香港吸煙與健康委員會
HONG KONG COUNCIL ON SMOKING AND HEALTH

The 7th "Quit to Win" Contest – Effectiveness of High Intensity of Active Referral Intervention on Smoking Cessation

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1. Introduction

Although smoking prevalence is decreasing in Hong Kong, there are still 615,000 daily smokers (10.0%)[1] and half will be killed by smoking[2] which accounts for about 7,000 deaths per year in Hong Kong[3]. Smoking also accounts for a large amount of medical costs, long-term care costs and productivity loss of about HK$5,585 million (US$716 million, 0.3% Hong Kong GDP)[1,4]. Smoking is a highly addictive behaviour and many smokers with strong nicotine dependence encounter difficulties to quit without assistance. On the other hand, reaching and helping many smokers who have no intention to quit is a challenge, because they are unlikely to seek professional help from smoking cessation (SC) services.

The Quit and Win programme provides an opportunity to reach and encourage a large number of smokers to initiate quitting and maintain abstinence. It also provides a golden opportunity to examine the effectiveness of brief and low cost SC interventions by a randomized controlled trial (RCT) so as to generate new evidence for future evidence-based interventions to reach, recruit and help a large number of smokers to quit.

The Quit and Win model posits that smokers participating in SC contest will have higher motivation to quit with incentives and better social support[5]. Studies have found that such quitting contests or incentive programmes reached a large number of smokers and showed a significantly higher abstinence rate in the Quit and Win group than the control group[6].

Since 2009 (except 2011), the Hong Kong Council on Smoking and Health (COSH) has been collaborating with the Schools of Nursing and Public Health of The University of Hong Kong (HKU), to organize the "Quit to Win" (QTW) Contest. Over 7,000 smokers were recruited from the community[7-12] since 2009. Small cash incentives and fabulous prizes of lucky draw or selection interview were awarded to participants whose abstinence was biochemically validated. The competition helped in boosting up participants' confidence and motivation to quit and allowed rooms for designing and evaluating the effectiveness of new SC interventions at low cost.

SC services substantially increase abstinence rate and the World Health Organization (WHO) has urged to promote SC services[13]. SC services in Hong Kong are under-used as most of the daily smokers (76.8%) had never tried smoking cessation services or specified methods and only 3.1% of these smokers were willing to use the services[1]. Our previous RCT in the 6th "Quit to Win" Contest conducted in 2015 evaluated the effects of low-intensity active referral (LAR) vs. very brief general SC advice (VBA) on quitting. LAR included on-site AWARD counseling and referring smokers contact information for SC services providers to connect with the smokers. The 6-month findings of this RCT showed the LAR intervention was effective, with a significantly higher self-reported abstinence rate than that in the control group (17.2% vs. 11.5%. p=0.02)[12]. It is warranted to evaluate if a higher intensity active referral (HAR) and/or text messaging on encouraging SC service use can achieve even higher abstinence rate when compared with only VBA is given in the control group.

In 2016, COSH collaborated with HKU, 18 District Councils, various district working partners and supporting organizations to organize the 7th "Quit to Win" Contest to promote SC in the community. A 3-arm RCT was conducted to evaluate the effectiveness of a high intensity personalized active referral to existing SC services including the SC Hotline (1833 183) and other SC services (HAR Group), and text messaging on encouraging SC service use to increase quitting (Text Group), compared with a self-help booklet and general SC advice (Control Group).

2. Methods

2.1 Recruitment

From 19 June to 30 September 2016, participants were recruited from 68 recruitment sessions of the QTW Contest in all 18 districts in Hong Kong. Each recruitment session was treated as a unit of cluster randomization (22 recruitment sessions for each RCT group). All participants in a recruitment session were allocated to the HAR Group, Text Group or Control Group.

In all the recruitment sessions, the trained SC ambassadors measured smokers' level of carbon monoxide (CO) in exhaled air and screened participants' eligibility for the Contest and the RCT:

1. Hong Kong residents aged 18 or above;
2. Daily smokers who smoked at least 1 cigarette per day in the past 3 months;
3. Able to communicate in Cantonese (including reading Chinese); and
4. Exhaled carbon monoxide (CO) of 4 parts per million (ppm) or above.

The SC ambassadors then explained and invited smokers to join the RCT. Written consent for voluntary participation in the RCT was obtained before administering the baseline questionnaire and delivery of the interventions to participants. Eligible participants who were unwilling to join the RCT could still join the QTW Contest, but were excluded from the RCT analysis (Non-trial Group). Cluster randomization was used to allocate the participants in each recruitment session into 1 of the 3 intervention groups:

1. High intensity and personalized active referral group;
2. Text group;
3. Control group.

Block randomization was used to ensure the number of recruitment sessions for the 3 RCT groups was balanced. The primary investigator, who was not involved in the recruitment, randomly generated blocks, with each block size equal to 3, 6 or 9, containing random permutations of the 3 RCT groups using the website http://www.random.org (a website for generating random integers). The primary investigator combined all the blocks and generated a list of group allocation for all recruitment sessions. The recruitment staff was informed about the group allocation one day prior to the recruitment activities. The trained SC ambassadors were unknown about the group assignment until they arrived at the recruitment venue. All outcome assessors were blinded to the group assignment.

A lucky draw and a publicity programme for SC promotion were organized by COSH. A total of 5 participants, whose abstinence were biochemically validated at 3-month, won the lucky draw prize (HK$10,000 gift voucher each). Among the 137 participants who joined the publicity programme, the biochemically validated quitters had been interviewed and a champion was selected to receive a prize of travel voucher at HK$25,000 to Australia, where the 1st and the 2nd runner-up received a prize of travel voucher at HK$15,000 to Singapore and at HK$10,000 to Thailand, respectively.

2.2 Interventions and Follow-up

High intensity and personalized active referral group: Participants received brief SC advice and were actively referred to existing SC services in Hong Kong. Brief advice was delivered using the AWARD model[7] face-to-face at baseline and via telephones at follow-ups. The AWARD model consists of the following components: Ask about smoking history; Warn about the high risk with the use of the health warning leaflet; Advise to quit as soon as possible and to quit within 3 months (to become eligible to win the prizes); Refer smokers to SC services; and Do it again. Participants also received an A4 color double-page printed leaflet which contained highlights of the risks of 1/2 smokers and 2/3 smokers started smoking at young age died from smoking, a full list of diseases related to active and secondhand smoking, 10 scary pictures featuring smoking-induced diseases, information on the benefits of quitting, and messages encouraging participants to quit and call the Integrated SC Hotline managed by the Department of Health. Participants received brief telephone booster advice at 1 and 2 months and validation of smoking status at 3 and 6 months.

To increase the chance of getting an earlier SC appointment and attendance, research staff helped smokers book their preferred SC services for the available appointment time on-site. For smokers who were not ready to book the SC services on-site, they were encouraged to set a date for appointment booking within a week and were followed up by telephone at 1-week. They could inform us to book the SC service through instant messaging (IM) or telephone calls anytime between 1-week and 1-month after baseline. Once smokers had chosen the SC services, we helped them book the SC appointment by sending the relevant information to SC providers. Participants received help to book the following SC services in Hong Kong: Department of Health, Tung Wah Group of Hospitals

Integrated Centre on SC, Hospital Authority SC clinics, Pok Oi Hospital Acupuncture SC Services, and Youth Quitline of The University of Hong Kong.

SC ambassadors introduced the SC services to participants using a pocket size SC services information card containing brief information and highlights of each SC service. Participants who consented for the transferal of their contact details through COSH to their selected SC service providers received proactive phone calls from the service providers for telephone SC counseling or booking an SC clinic appointment.

Tailored, automatic, fix-schedule messages were sent three times in the 1st week via IM services (e.g. WhatsApp) since initial contact and then one message per week until 8 weeks after baseline. Any smokers who did not use IM or refused to receive IM messages were contacted via SMS messages. SC messages included the harms of smoking, the benefits of SC, the importance of adherence to SC appointment and encouragement on abstinence. The messages were sent according to smokers' SC appointment status e.g. (1) Not yet decided to book SC appointment, (2) Booked SC appointment; (3) Booked but had not yet attended the SC service. All participants received a reminder to attend the SC service in the 7th IM messages. Research staff monitored the use of SC services by smokers at each follow-up (1, 2, 3 & 6 months) and assisted participants to book or re-book the appointments if necessary.

Text group: Participants were introduced and motivated to use the SC services on-site. IM/SMS messages (3 per week in the first month, then 1 per week in the second month) were sent to encourage them to book an SC appointment by themselves since initial contact. A total of 16 messages were sent to the smokers. The IM/SMS messages in this group were simpler and more generic than the IM messages in HAR Group. Research staff monitored the use of SC services by smokers at each follow-up (1, 2, 3 & 6 months) and encouraged participants to book or re-book the appointments if necessary.

Control group: Participants received very brief, minimal general SC advice and a 12-page self-help SC booklet which was designed by COSH and routinely used in QTW Contests.

Non-trial group: The following participants joined the QTW Contest and were classified as the non-trial group: (1) chose to participate in the COSH publicity programme, which had different prizes; (2) refused to participate in the RCT; and (3) were recruited from the workplace where additional incentives might be provided by the employers. The non-trial participants received the same intervention(s) received by the RCT participants in the same recruitment session. All of them could receive the same monetary incentive after passing the biochemical validation for abstinence at 3- and 6-month.

All participants were assessed for their smoking status and quitting progress through telephone interview at 1- and 2-month, followed by a booster intervention (HAR Group and Text Group only), and then at 3- and 6-month with assessment only. Both HAR Group and Text Group received booster interventions which involved brief AWARD advice, enquiry and reinforcement of the use of SC services, but HAR Group additionally received assistance in booking/re-booking SC services through telephone and IM at 1-, 2- and 3-month follow-ups. No booster intervention was provided to the Control Group. About 7 calls and 1 voice message were made before a participant was treated as unreachable. Self-reported quitters (did not smoke, even a puff, in the past 7 days) at 3- and 6-month were invited to participate in the biochemical validations. HKU staff assessed self-reported quitter's exhaled CO level and saliva cotinine level in the biochemical validation and all validated quitters could receive a cash incentive of HK$500. To boost the retention rate, participants who completed all the 4 follow-up interviews could receive another cash incentive of HK$100.

The primary outcomes were the self-reported 7-day point prevalence (PP) abstinence rate at 3- and 6-month. The secondary outcomes were (1) biochemically validated SC, (2) smoking reduction (50% reduction or above in cigarette consumption compared with baseline), and (3) self-reported SC service use at 3- and 6-month.

The socio-demographic and smoking characteristics at baseline of all participants (N=1,317) were described. We compared the primary and secondary outcomes, perceived importance, difficulty and confidence to quit among the three groups. We adopted the intention-to-treat (ITT) analysis (assuming that non-respondents at the follow-up did not change their baseline smoking behavior) and complete-case (CC) analysis (excluding participants who were lost to follow-up) to calculate the self-reported and biochemically validated abstinence rates and other outcomes.

We also reported participants' reasons to quit, methods to quit, withdrawal symptoms experienced, perceived social support for quitting, use of SC aids and perception of follow-up calls.

3. Results

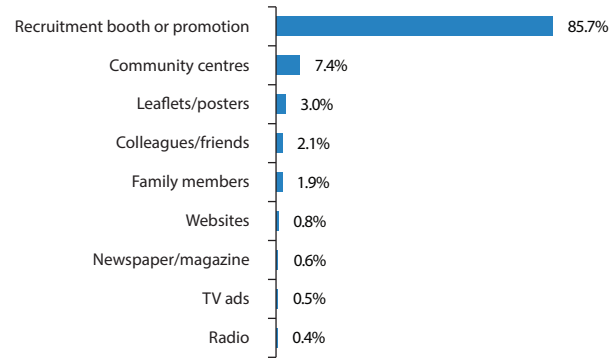
In all the 68 recruitment sessions of the 7th "Quit to Win" Contest, more than 60 trained SC ambassadors participated in the on-site promotion and recruited 1,344 adult daily smokers to participate in the Contest. About 124,000 people passed by the QTW promotion booths. About 13,000 people made enquiries about SC or participated in the game booth. The SC ambassadors approached nearly 7,000 smokers and over 12,000 non-smokers in all the activities.

Of the 1,344 screened smokers who were interested to join the Contest, 15 (1.1%) did not meet the inclusion criteria, and 12 (0.9%) refused to participate in the Contest, making up a final of 1,317 participants in the Contest. Among the 1,317 eligible participants, 1,163 (88.3%) consented to participate in the RCT. 137 (10.4%) participants in the publicity programme and 17 (1.3%) participants who refused to join the RCT or were recruited from a specific workplace were combined and analyzed in the non-trial group. Of the 1,163 participants in the RCT, 395 (34.0%) were allocated to the HAR Group, 385 (33.1%) to the Text Group, and 383 (32.9%) to the Control Group.

The recruitment booth of the QTW Contest was the leading source of information about the QTW Contest for the participants (85.7%). The second source was the community centres (7.4%) and few participants knew it from leaflets/ posters (3.0%) (Figure 1).

Figure 1

Sources of knowing the 7th "Quit to Win" Contest (N=1,317) [1,2]



[1]Missing data were not displayed.

[2]Participants could choose more than one option.

3.1 Socio-demographic characteristics of all participants

The average age of participants was 41.4 (SD=16.6) years and most participants were male (79.1%) and employed (61.2%) and had received junior secondary or above education (75.0%). Near half (49.8%) were married and two-fifths had children (40.2%). Near half had a monthly household income less than HK$20,000 (46.5%), and less than half lived in public housing (43.4%) (Table 1).

3.2 Smoking profile

The mean age of starting smoking was 19.1 (SD=6.4) years, 37.5% started smoking before 18 and the mean year of smoking was 22.1 (SD=16.0) (Figure 2). The mean daily cigarette consumption was 14.4 (SD=9.4) cigarettes, while 50.0% consumed 1-10 cigarettes and 38.7% consumed 11-20 per day (Figure 3). According to the Heaviness of Smoking Index (HSI), 48.9% had light nicotine dependence (HSI≤2) (Figure 4). Only 36.7% had made a quit attempt (smoking abstinence ≥24 hours) before, and 60.7% of them had the attempt more than 1 year ago (Figure 5). Only 27.9% of participants intended to quit smoking within 7 days (Figure 6).

Figure 2

Age of starting weekly smoking in all participants (N=1,317) [1]

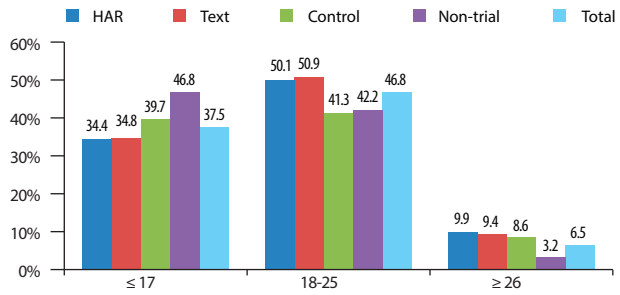


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Figure 3

Daily cigarette consumption at baseline in all participants (N=1,317)[1]

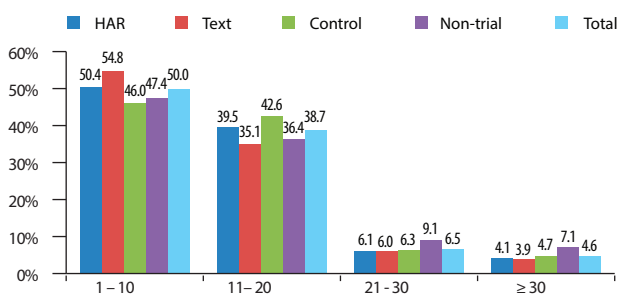

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Table 1. Socio-demographic characteristics of all participants (N=1,317)

n (%)	Total (N=1,317)	Non-trial (N=154)	HAR (N=395)	Text (N=385)	Control (N=383)
Age, mean ± SD, years	41.4 ± 16.6	41.4 ± 16.1	40.9 ± 16.3	41.0 ± 16.7	42.3 ± 17.1
Gender					
Male	1,042 (79.1)	139 (90.3)	311 (78.7)	301 (78.2)	291 (76.0)
Female	274 (20.8)	15 (9.7)	84 (21.3)	84 (21.8)	91 (23.8)
Missing	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)
Marital status					
Single	510 (38.7)	54 (35.1)	157 (39.7)	162 (42.1)	137 (35.8)
Married/ Cohabited	656 (49.8)	87 (56.5)	199 (50.4)	185 (48.1)	185 (48.3)
Others	50 (3.8)	4 (2.6)	12 (3.1)	15 (3.9)	19 (4.9)
Missing	101 (7.7)	9 (5.8)	27 (6.8)	23 (6.0)	42 (11.0)
Had a child					
Yes	530 (40.2)	75 (48.7)	159 (40.3)	160 (41.6)	136 (35.5)
No	582 (44.2)	60 (39.0)	183 (46.3)	171 (44.4)	168 (43.9)
Missing	205 (15.6)	19 (12.3)	53 (13.4)	54 (14.0)	79 (20.6)
Education level					
No formal education	28 (2.1)	6 (3.9)	4 (1.0)	10 (2.6)	8 (2.1)
Elementary education	111 (8.4)	13 (8.4)	26 (6.6)	32 (8.3)	40 (10.4)
Junior secondary education	251 (19.1)	28 (18.2)	96 (24.3)	61 (15.8)	66 (17.2)
Senior secondary education	469 (35.6)	55 (35.7)	149 (37.7)	142 (36.9)	123 (32.1)
Post-secondary or above	267 (20.3)	36 (23.4)	80 (20.3)	76 (19.8)	75 (19.6)
Missing	191 (14.5)	16 (10.4)	40 (10.1)	64 (16.6)	71 (18.5)
Employment status					
Student	108 (8.2)	6 (3.9)	36 (9.1)	32 (8.3)	34 (8.9)
Self-employed/ employed	806 (61.2)	103 (66.9)	264 (66.8)	231 (60.0)	208 (54.3)
Unemployed	49 (3.7)	8 (5.2)	12 (3.0)	15 (3.9)	14 (3.7)
Housewife	34 (2.6)	2 (1.3)	4 (1.0)	15 (3.9)	13 (3.4)
Retired	152 (11.5)	21 (13.6)	40 (10.1)	44 (11.4)	47 (12.3)
Missing	168 (12.8)	14 (9.1)	39 (9.9)	48 (12.5)	67 (17.5)
Monthly household income (HK$)					
Less than 10,000	182 (13.8)	21 (13.6)	50 (12.7)	53 (13.8)	58 (15.1)
10,000-19,999	430 (32.7)	52 (33.8)	140 (35.4)	123 (31.9)	115 (30.0)
20,000-29,999	279 (21.2)	30 (19.5)	97 (24.6)	83 (21.6)	69 (18.0)
30,000-39,999	88 (6.7)	9 (5.8)	31 (7.8)	19 (4.9)	29 (7.6)
40,000 or more	111 (8.4)	21 (13.6)	29 (7.3)	31 (8.1)	30 (7.8)
Missing	227 (17.2)	21 (13.6)	48 (12.2)	76 (19.7)	82 (21.4)
Housing condition					
Public housing (rental)	482 (36.6)	68 (44.2)	131 (33.2)	137 (35.6)	146 (38.1)
Public housing (purchased)	89 (6.8)	5 (3.2)	36 (9.1)	22 (5.7)	26 (6.8)
Home Ownership Scheme	204 (15.5)	25 (16.2)	63 (16.0)	64 (16.6)	52 (13.6)
Private housing (rental)	146 (11.1)	11 (7.1)	56 (14.2)	48 (12.5)	31 (8.1)
Private housing (purchased)	167 (12.7)	25 (16.2)	55 (13.9)	43 (11.2)	44 (11.5)
Others	20 (1.5)	3 (2.0)	8 (2.0)	3 (0.8)	6 (1.6)
Missing	209 (15.9)	17 (11.0)	46 (11.6)	68 (17.7)	78 (20.4)

Figure 4

Nicotine dependence (Heaviness of Smoking Index) at baseline in all participants (N=1,317) [1]

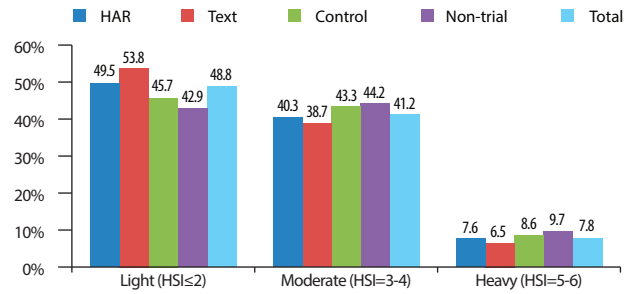

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Figure 5

Past quit attempt at baseline in all participants (N=1,317) [1]

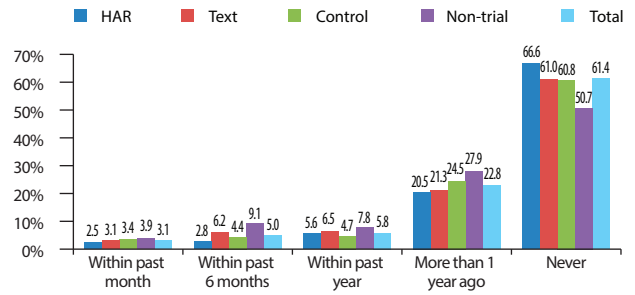

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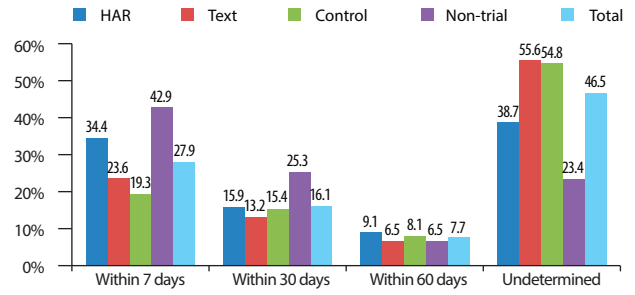
Figure 6

Intention to quit at baseline in all participants (N=1,317) [1]



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3.3 Baseline referral status of participants who received active referral intervention

At baseline, 450 participants received active referral intervention. 395 (87.8%) were participants in the HAR Group of the RCT and 55 (12.2%) were in the non-trial group. Most of them (76.7%) had chosen an SC service provider at baseline and the proportion was 74.2% in the HAR Group and 94.5% in the non-trial group. The remaining participants were not ready to use SC service (13.3%) or refused to be referred (10.0%) (Table 2).

Table 2 Referral status for active referral group at baseline (N=450).

	Total (N=450)	Non-trial Group (N=55)	HAR Group (N=395)
Had chosen any smoking cessation service	345 (76.7)	52 (94.5)	293 (74.2)
Had not decided a smoking cessation service yet	60 (13.3)	2 (3.6)	58 (14.7)
Refused to be referred	45 (10.0)	1 (1.8)	44 (11.1)

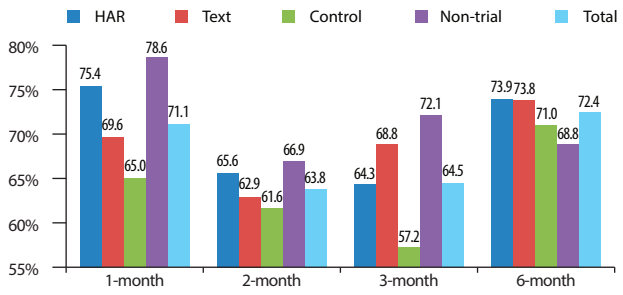
3.4 1-, 2-, 3- and 6-month follow-ups results

Retention rate

All participants were followed up by telephone interviews at 1-, 2-, 3- and 6-month with the corresponding overall retention rates (including non-trial group) of 71.1%, 63.8%, 64.5% and 72.4%. At 3-month, the retention rate of the HAR Group, Text Group and Control Group were 64.3% , 68.8% and 57.2%, respectively. While at 6-month were 73.9%, 73.8% and 71.0% (Figure 7).

Figure 7

Retention rate of 1-, 2-, 3- and 6-month follow-ups (N=1,317) [1]



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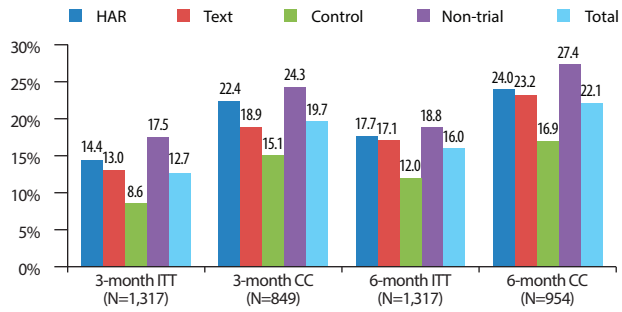
Primary outcome: Self-reported 7-day point prevalence abstinence rate at 3- and 6-month follow-ups

By ITT analysis, the overall self-reported 7-day point prevalence of abstinence (PPA) at 3-month follow-up was 12.7%. The HAR Group (14.4%) had the highest abstinence rate among 3 RCT groups, which was non-significantly greater than that in the Text Group (13.0%, p=0.56), and significantly (p=0.01) greater than that in the Control Group (8.6%), while the Text Group also had a greater PPA than the Control Group with marginal significance (p=0.05). By CC analysis, the overall abstinence rate was 19.7%, the HAR Group (22.4%) had the highest self-reported abstinence rate when compared with the Text Group (18.9%, p=0.32), and the Control Group (15.1%, p=0.04). The difference between the Text Group and the Control group was not significant (p=0.27) (Figure 8).

At 6-month follow-up, by ITT analysis, the overall self-reported 7-day PPA was 16.0%. The PPA in the HAR Group (17.7%) was similar to that of the Text Group (17.1%, p=0.83) but significantly greater than that of the Control Group (12.0%, p=0.03). The PPA in the Text Group was also significantly greater than that of the Control Group (p=0.04). By CC analysis, the overall abstinence rate was 22.1%. The PPA in the HAR Group (24.0%) was similar to that in the Text Group (23.2%, p=0.84) but significantly greater than that in the Control Group (16.9%, p=0.04). The Text Group also had marginally significantly higher PPA than the Control Group (p=0.06) (Figure 8).

Figure 8

Self-reported abstinence rates at 3-month and 6-month follow-ups, by intention-to-treat and complete-case analysis



ITT: Intention-to-treat analysis; CC: Complete-case analysis

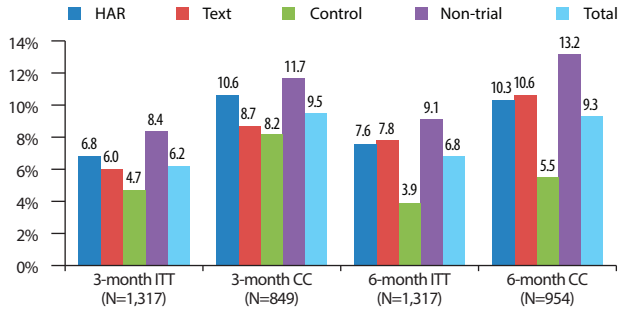
Biochemically validated abstinence rate at 3- and 6-month follow-ups

At 3-month follow-up, among the 167 self-reported quitters (including non-trial group), 102 (61.1%) participated in the biochemical validation and 79.4% passed the test. By ITT analysis, the overall validated abstinence rate was 6.2%. The corresponding rate in the HAR, Text and Control Group were 6.8%, 6.0% and 4.7% respectively. By CC analysis, the overall validated abstinence rate was 9.5%. HAR Group and Text Group had higher validated abstinence rate than the Control Group but the differences were not significant (Figure 9).

At 6-month follow-up, 109 out of 211 (51.7%) self-reported quitters (including non-trial group) participated in the biochemical validation and 81.7% passed the test. By ITT analysis, the overall validated abstinence rate was 6.8%. It was significantly lower in the Control Group (3.9%), when compared with the HAR Group (7.6%, p=0.03) or the Text Group (7.8%, p=0.02). By CC analysis, the validated abstinence rate was 9.3%. The HAR Group (10.3%) had a similar validated abstinence rate with the Text Group (10.6%, p=0.91). Both the HAR Group and Text Group had significantly greater validated abstinence rate than the Control Group (5.5%, p=0.04 and 0.03) (Figure 9).

Figure 9

Biochemically validated abstinence rates at 3-month and 6-month follow-ups, by intention-to-treat and complete-case analysis



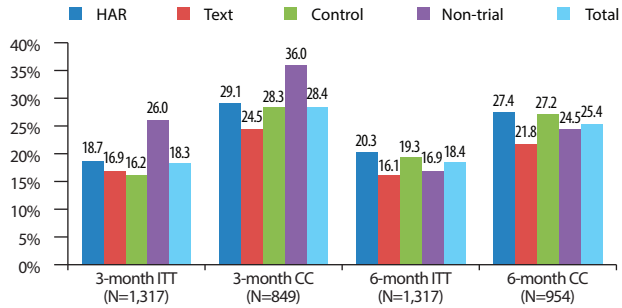
ITT: Intention-to-treat analysis; CC: Complete-case analysis

Smoking reduction rate at the 3- and 6-month follow-ups

By ITT analysis, after excluding the quitters, 18.3% and 18.4% participants reduced daily cigarette consumption by at least 50% at 3- and 6-month follow-ups, when compared with the baseline. The HAR Group, Text Group and Control Group had similar (all p>0.05) results at 3-month follow-up: 18.7%, 16.9% and 16.2%, respectively. The results were also similar (all p>0.05) at the 6-month follow-up: 20.3%, 16.1% and 19.3%, respectively. By CC analysis, the overall reduction rates were 28.4% and 25.4% at 3- and 6-month follow-ups. The HAR, Text and Control groups had similar (all p>0.05) results at both follow-ups (Figure 10).

Figure 10

Rate of smoking reduction by 50% or more at 3- and 6-month follow-ups, by intention-to-treat analysis and complete-case analysis [1]

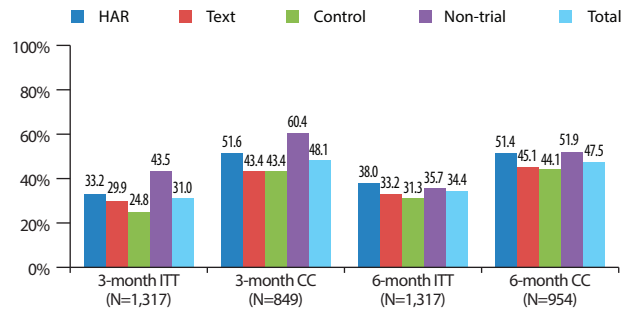


[1]Quitters were excluded in the numerator but included in the denominator.

By ITT analysis and including quitters, 31.0% and 34.4% of all participants had reduced daily cigarette consumption by at least 50% at 3- and 6- month follow-ups. The reduction rate in the HAR Group was marginally significantly higher than that in the Control Group (38.0% versus 31.3%, p=0.052) at 6-month. By CC analysis, the reduction rate in the HAR Group was marginally significantly higher than that in the Control Group (51.6% versus 43.4%, p=0.08) at 3-month (Figure 11).

Figure 11

Rate of smoking reduction by 50% or more at 3- and 6-month follow-ups, by intention-to-treat analysis and complete-case analysis [1]



[1]Quitters were included in the numerator and denominator.

Smoking cessation service use at the 1-, 2-, 3- and 6-month follow-ups

Among 395 participants in the HAR Group, 74.2% chose a smoking cessation service provider at baseline (Table 2). The HAR Group had a significantly (all p<0.001) higher rate of SC service use when compared with the other 2 groups at all follow-ups (Table 3). At any time point, over three quarters (77.0%) in the HAR Group had chosen a SC service and among them, 34.9% used the SC service. The 4 most common services being used were: (1) nicotine replacement therapy (e.g. gum/patch/inhaler) (39.6%), (2) medications prescribed by doctors (34.0%), (3) face-to-face counseling (27.4%), and (4) telephone counseling (27.4%) (Figure 12). In the 198 participants who had not used the SC service, the most common reasons were busy schedule (80.8%) and time mismatch (24.7%) (Figure 13).

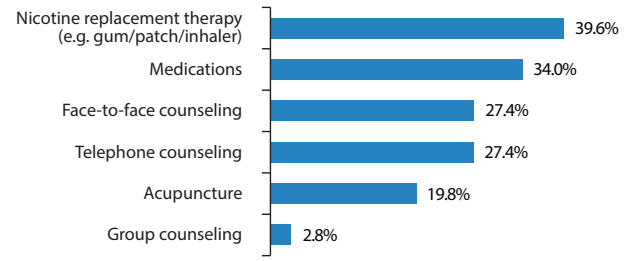
Table 3 Use of SC service (cumulative at 6 month)[1]

	Total (N=1,317)	Non-trial (N=154)	HAR (N=395)	Text (N=385)	Control (N=383)
Have chosen the service	356 (27.0)	52 (33.8)	304 (77.0)	NA	NA
Have used the service	193 (14.7)	29 (18.8)	106 (26.8)	31 (8.1)	27 (7.1)

[1]Only all participants of HAR Group and 55 non-trial participants chose the service with assistance at baseline and follow-ups. The records for Text and Control groups are not available.

Figure 12

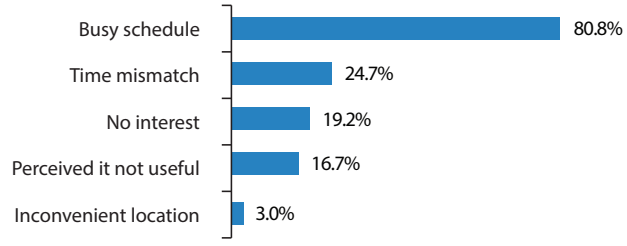
Smoking cessation services or medications being used (among service users, N=106) [1]



[1]Participants could choose more than one option.

Figure 13

Reasons for not using the smoking cessation services (among non- service users, N=198) [1]



[1]Participants could choose more than one option.

Self-efficacy of quitting

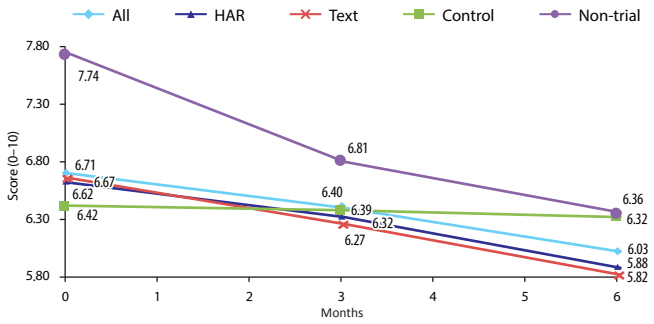
Perceived importance of quitting

In a scale of 0 (minimum) to 10 (maximum), the mean scores of "perceived level of importance to quit smoking", "perceived level of difficulty to quit smoking", and "perceived level of confidence to quit smoking" at baseline were 6.71, 6.98, and 5.72, respectively.

The mean score of perceived importance to quit smoking in the HAR Group dropped significantly from baseline to 3-month (from 6.62 to 6.32, p=0.007), and further declined (from 6.62 to 5.88, p<0.01) at 6-month. In the Text Group, this score decreased significantly from baseline to 3-month (from 6.67 to 6.27, p=0.003), and further decreased to 5.82 (p<0.01) at 6-month. In the Control Group, this score also decreased from baseline to 3-month (from 6.42 to 6.39, p=0.21), and to 6.32 (p=0.02) at 6-month. The HAR and Text group had significantly lower scores than that in the Control Group at 6-month (p=0.02 and 0.05, respectively) (Figure 14).

Figure 14

Perceived level of importance to quit smoking [1]



Within-group pair-sample t-test (p-values):		
	Baseline versus 3-month	Baseline versus 6-month
HAR	**0.007**	**<0.001**
Text	**0.003**	**<0.001**
Control	0.21	**0.02**

Between group independent t-test (p-values):			
	HAR versus Text	HAR versus Control	Text versus Control
Baseline	0.75	0.22	0.12
3-month	0.77	0.67	0.48
6-month	0.73	**0.02**	**0.05**

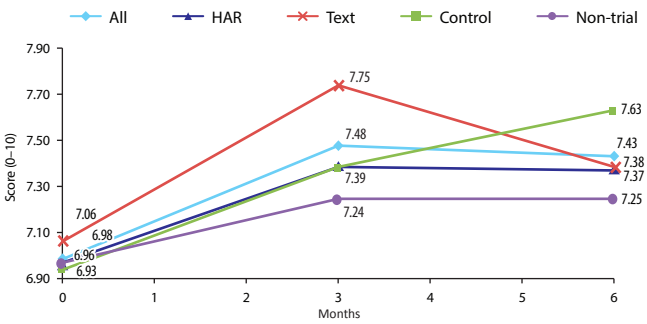
[1]Scale 0-10, 0 lowest, 10 highest; analysis excluded missing data.

Perceived difficulty of quitting

The mean score of perceived difficulty to quit smoking in the HAR Group increased from 6.96 at baseline to 7.39 at 3-month then slightly decreased to 7.37 at 6-month, but the changes were not statistically significant (all p>0.05). When compared with the baseline (7.06), the mean score in the Text Group increased to 7.75 at 3-month (p<0.001) and to 7.38 at 6-month (p=0.04). This score in the Control Group significantly increased from 6.93 at baseline to 7.63 at 6-month (p<0.001). The Text Group perceived quitting as more difficult than the HAR (7.75 vs. 7.39, p=0.03) and Control Group (7.75 vs. 7.39, p=0.06) at 3-month (Figure 15).

Figure 15

Perceived level of difficulty to quit smoking [1]



Within-group pair-sample t-test (p-values):		
	Baseline versus 3-month	Baseline versus 6-month
HAR	0.11	0.29
Text	**<0.001**	**0.04**
Control	0.37	**<0.001**

Between group independent t-test (p-values):			
	HAR versus Text	HAR versus Control	Text versus Control
Baseline	0.56	0.83	0.43
3-month	**0.03**	>0.995	0.06
6-month	0.95	0.09	0.12

[1]Scale 0-10, 0 lowest, 10 highest; analysis excluded missing data.

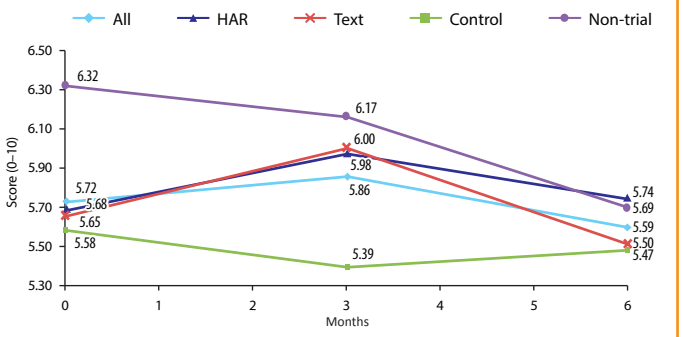
Perceived confidence of quitting

The HAR Group's mean score of perceived confidence to quit smoking increased from baseline (5.68) to 3-month (5.98), but decreased to 5.74 at 6-month, although the changes were not significant (all p>0.05). This score in the Text Group also increased from 5.65 at baseline to 6.00 at 3-month but decreased to 5.50 at 6-month, and the changes were also not significant (all p>0.05). This score in the Control Group dropped from 5.58 at baseline to 5.39 at 3-month but then increased to 5.47 at 6-month without statistical significance

(all p>0.05). The mean scores in the HAR and Text Group were significantly higher than that in the Control Group (both p=0.01) at 3-month (Figure 16).

Figure 16

Perceived level of confidence to quit smoking[1]



Within-group pair-sample t-test (p-values):		
	Baseline versus 3-month	Baseline versus 6-month
HAR	0.40	0.61
Text	0.17	0.18
Control	0.19	0.28

Between group independent t-test (p-values):			
	HAR versus Text	HAR versus Control	Text versus Control
Baseline	0.86	0.53	0.66
3-month	0.93	**0.01**	**0.01**
6-month	0.24	0.19	0.91

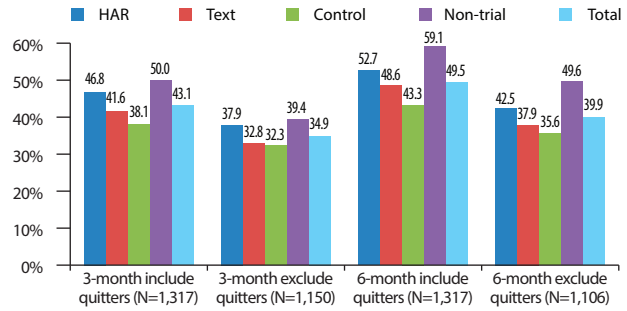
[1]Scale 0-10, 0 lowest, 10 highest; analysis excluded missing data.

Cessation attempt at the 3- and 6-month follow-ups

At 3-month follow-up, the rate of cessation attempt, including quitters was 43.1%. The HAR Group had a significantly higher rate than the Control Group (46.8% vs. 38.1%, p=0.01). However, the difference was not significant when quitters were excluded (37.9% vs. 32.3%, p=0.13). At 6-month follow-up, the overall rate of cessation attempt including quitters was 49.5%. The HAR Group had a significantly higher rate than the Control Group (52.7% vs. 43.3%, p=0.01). The difference was marginally significant when quitters were excluded (42.5% vs. 35.6%, p=0.07) (Figure 17). The rates of cessation attempt were similar between Text and Control groups at 3- and 6- month.

Figure 17

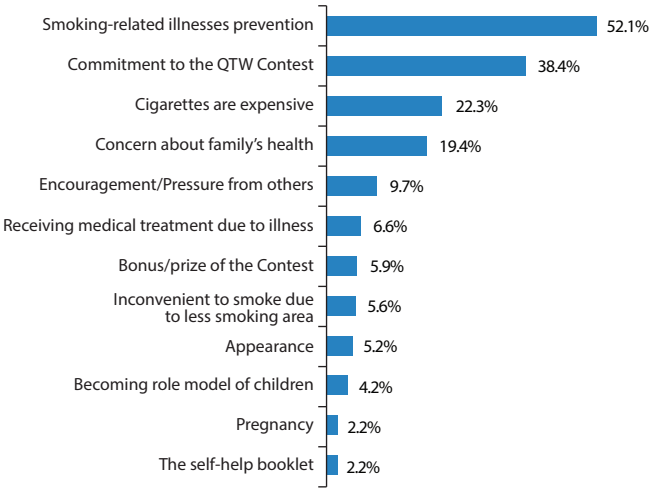
Rate of cessation attempt at 3-month and 6-month follow-ups



For those who could be followed up at 6-month, the 4 most common reasons of having cessation attempts were: (1) illness prevention (52.1%), (2) commitment to the QTW Contest (38.4%), (3) cigarettes are expensive (22.3%), and (4) concerned about family's health (19.4%) (Figure 18).

Figure 18

Reasons for quit attempts among participants who had at least one cessation attempt during the study period (N=649)[1,2]

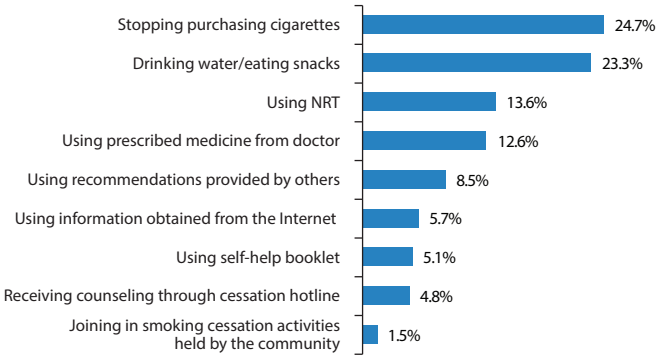


[1]Participants who were lost to follow up were excluded.
[2]Participants could choose more than one option.

About three-quarter (72.9%) participants did not use any specific methods to quit. The 3 most common methods used by participants were: (1) stopping purchasing cigarette (24.7%), (2) drinking water/eating snack (23.3%), and (3) using Nicotine Replacement Therapy (NRT) (13.6%) (Figure 19).

Figure 19

Methods of quit attempt among participants who had at least one cessation attempt during the study period (N=649)[1,2]

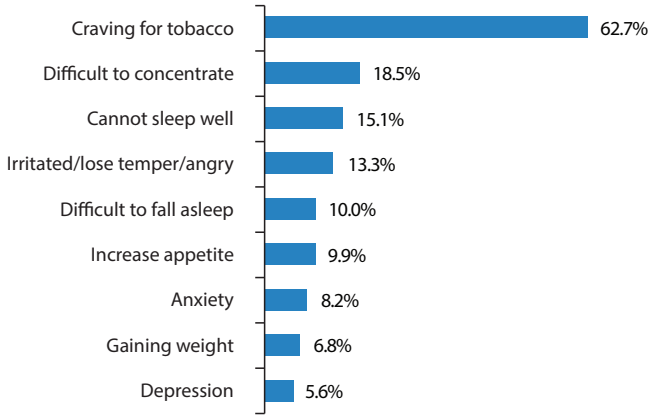


[1]Participants who were lost to follow up were excluded.
[2]Participants could choose more than one option.

The 4 most common withdrawal symptoms for participants who had quit attempt were: (1) craving for tobacco (62.7%), (2) difficult to concentrate (18.5%), (3) cannot sleep well (15.1%), and (4) feeling irritated or losing temper or angry (13.3%) (Figure 20).

Figure 20

Withdrawal symptoms in all participants who had at least one cessation attempt during the study period (N=649) [1,2]



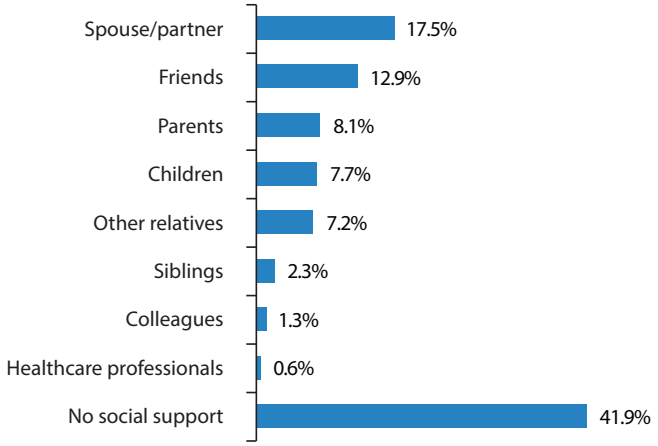
[1]Participants who were lost to follow up were excluded.
[2]Participants could choose more than one option.

Social support during smoking cessation

Participants who responded to the 6-month follow-up perceived support in the quitting process from: (1) spouse / partner (17.5%), (2) friends (12.9%), (3) parents (8.1%), and (4) children (7.7%). However, over 40% (41.9%) did not receive any social support (Figure 21).

Figure 21

Perceived support in the quitting process in all participants at 6-month follow-up (N = 954) [1, 2]



[1]Participants who were lost to follow up were excluded.
[2]Participants could choose more than one option.

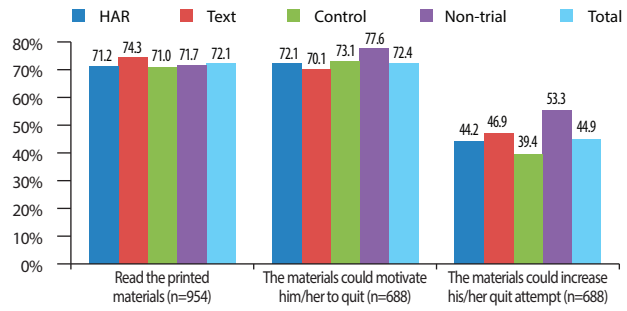
Use and satisfaction of smoking cessation aids

Printed materials

In participants who responded to the 6-month follow-up, nearly three quarters (72.1%) had read the printed smoking cessation materials. The three RCT groups showed similar results (all p>0.05). Of the 688 participants who read the materials, 72.4% reported that the printed materials could motivate them to quit, and 44.9% reported that these materials could increase their cessation attempt (Figure 22).

Figure 22

Use of printed smoking cessation materials in all participants at 6-month (N=954) [1, 2]



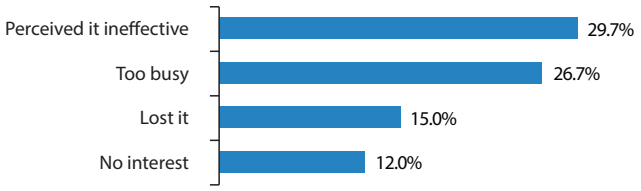
[1] Participants could choose more than one option.

[2] Participants who were lost to follow up at 6-month were excluded; Missing data were not displayed.

Of the 266 (27.9%) participants who did not read the materials, the three most common reasons were: (1) perceived it ineffective (29.7%), (2) too busy (26.7%), and (3) lost it (15.0%) (Figure 23).

Figure 23

Reasons of not reading the materials of participants at 6-month (N=266) [1, 2]



[1] Participants could choose more than one option.

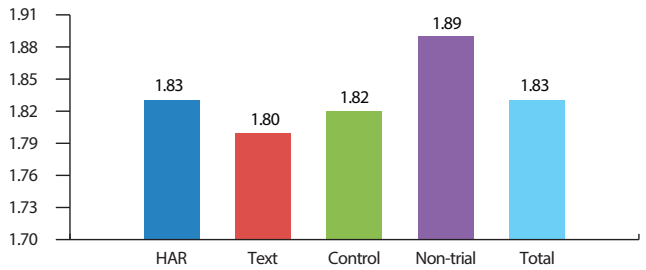
[2] Participants who were lost to follow up at 6-month and missing data were excluded.

Tangle

At 6-month follow-up, in a scale of 1 (very helpless) to 5 (very helpful) for the perceived helpfulness of the "Tangle" for smoking cessation, the mean score of helpfulness was 1.83 (SD=0.83). No significant difference was observed in between group comparisons (all p>0.05) (Figure 24).

Figure 24

Perceived helpfulness of "Tangle" in all participants at 6-month (N=954) [1,2]



[1] Score 1-5: 1 lowest, 5 highest.

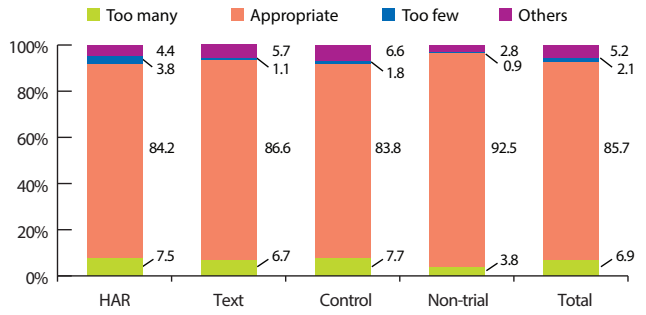
[2] Participants who were lost to follow up at 6-month were excluded; missing data were not displayed.

Perception on the follow-up calls

Of the 954 participants responded to the 6-month follow-up, 85.7% agreed that the frequency of the follow-up calls was appropriate. All groups had similar results (all p>0.05) (Figure 25).

Figure 25

Perception on the follow-up calls in all participants at 6-month (N=954) [1]



[1] Participants who were lost to follow up at 6-month were excluded; missing data were not displayed.

4. Discussion

In about three months from June to September 2016, the 7th "Quit to Win" Contest successfully disseminated the smoking cessation messages in the community by organizing 68 recruitment activities in streets and shopping malls with 74 university students, NGO helpers and volunteers taking part in health promotion and recruitment in 18 districts throughout Hong Kong. Near 7,000 smokers were approached by the SC ambassadors and about 5,700 smokers received SC promotion leaflets and 1,317 smokers participated in the Contest. By ITT analysis, the overall self-reported abstinence rate was 12.7% at 3-month and 16.0% at 6-month for all participants. Compared to the results of the recent years, the abstinence rate at 6-month of the 7th "Quit to Win" Contest was the highest.

Aside from the attraction of financial incentive, different interventions and strategies were provided to the participants of the 7th "Quit to Win" Contest accordingly. Our RCT findings indicated that motivating smokers to quit using higher intensity and personalized active referral to SC services could increase self-reported abstinence by near 50% and double the biochemically validated abstinence rate of the control condition. Compared with last Contest's active referral intervention, this year's active referral was more intensive and personalized to smokers as an on-site SC appointment booking services were provided. SC appointments were made according to smokers' decision and research staff assisted the booking process accordingly. The higher intensity and personalized active referral intervention was well accepted by the smokers as most participants in the HAR group consented to be referred (77%) and over one-third of them used the SC service eventually (34.9%). Yet, the proportion of smokers who chose the SC referral service was slightly smaller than that of last year's, and only 34.4% of smokers from HAR group were intended to quit within seven days (reported at baseline), suggesting that smokers might not be ready to decide or confirm the use of SC services immediately on-site or within 1-week.

In spite of the lower acceptance to SC services, high intensity and personalized active referral enhanced by approximately 20% (29.1% in 2015 and 34.9% in 2016) the proportion of smokers who actually used SC services compared with last year's Contest. This suggested that face-to-face introduction of SC services followed by immediate (or within one-week) booking could motivate participants to attend SC appointment afterwards. On the contrary, SC service usage rate was significantly lower in the Text Group than that of the HAR Group at all follow-up time points, as there was no active referral service provided in the Text Group and the participants had to book the SC service appointment themselves. Thus, higher intensity of active referral to SC services enhanced the actual usage rate of SC services as it was more motivating and convenient.

Research showed that one of the major barriers to accept SC services was the lack of understanding towards SC treatments[14]. With sufficient knowledge about SC treatments provided through face-to-face introduction and the information card, cessation attempt and quit rate could be enhanced. Yet, busy schedule and time mismatch were the two major reasons for not using the SC service. Over 60% of the participants were employees and not available to attend the SC clinics which generally operated during weekdays from 9am to 5pm. Thus, more support from employers such as providing leave allowance for SC might enhance SC service use. Besides, 40% of the participants reported that they did not have social support for SC. Although reminder texts were sent to participants of "Quit to Win" Contest, text-based interventions could not provide real-time responses from the counselors, which might affect smokers' intention to quit and lower the intensity of social support[15]. Thus, an instant communication through text messaging would be advantageous. Smokers found that instant messaging is quick, instant to respond and easy to use. Instant messaging might provide some social support and motivation to smokers for SC[15].

Regarding smoking cessation aids, a warning leaflet was distributed to the HAR Group and the Text Group, but a 12-page self-help SC booklet was given to participants in the Control Group. Although over 70% of participants did read the printed smoking cessation materials, many of them reported that they lost or were not interested in the printed aids. Similar to those in the last Contest, this cohort of smokers might be less receptive to the health warning leaflet. Health warnings had already been widely publicized and probably those hard-core smokers in the cohort were not motivated by these warnings at all. Nevertheless, the results highlighted the importance to continue to design and evaluate the most effective advice, leaflet, or using social media and other modes on referring smokers to evidence-based SC intervention.

5. Conclusions

In conclusion, the 7th "Quit to Win" Contest successfully reached a large number of smokers and non-smokers in the community and promoted SC messages and the existing services. "Quit to Win" Contest provides an important platform to disseminate SC messages to a vast number of smokers and non-smokers. The higher intensity active referral intervention effectively increased abstinence rate at six months. Early proactive contact and referring smokers to SC service providers enhanced SC service use, which significantly increased abstinence. Longer-term follow-up and cocktail interventions including different combinations of very brief intervention are warranted.

6. Clinical trial Registration

Clinical trial registration number: NCT02804880 (ClinicalTrials.gov) (https://clinicaltrials.gov/)

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