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Prevalence of seasonal influenza vaccination and associated factors in people with chronic diseases in Hong Kong

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SUMMARY

Chronic disease patients are at high risk of developing serious influenza-related complications. This study investigated the prevalence of seasonal influenza vaccination (IV) and associated factors in such patients. A random sample of 704 Chinese adults with chronic disease was anonymously interviewed by telephone; 35·8% of them had ever taken up IV and 22·7% did so during the last flu season. The most frequently mentioned facilitator was recommendation made by a healthcare worker (HCW). Knowledge that IV is required annually, perceived severe health impacts of influenza, and recommendation made by a HCW were positively associated with previous IV and intention to take up IV in the next year, while perceived side-effects was inversely associated with previous IV and intention to take up IV. The coverage of IV in this study population was low. HCWs should clarify IV-related health beliefs in chronic disease patients and actively advise them to take up IV.

Key words: Chinese, chronic diseases, coverage, factors, influenza vaccination, respiratory infectious disease.

INTRODUCTION

It is known that chronic disease conditions are associated with serious influenza-related complications, including elevated mortality [1, 2]. A previous study has shown that 47% and 23%, respectively, of deaths related to influenza were attributable to heart and lung diseases [3]. Chronic obstructive pulmonary disease (COPD), asthma and neurological diseases are also associated with deaths related to influenza [4]. Influenza vaccination (IV) is the most effective public health measure in reducing influenza-related morbidity and mortality. The World Health Organization further recommends that governments increase the coverage of IV in various high-risk groups, including people living with chronic diseases [5, 6]. Among such patients, IV reduces the number of medical consultations, exacerbation of current medical conditions, comorbidity, hospitalization, and death [7].

Despite ample evidences, the prevalence of IV in people living with chronic diseases has been low – ranging from 11·1% in Poland to 56·0% in the

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UK [8–10]. In some countries, the prevalence was lower than that in the elderly [10]. In a survey conducted in primary-care clinics in Turkey, only 27·3% of COPD patients, 21·3% of chronic cardiopulmonary disease patients, 18·0% of asthma patients, and 13·4% of diabetic patients had ever taken up IV [11]. Although the Hong Kong government recommends that people living with chronic diseases should take up IV annually [12], free IV is not available to such patients unless they are aged $\geqslant$65 years [13].

Although many studies have investigated factors associated with IV in high-risk groups such as the elderly and children [14–17], relatively few studies have targeted adult chronic disease patients [18, 19], and far fewer have been conducted in Chinese populations. Our literature search only found one study reporting prevalence of IV in Chinese patients with chronic diseases; however, that study was conducted at outpatient clinics and included other populations [20]. An information gap exists.

The Health Belief Model (HBM) specifies that cognitive factors on perceived susceptibility, perceived severity, perceived benefits (e.g. efficacy in preventing influenza), perceived barriers (e.g. cost of IV), cues to action [e.g. recommendation made by healthcare workers (HCWs)] and self-efficacy (confidence to take up IV if desired) are determinants of health-related behaviours [21, 22]. Such factors have been used to investigate IV in various populations [15, 20, 23, 24]. The model is one of the most commonly used behavioural health models that has been applied to explain behaviours relating to IV [25] and screening behaviours [26, 27]. It has also been used to guide design of health promotion campaigns [28].

We investigated the prevalence of taking up seasonal IV and identified socio-demographic and cognitive factors associated with IV in Hong Kong Chinese people living with chronic diseases. Cognitive factors such as perceived severity and susceptibility related to influenza, and perceived benefits and barriers for taking up IV were derived from the HBM. The last episode of IV was also described in detail.

METHODS

Study design and setting

The study population comprised Hong Kong Chinese adults aged 18–64 years, who self-reported suffering from at least one of the following chronic diseases: hypertension, diabetes, heart disease, renal disease, liver disease, chronic respiratory disease, cancer, and others. An anonymous cross-sectional telephone survey was conducted during April and May 2006. Random telephone numbers were selected from up-to-date telephone directories. Telephone surveys have commonly been used to investigate prevalence and associated factors relating to IV, both internationally and locally [14–16, 29]. Telephone interviews were administered by trained interviewers from 18:30 to 22:00 hours to avoid over-sampling of unemployed persons. At least three more independent calls were made on different days and times before a particular telephone number was considered invalid.

Interviewers first briefed the individual answering the phone about the purpose and background of the study. A few screening questions were used to see whether the household had had at least one eligible prospective participant. The eligible household member whose birthday was closest to the date of the interview was invited to join the study. The interviewer then re-confirmed the eligibility of the selected individual. Verbal informed consent was obtained from the participants before the survey commenced. The questionnaire took about 15–20 minutes to complete. Ethical approval was obtained from the ethics committee of the Chinese University of Hong Kong. A total of 856 eligible participants were identified, of whom 704 (82·2%) completed the interview.

Measures

Participants' socio-demographic data were collected. Participants were asked whether they had ever heard of seasonal IV, whether they had taken up seasonal IV (lifetime and during the last flu season) and if they intended to take up seasonal IV in the coming year. We also asked about the timing, location, reason(s) and side-effects related to the last episode of IV. Reason(s) for not taking up IV during the last flu season was/were recorded.

Those who had heard of IV answered four questions on IV-related knowledge and five questions on IV-related perceptions, including those related to perceived benefit (efficacy of IV), perceived barrier (side-effects of IV), perceived susceptibility and perceived severity with respect to influenza (comparing his/her situation with those of other fellow chronic disease patients). These cognitive factors were derived from the HBM (the items are listed in Table 2). Facilitators of seasonal IV were also mentioned.

Statistical analysis

Univariate odds ratios (OR) and respective 95% confidence intervals (CI) were used to investigate the strength of associations between various factors and the three dependent variables (i.e. having ever taken up seasonal IV, having taken up IV during the last flu season and intention to take up IV in the coming year). Those variables that were significant in the univariate analysis were then used as candidates for fitting multivariate stepwise logistic regression models, in order to identify significant factors that were independently associated with the three dependent variables. We included participants who had not heard of IV in calculating the prevalence of IV, but we excluded such cases when we analysed factors associated with the three aforementioned dependent variables related to IV. Statistical analyses were performed using SPSS for Windows version 14.0 (SPSS Inc., USA) and a P value of $<0{\cdot}05$ was taken as statistically significant.

RESULTS

Background characteristics

About two-thirds (66·5%) of the participants were female. Their age distribution was <40 (10·8%), 40–49 (21·5%) and $\geqslant 50$ (67·8%) years, and their education levels were primary school or below (37·1%), secondary school (47·4%) and post-secondary education (15·4%). The majority (83·5%) of the 704 participants were currently married, were not HCWs (97·4%) and had no contact with live poultry at work (97·3%); 6·3% of them were on the Comprehensive Social Security Assistance (CSSA) scheme.

Prevalence of taking up seasonal IV behaviours and intention to take up IV

Almost all participants (95·5%) had heard of IV, while 35·8% had ever taken up IV (29·8% of them did so >1 year ago); and 22·7% took up IV during the last flu season (Table 1). Of those who had heard of IV ($n=672$), 32·9% intended to take up IV in the coming year.

Knowledge and perceptions related to seasonal IV

About 20% had been recommended by a HCW to take up IV, while 32·4% knew that the Hong Kong government recommended people living with chronic diseases to take up IV. The majority (84·7%) of participants were not willing to pay more than HK$150 (US$19·2) for IV (Table 1).

The percentages of participants who had heard of IV providing correct responses to IV-related knowledge items were: IV could reduce the risk of influenza-induced complications such as pneumonia (42·6%), IV could reduce the risk of hospitalization due to influenza (52·5%), IV could reduce the risk of death due to influenza (46·9%), and it is necessary to take up IV annually (43·2%). The percentages of participants who had heard of IV and having specific perceptions on IV were: IV carries no side-effects (36·0%), IV is efficacious for influenza prevention (57·4%), chronic disease patients have a higher or much higher chance of contracting influenza compared to the general population (30·2%), influenza would cause more severe consequences for chronic disease patients compared to the general population (31·4%), and there is a severe to very severe health impact if contracting influenza (32·6%). Commonly mentioned facilitators of IV included: recommendation made by a HCW (70·7%), local reporting of a new human avian flu case (52·1%), suggestion given by a family member (50·3%), and short distance between residence and the site for taking up IV (49·0%) (Table 2).

The last episode of seasonal IV

Of those who reported having taken up IV during the last flu season ($n=160$), 63·8% did so at a private clinic, 15·6% did so at a governmental clinic and 9·4% did so at a community centre. Only eight (5%) participants self-reported that IV had caused some side-effects. The most commonly mentioned reasons for taking up IV included: 'influenza prevention' (31·3%), 'worried about contracting influenza' (18·8%), and 'being recommended by a HCW' (12·5%). Commonly given reasons for not taking up IV included: 'lack of necessity' (42·1%), 'good health' (13·9%), and 'no recommendation made by a HCW' (7·4%) (Table 3).

Factors associated with having taken up seasonal IV

Having ever taken up IV in the lifetime

An education level of university or above (OR 2·03), being a HCW (OR 4·11), knowledge that IV is required annually (OR 3·83), perceived severe/very severe health impacts or perceived uncertainty about health

Table 1. *Behaviours and intention related to influenza vaccination (IV)*

	n	(%)
Had heard of IV*	672	(95·5%)
Had ever taken up IV*	252	(35·8%)
Had taken up IV during the last flu season*	160	(22·7%)
Time since last episode of IV†		
⩽1 year	176	(69·9%)
>1 year	75	(29·8%)
Don't know	1	(0·4%)
Intend to take up IV in the coming year‡		
Yes	221	(32·9%)
No	297	(44·2%)
Don't know	154	(22·9%)
Recommendation made by healthcare worker to take up IV‡		
Yes	135	(20·1%)
No	537	(79·9%)
Government had recommended chronic disease patients to take up IV‡		
Yes	218	(32·4%)
No	316	(47·0%)
Don't know	138	(20·5%)
The maximum you are willing to pay for IV which could effectively reduce the risk of influenza-induced complications/ hospitalization (in HK$)‡		
0	160	(23·8%)
1–150	409	(60·9%)
151–300	82	(12·2%)
301–500	8	(1·2%)
501–1000	3	(0·4%)
>1000	7	(1·0%)
Don't know	3	(0·4%)

* All study participants ($n=704$).
† Those who had ever taken up IV ($n=252$).
‡ Those who had heard of IV ($n=672$).

impacts of influenza (OR 3·72 and 4·35, respectively), uncertainty about the consequences of influenza for chronic disease patients compared to the general population (OR 3·45), willingness to pay for IV [OR 2·05 (HK$1–150) and 2·26 (>HK$150)], and recommendation made by a HCW to take up IV (OR 5·23) were associated with having ever taken up IV, whereas perceived side-effects of IV (OR 0·31), uncertainty about side-effects of IV (OR 0·14), and uncertainty about the efficacy of IV (OR 0·46) were associated with a lower likelihood of doing so (Table 4).

Taken up IV during the last flu season

Being a HCW (OR 4·34), knowledge that IV is required annually (OR 4·04), perceived severe/very severe health impacts of influenza (OR 2·82), and recommendation made by a HCW to take up IV (OR 3·25) were associated with having taken up IV during the last flu season, while perceived side-effects of IV (OR 0·35) and uncertainty about side-effects (OR 0·23) were associated with a lower likelihood of doing so during the last flu season (Table 4).

Intention to take up seasonal IV in the coming year

Older age (OR 2·28–4·53), knowledge on the benefits of IV in reducing the risks of influenza-induced complications, hospitalization and death (OR 1·70), knowledge that IV is required annually (OR 6·68), perceived severe/very severe health impacts of influenza (OR 2·34), willingness to pay for IV [OR 2·53 (HK$1–150) and 2·05 (>HK$150)], and

Table 2. *Knowledge and perceptions related to influenza and influenza vaccination (IV) (among those who had heard of IV, n=672)*

	n	(%)
Knowledge related to influenza vaccination (IV)		
Perceived that IV could reduce risk of influenza-induced complications, e.g. pneumonia		
Yes	286	(42·6%)
No	105	(15·6%)
Don't know	281	(41·8%)
Perceived that IV could reduce risk of hospitalization due to influenza		
Yes	351	(52·2%)
No	100	(14·9%)
Don't know	221	(32·9%)
Perceived that IV could reduce risk of death due to influenza		
Yes	315	(46·9%)
No	104	(15·5%)
Don't know	253	(37·6%)
Perceived that IV is required annually		
Yes	290	(43·2%)
No	159	(23·7%)
Don't know	223	(33·2%)
Perceptions related to influenza vaccination		
Perceived side-effects of IV		
No side-effect	242	(36·0%)
Not severe	192	(28·6%)
Severe	23	(3·4%)
Don't know	215	(32·0%)
Perceived efficacy of IV		
Efficacious	386	(57·4%)
Not efficacious	100	(14·9%)
Don't know	186	(27·7%)
Perceptions related to influenza		
Perceived health impact on oneself if contracting influenza		
Very severe	33	(4·9%)
Severe	186	(27·7%)
Moderate	291	(43·3%)
Mild	89	(13·2%)
No effect	31	(4·6%)
Don't know	42	(6·3%)
Perceived chances for chronic disesase patients to contract influenza compared to the general public		
Much higher	12	(1·8%)
Higher	191	(28·4%)
Same	332	(49·4%)
Lower	75	(11·2%)
Much lower	11	(1·6%)
Don't know	51	(7·6%)
Perceived consequences of contracting influenza for chronic disease patients compared to the general public		
Much more severe	22	(3·3%)
More severe	189	(28·1%)

Table 2 (*cont.*)

	n	(%)
Same	337	(50·1%)
Less severe	65	(9·7%)
Much less severe	10	(1·5%)
Don't know	49	(7·3%)
Facilitators of IV		
More likely to take up IV if recommended by a healthcare professional		
Yes	475	(70·7%)
No	123	(18·3%)
Don't know	74	(11·0%)
More likely to take up IV if a new human case of avian flu is reported in Hong Kong		
Yes	350	(52·1%)
No	214	(31·8%)
Don't know	108	(16·1%)
More likely to take up IV if suggested by the family		
Yes	338	(50·3%)
No	245	(36·5%)
Don't know	89	(13·2%)
More likely to take up IV if it is provided close to residence		
Yes	329	(49·0%)
No	259	(38·5%)
Don't know	84	(12·5%)

recommendation made by a HCW to take up IV (OR 2·85) were associated with intention to take up IV in the coming year, while perceived side-effects (OR 0·42) and uncertainty about side-effects (OR 0·31) were associated with lower likelihoods of doing so in the coming year (Table 4).

DISCUSSION

Despite the recommendations given by the local government and international health authorities [5, 12], only about one-third of the participants had ever taken up seasonal IV and less than one-fourth did so during the last flu season. The IV coverage was hence lower than that (40–80%) reported in some European countries [10] and was also lower than that of the Hong Kong elderly population (about 48%) [15]. A large proportion of the chronic disease patients in Hong Kong had therefore failed to take up this measure to prevent contracting influenza or to minimize the occurrence of severe related complications that are potentially related to influenza. Good implementation is as important as a sound recommendation.

Although most of the study population had heard of IV, it remains necessary to enhance IV-related knowledge as only about half of the participants perceived that IV could reduce risks of influenza-induced complications, hospitalization and death. Furthermore, only about 40% of the participants understood the need to take up IV annually and this variable was significantly associated with IV and intention to take up IV.

We found significant associations between HCWs' recommendation and IV-related behaviour and intention. Furthermore, 'recommendation made by a HCW' was commonly mentioned as a facilitator of IV. The findings corroborate with the results reported in a number of previous studies conducted among healthy adults [30, 31]. However, about three-quarters of the participants had not received such an advice from their HCW. HCWs working in both private and public sectors should disseminate IV-related information to chronic disease patients.

However, studies conducted both in Europe and in Hong Kong have shown that HCWs had low prevalence of IV and low intention to take up IV during the H1N1 pandemic, due to perceived uncertainty about

Table 3. *Details of the last episode of influenza vaccination (IV) (among those whose last IV episode was received during the last flu season, n = 160)*

	n	(%)
Place where the last episode of IV was taken up		
Private clinic	102	(63·8)
Government/hospital authority general outpatient clinic	25	(15·6)
Community centre	15	(9·4)
Workplace	9	(5·6)
Other	9	(5·6)
The most important reason of taking up IV (last episode)		
Influenza prevention	50	(31·3)
Worry about contracting influenza	30	(18·8)
Recommended by a healthcare professional	20	(12·5)
Arranged by employer/someone provided the service at home	14	(8·8)
Suggested by family members/peers	11	(6·8)
Arranged by community centre/elderly centre/religious group	10	(6·3)
Government advertisement	9	(5·6)
Other reasons	16	(10·0)
Self-reported side-effects (last episode of IV)		
Yes*	8	(5·0)
No	151	(95·0)
Can't remember/Don't know	0	(0)
The most important reason of not taking up IV†		
Not necessary	215	(42·1)
In good health	71	(13·9)
Had not been recommended by a healthcare professional	38	(7·4)
Worried about side-effects of IV	27	(5·3)
Cannot afford it	24	(4·7)
Perceived that IV was not efficacious	22	(4·3)
Perceived that IV taken more than 6 months ago was still efficacious	19	(3·7)
Other reasons	95	(18·6)

* The prevalence of experiencing mild pain, fever, and fatigue were 25%, 25%, and 50%, respectively. No other side-effects were reported.
† Among those who had not yet received IV/not received IV during the last flu season ($n = 511$).

the safety and efficacy of the new vaccine [32, 33]. Recommendations made by HCWs are clearly important cues for action, according to the HBM. Therefore, future social marketing promoting IV among chronic disease patients should target both HCWs and patients, to update them about evidences on improved safety and efficacy of the influenza vaccine. In such campaigns, the HCWs' key role in improving coverage of IV in chronic disease patients and the importance of IV to patients should be emphasized.

It is important to point out that the majority (>80%) of participants were unwilling to pay more than HK$150 for the vaccine, even after they had been told about its efficacy in reducing risks of influenza or influenza-related complications, hospitalization and death. A previous study came to a similar conclusion that the need to pay for vaccine was a strong deterrent for vaccination in the elderly and other at-risk populations [34]. Other evidence has shown that reimbursement increases IV coverage in some general European populations [29]. Given the significance of

Table 4. *Predictors of influenza vaccination (IV) behaviours (among those who had heard of IV, n=672)*

		Had ever taken up IV			Had taken up IV during the last flu season			Intend to take up IV in the coming year		
	n†	Row %	OR_u	OR_m (95% CI)	Row %	OR_u	OR_m (95% CI)	Row %	OR_u	OR_m (95% CI)
Demographic characteristics										
Gender										
Male	218	36·2	1·00	–	23·9	1·00	–	34·9	1·00	–
Female	454	38·1	1·08		23·8	1·00		31·9	0·88	
Age group (yr)										
18–39	75	30·7	1·00	–	18·7	1·00	–	17·3	1·00	1·00
40–49	146	37·7	1·37		20·5	1·13		30·1	**2·06***	**2·28 (1·03–5·04)***
50–59	282	34·8	1·20		22·3	1·25		30·5	**2·09***	**2·29 (1·09–4·81)***
⩾60	169	45·0	**1·85***		31·4	**1·99***		46·2	**4·09****	**4·53 (2·05–10·02)****
Education level										
Primary school or below	240	37·5	1·00	1·00	25·4	1·00	–	37·5	1·00	–
Junior secondary school – matriculation	349	33·5	0·84	0·83 (0·53–1·29)	20·9	0·78		30·4	0·73	
University or above	83	54·2	**1·97****	**2·03 (1·03–3·99)***	31·3	1·34		30·1	0·72	
Marital status										
Single/divorced/separated/ widowed	112	37·5	1·00		18·8	1·00	–	20·5	1·00	n.s.
Married/cohabiting	560	37·5	1·00		24·8	1·43		35·4	**2·12****	
Being a healthcare professional										
No	654	36·7	1·00	1·00	23·1	1·00	1·00	32·7	1·00	–
Yes	18	66·7	**3·45***	**4·11 (1·25–13·51)***	50·0	**3·33***	**4·34 (1·46–12·93)****	38·9	1·31	
Have chance of contacting live poultry at work										
No	656	37·7	1·00	–	23·9	1·00	–	32·3	1·00	n.s.
Yes	15	33·3	0·83		20·0	0·79		60·0	**3·14***	
Receiving CSSA										
No/refused to answer	633	38·2	1·00	–	24·5	1·00	–	33·8	1·00	n.s.
Yes	39	25·6	0·56		12·8	0·45		17·9	**0·43***	
Knowledge related to IV										
Perceived that IV could reduce the risk of influenza-induced complications (e.g. pneumonia) or hospitalization or death										
No	269	29·0	1·00	n.s.	17·5	1·00	n.s.	22·7	1·00	1·00
Yes	403	43·2	**1·86***		28·0	**1·84****		39·7	**2·25****	**1·70 (1·12–2·58)***

Table 4 (*cont.*)

		Had ever taken up IV			Had taken up IV during the last flu season			Intend to take up IV in the coming year		
	n†	Row %	OR_u	OR_m (95% CI)	Row %	OR_u	OR_m (95% CI)	Row %	OR_u	OR_m (95% CI)
IV is required annually										
No	159	23·9	1·00	1·00	11·9	1·00	1·00	12·6	1·00	1·00
Yes	290	55·2	**3·92****	**3·83 (2·23–6·58)****	37·6	**4·44****	**4·04 (2·25–7·26)****	54·8	**8·44****	**6·68 (3·80–11·76)****
Don't know	223	24·2	1·02	1·37 (0·76–2·46)	14·3	1·23	1·47 (0·76–2·87)	18·8	1·61	1·85 (0·99–3·48)
Perceptions related to IV										
Perceived side-effects of IV										
No	242	61·6	1·00	1·00	40·9	1·00	1·00	50·8	1·00	1·00
Yes	215	31·2	**0·28****	**0·31 (0·20–0·50)****	17·2	**0·30****	**0·35 (0·21–0·56)****	26·5	**0·35****	**0·42 (0·26–0·67)****
Don't know	215	16·7	**0·13****	**0·14 (0·08–0·24)****	11·2	**0·18****	**0·23 (0·13–0·40)****	19·1	**0·23****	**0·31 (0·18–0·52)****
Perceived efficacy of IV										
Not efficacious	100	36·0	1·00	1·00	16·0	1·00	n.s.	20·0	1·00	n.s.
Efficacious	386	45·3	1·47	0·92 (0·52–1·62)	30·8	**2·34****		41·5	**2·83****	
Don't know	186	22·0	**0·50***	**0·46 (0·24–0·92)***	13·4	0·82		22·0	1·13	
Perceptions related to influenza										
Perceived health impact on oneself if contracting influenza										
No effect/mild	120	30·0	1·00	1·00	18·3	1·00	1·00	27·5	1·00	1·00
Moderate	291	32·6	1·13	1·35 (0·75–2·42)	18·9	1·04	1·10 (0·59–2·04)	27·8	1·02	1·18 (0·66–2·10)
Severe/very severe	219	48·9	**2·23****	**3·72 (1·98–6·98)****	34·2	**2·32****	**2·82 (1·51–5·24)****	44·3	**2·10****	**2·34 (1·29–4·24)****
Don't know	42	33·3	1·17	**4·35 (1·63–11·59)****	19·0	1·05	2·21 (0·80–6·13)	23·8	0·82	1·45 (0·54–3·90)
Perceived chances for chronic disease patients to contract influenza compared to general public										
Much lower/lower	86	34·9	1·00	–	24·4	1·00	–	27·9	1·00	–
Same	332	33·1	0·92		20·2	0·78		30·4	1·13	
Much higher/higher	203	42·4	1·37		26·6	1·12		39·9	1·72	
Don't know	51	51·0	1·94		35·3	1·69		29·4	1·08	
Perceived consequences of contracting influenza for chronic disease patients compared to general public										
Much less severe/less severe	75	28·0	1·00	1·00	20·0	1·00	–	29·3	1·00	–
Same	337	35·9	1·44	1·33 (0·65–2·72)	21·4	1·09		31·8	1·12	
Much more severe/ more severe	211	40·3	1·73	0·88 (0·41–1·89)	27·5	1·52		37·0	1·41	
Don't know	49	51·0	**2·68****	**3·45 (1·28–9·26)***	30·6	1·76		28·6	0·96	

Table 4 (*cont.*)

		Had ever taken up IV			Had taken up IV during the last flu season			Intend to take up IV in the coming year		
	n†	Row %	OR_u	OR_m (95% CI)	Row %	OR_u	OR_m (95% CI)	Row %	OR_u	OR_m (95% CI)
Other factors										
The maximum you are willing to pay for IV which could effectively reduce the risk of influenza-induced complications/ hospitalization (HK$)										
0	163	21·5	1·00	1·00	14·1	1·00	–	17·2	1·00	1·00
1–150	409	41·3	**2·58****	**2·05 (1·20–3·48)****	25·9	**2·13****		38·1	**2·97****	**2·53 (1·47–4·34)****
>150	100	48·0	**3·38****	**2·26 (1·11–4·59)***	31·0	**2·73****		37·0	**2·83****	**2·05 (1·02–4·13)***
Recommendation made by healthcare workers to take up IV										
No	537	27·9	1·00	1·00	16·6	1·00	1·00	25·9	1·00	1·00
Yes	135	75·6	**7·97****	**5·23 (3·13–8·76)****	52·6	**5·58****	**3·25 (2·07–5·12)****	60·7	**4·43****	**2·85 (1·77–4·60)****
Government had recommended chronic disease patients to take up IV										
No	316	33·2	1·00	n.s.	18·7	1·00	n.s.	29·4	1·00	n.s.
Yes	218	44·0	**1·58***		29·8	**1·85****		40·8	**1·65****	
Don't know	138	37·0	1·18		26·1	1·54		28·3	0·94	

CSSA, Comprehensive Social Security Assistance OR_u, Univariate odds ratio; OR_m, multivariate odds ratio obtained from stepwise logistic regression using univariately significant variables as candidates; n.s., not significant; –, univariately not significant.

† Valid percentages were reported (i.e. missing values were not included in the denominator) and the frequencies therefore may not sum up to the total.

* $P<0·05$, ** $P<0·01$.

IV, financial subsidy should be considered by the government to encourage chronic disease patients to take up IV.

Some constructs of the HBM, such as perceived side-effects of IV (barrier) and perceived benefits of IV in reducing the risks of influenza-induced complications (benefit), were significantly associated with IV and the intention to take up IV in the coming year. The model has been used widely to explain health-related behaviours [21, 22] and can be used to design effective intervention programmes [28]. It is potentially useful for our study population. We also discovered that perceived IV-related side-effects was a concern against taking up IV. However, only a few participants (about 5%) of those taking up IV had actually experienced relatively minor side-effects such as fatigue, fever and mild pain. Factual information about the prevalence and nature of side-effects should be disseminated to chronic disease patients, thereby encouraging them to make a more rational and evidence-based decision on IV.

There is a paucity of studies investigating IV in chronic disease patients in other Chinese populations; therefore no comparisons can be made. As the prevalence of IV is low in non-Chinese populations in Western countries and in the Chinese population in Hong Kong, we believe that it would also be low in mainland China and in other Chinese populations. We contend that some similar significant cognitive factors that are found in other Chinese populations (e.g. those of the HBM) are significantly associated with IV in different populations in different countries. However, future studies including contextual factors are warranted to confirm these contentions.

Importantly, this study used variables mainly derived from the HBM model. Although this and other studies have shown that the model can be used to explain behaviours related to IV very well, other factors are equally important. Examples of these factors include misconceptions about modes of transmission of the viruses, emotional responses (e.g. fear and disturbance), experience during SARS and H1N1, perceived likelihood of outbreak of emerging respiratory diseases such as H5N1, and perceptions and trust on governmental policies [35–38]. As this study was conducted prior to the H1N1 pandemic, most of these factors have not been considered in the study. The data, therefore, can be considered as reflecting the pre-pandemic situation and serve as a baseline for future comparisons.

The study has several limitations. Although the majority of the households in Hong Kong have a residential phone [39], a minor proportion of the households without one were unable to join the study. Moreover, as the demographic information of this study population is different from that of general population, we cannot compare such characteristics of this population and the census population to assess representativeness. However, we believe that the sample is a representative one as it is based on a random population-based survey. The design has been used in many local published studies, including those investigating prevalence of various chronic illnesses [39, 40]. Furthermore, this study used a cross-sectional design; associations rather than causal relationships were described. Further, self-reported IV history was not validated against medical records and may be subject to recall bias. Last, we checked whether prospective participants were suffering from at least one of the listed types of chronic diseases but did not record the frequency of the individual disease categories.

The study has important public health implications. It is not sufficient to rely on governmental recommendation – HCWs should develop multiple strategies to promote IV in people living with chronic diseases. Social marketing campaigns should be launched. Such campaigns need to target various types of stakeholders such as healthcare professionals working in both the public and private sectors, changing their own views on IV and requesting HCWs to serve as role models for their patients. The campaigns targeting chronic disease patients should also clarify and foster relevant health beliefs that are strongly associated with taking up IV or the intention to take up IV. The government needs to consider cost-effectiveness of financial subsidy. Components to address issues such as emotional responses to emerging respiratory diseases should also be included in the campaigns.

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DECLARATION OF INTEREST

None.

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