. Implementing a smoking cessation program in social and community service organisations: a feasibility and acceptability trial. *Drug and alcohol review.* 2012;31(5):678-684.
30. Bryant J, Bonevski B, Paul C, O'Brien J, Oakes W. Delivering smoking cessation support to disadvantaged groups: a qualitative study of the potential of community welfare organizations. *Health education research.* 2010;25(6):979-990.
31. Christiansen BA, Brooks M, Keller PA, Theobald WE, Fiore MC. Closing tobacco-related disparities: Using community organizations to increase consumer demand. *American journal of preventive medicine.* 2010;38(3 Suppl):S397-402.
32. Marteau TM, Ashcroft RE, Oliver A. Using financial incentives to achieve healthy behaviour. *BMJ.* 2009;338:b1415.
33. Giuffrida A, Torgerson DJ. Should we pay the patient? Review of financial incentives to enhance patient compliance. *BMJ.* 1997;315(7110):703-707.

Table 1. Participants' baseline demographic characteristics and smoking profile.

Characteristics		N (%)[a] Active referral (n=402)	Brief advice (n=416)	Control (n=408)
Male [f]		317 (78.9)	328 (78.8)	346 (84.8)
Age, mean(SD), yrs		40.8 (14.9)	42.4 (14.7)	42.8 (14.9)
Marital status	Single	157 (40.1)	129 (32.2)	123 (32.3)
	Married/ cohabiting	214 (54.5)	249 (62.1)	239 (62.7)
	Divorced/separated/widowed	21 (5.4)	23 (5.7)	19 (5.0)
Had a child		199 (49.5)	211 (50.7)	207 (50.7)
Education [f]	Primary or below	27 (7.2)	31 (7.5)	50 (14.1)
	Secondary	259 (69.3)	232 (55.8)	238 (67.0)
	Tertiary	88 (23.5)	85 (20.4)	67 (18.9)
Employment status	Unemployed	51 (13.9)	51 (14.0)	39 (10.2)
	Employed	282 (76.6)	282 (77.3)	277 (72.3)
	Retired	35 (9.5)	32 (8.8)	46 (17.5)
Monthly household income (HK $) (US $1=HK $7.8)	Less than 10,000	59 (16.3)	53 (15.8)	70 (21.5)
	10,000-29,999	231 (64.0)	210 (62.7)	185 (56.7)
	30,000 or more	71 (19.7)	72 (21.5)	71 (21.8)
Daily cigarette consumption	1-10 (fewer than half a pack)	210 (52.5)	196 (47.7)	183 (45.0)
	11-20 (half to one pack)	158 (39.5)	165 (40.1)	183 (45.0)
	>20 (more than one pack)	32 (8.0)	50 (12.2)	41 (10.1)
Years of smoking	<10	104 (27.2)	100 (24.7)	82 (21.0)
	11-20	101 (26.4)	88 (21.7)	95 (24.3)
	21-30	76 (19.9)	91 (22.5)	88 (22.5)
	≥31	101 (26.4)	126 (31.1)	126 (32.2)
Nicotine dependency [b]	Light (≤2)	213 (53.7)	195 (48.6)	193 (48.6)
	Moderate (3-4)	156 (39.3)	174 (43.4)	168 (42.3)
	Heavy (5-6)	28 (7.1)	32 (8.0)	36 (9.1)
Past quit attempt		207 (51.5)	232 (55.8)	235 (57.6)
Recent quit attempt	Within past month	9 (2.3)	24 (6.1)	13 (3.4)
	Within past 6 months	23 (6.0)	31 (7.9)	28 (7.3)
	Within past year	25 (6.5)	18 (4.6)	30 (7.8)
	More than 1 year ago	139 (36.2)	146 (37.1)	147 (38.4)
	Never	188 (49.0)	175 (44.4)	165 (43.1)
Intending to quit	Within 7 days	127 (32.1)	122 (30.5)	117 (29.8)
	Within 30 days	86 (21.7)	90 (22.5)	72 (18.3)
	Within 60 days	48 (12.1)	32 (8.0)	24 (6.1)
	Undetermined	135 (34.1)	156 (39.0)	180 (45.8)
Self-efficacy, mean (SD)	Importance of quitting [c]	7.68 (1.96)	7.34 (1.99)	7.42 (2.26)
	Difficulty of quitting [d]	7.07 (2.31)	7.08 (2.29)	7.14 (2.35)
	Confidence in quitting [e]	6.13 (2.04)	6.07 (2.02)	6.08 (2.25)

[a] Sample size varied because of missing data on some variables.

[b] The Heaviness of Smoking Index (HSI), a 2-item score from multiple-choice response options (0-3) assessing cigarettes smoked per day and latency to smoke after waking; the higher the scores, the greater smoking nicotine dependence.

[c] Rate on a scale of 0 to 10 (0=least important; 10=most important).

[d] Rate on a scale of 0 to 10 (0=least difficult; 10=most difficult).

[e] Rate on a scale of 0 to 10 (0=least confident; 10=most confident).

[f] $P < .05$ for chi-square test among intervention groups.

Table 2. Smoking cessation outcomes by time and intervention group status.

	%			AR vs. BA		AR vs. Control		BA vs. Control	
Outcomes	**AR**	**BA**	**Control**	**OR (95% CI)**	**P Value**	**OR (95% CI)**	**P Value**	**OR (95% CI)**	**P Value**
PPA									
1 month	12.9	5.5	9.8	2.54 (1.52-4.23)	<.001	1.37 (0.88-2.12)	.18	0.54 (0.32-0.92)	.03
2 months	16.4	6.3	13.2	2.95 (1.83-4.75)	<.001	1.29 (0.87-1.90)	.24	0.44 (0.27-0.71)	<.001
3 months	18.9	8.9	14.0	2.39 (1.57-3.63)	<.001	1.44 (0.99-2.09)	.07	0.60 (0.39-0.93)	.03
6 months	17.2	9.4	11.5	2.00 (1.32-3.05)	.001	1.59 (1.07-2.37)	.03	0.80 (0.51-1.24)	.36
Validated abstinence									
3 months	10.2	3.8	4.2	2.84 (1.57-5.15)	<.001	2.61 (1.46-4.68)	.001	0.92 (0.46-1.85)	.86
6 months	9.0	5.0	5.1	1.85 (1.06-3.23)	.04	1.81 (1.04-3.16)	.04	0.98 (0.53-1.82)	>.99
Smoking reduction[a]									
1 month	22.1	24.5	24.0	1.00 (0.90-1.11)	.99	0.90 (0.65-1.25)	.53	1.03 (0.75-1.41)	.87
2 months	19.2	21.6	26.0	1.10 (0.99-1.23)	.07	0.68 (0.48-0.94)	.02	0.79 (0.57-1.08)	.14
3 months	18.7	23.8	22.6	0.99 (0.89-1.11)	.92	0.79 (0.56-1.11)	.17	1.07 (0.78-1.48)	.67
6 months	22.9	23.3	24.5	1.03 (0.92-1.14)	.64	0.91 (0.66-1.26)	.59	0.94 (0.68-1.29)	.69
SC service use									
1 month	16.4	0.5	0.0	40.66 (9.89-166.22)	<.001	-		-	
2 months	20.6	0.5	1.0	53.86 (13.15-220.62)	<.001	26.28 (9.53-72.44)	<.001	0.49 (0.09-2.68)	.45
3 months	23.4	1.2	2.5	25.09 (1.02-62.42)	<.001	12.15 (6.22-23.71)	<.001	0.48 (0.16-1.43)	.20
6 months	25.1	2.4	3.4	13.62 (7.00-26.53)	<.001	9.44 (5.29-16.85)	<.001	0.69 (0.30-1.58)	.41

[a] Quitting not included as reduction

AR: Active referral group, BA: Brief advice only group.

PPA: point prevalence of abstinence.

OR: crude odds ratio.

Table 3. Baseline predictors of self-reported and validated smoking abstinence at 6-month follow-up [a].

	Self-reported PPA				Validated abstinence			
	GEE model [d]		MI model [c]		GEE model [b]		MI model [c]	
Baseline variables	**AOR (95% CI)**	**P Value**	**AOR (95% CI)**	**P Value**	**AOR (95% CI)**	**P Value**	**AOR (95% CI)**	**P Value**
Gender								
Female	1.00		1.00		1.00		1.00	
Male	0.77 (0.50-1.18)	.24	0.69 (0.46-1.04)	.08	1.00 (0.54-1.89)	.98	0.82 (0.42-1.60)	.56
Education level								
Primary or below	1.00		1.00		1.00		1.00	
Secondary	0.56 (0.36-0.88)	.01	0.56 (0.37-0.84)	<.01	0.61 (0.40-0.93)	.02	0.63 (0.93-1.01)	.05
Tertiary	0.88 (0.47-1.67)	.70	0.81 (0.41-1.60)	.55	0.60 (0.25-1.42)	.24	0.60 (0.27-1.38)	.23
Intervention								
Control	1.00		1.00		1.00		1.00	
Active referral	1.59 (1.03-2.47)	.04	1.64 (1.08-2.48)	.02	1.79 (0.95-3.35)	.07	1.80 (1.06-3.05)	.03
Brief advice	0.75 (0.47-1.21)	.24	0.78 (0.51-1.20)	.26	0.99 (0.49-1.99)	.98	0.99 (0.54-1.84)	.98

[a] All variables in the table were mutually adjusted.
[b] Missing data in outcome variables was handled on the intention-to-treat (ITT) principle (N=1077).
[c] Missing data in outcome variable was handled by the multiple imputation (MI) method (N=1226).
GEE: generalised estimating equations.
MI: multiple Imputation.

Table 4. Smoking cessation services use in Active referral group (N=402).

	n(%)
Chose an SC service	351 (87.3)
Received proactive calls	
Yes	251 (71.5)
No	56 (16.0)
Missing[a]	44 (12.5)
Use of any SC service	
Yes	102 (29.1)
No	205 (58.4)
Missing[a]	44 (12.5)
Services or medication used (by SC service users)	**(N=102)**
1. Telephone counselling	22 (21.6)
2. Face-to-face counselling	63 (61.8)
3. Group counselling	8 (7.8)
4. Prescribed cessation medication (e.g. Varenicline)	43 (42.2)
5. Nicotine replacement therapy (gum/patch/inhaler)	41 (40.2)
6. Acupuncture	24 (23.5)
Reasons for not using SC service	**(N=149)**
1. Busy schedule	80 (53.7)
2. Not interested i	15 (10.1)
3. Perceived it as not useful	15 (10.1)
4. Time mismatch	69 (46.3)
5. Inconvenient location	3 (2.0)

[a] Missing means participants who were lost to follow-up at all time-points.