

Decisional Consideration of Hereditary Colon Cancer Genetic Test Results Among Hong Kong Chinese Adults¹

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Abstract

This study investigated the relationship between psychosocial factors and the decisional consideration of genetic testing of hereditary colon cancer. Attitudes and beliefs about genetic testing, anxiety and depression levels, coping style, and optimism were used as psychosocial independent variables. Sixty-two registrants (61% males and 39% females) of the Hereditary Gastrointestinal Cancer Registry of the Queen Mary Hospital in Hong Kong completed a mail survey. Mean age of the respondents was 42 years (SD = 9.92 years, range: 18–68 years). Correlational analyses and regression analyses were used to examine the relationships between the dependent and independent variables. Participants were concerned about the well-being and reactions of their significant others even more than their own well-being in their decisional consideration processes. Those who had higher perceived risks of being a mutated carrier and higher depression levels tended to emphasize more on the negative consequences of learning the test results and sharing them with relatives. Besides, those who believed that having cancer was attributable to personal (e.g., stress) rather than environmental factors considered that the negative consequences were relatively more important than the positive gains in sharing their results with relatives. Our participants tended to be relational or interdependent oriented in their decisional consideration processes related to genetic testing of colon cancer. This result is consistent with the established interdependent orientation of Chinese. Participants with higher risk perception focused more on the negative consequences of genetic testing. Psychological counseling might help these patients to cope with their concerns about being diagnosed as gene carriers after genetic testing.

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Introduction

Genetic Testing and Colon Cancer. Colorectal cancer is the second commonest cancer and the third leading cause of cancer deaths in Hong Kong. In 1999, there were 3024 new cases of colorectal cancer and 1329 colorectal cancer-related deaths (1). There is a progressive increase in the rate of colorectal cancer in Hong Kong up to 4% per year, mainly attributable to classical, late-onset colorectal cancer. As compared with other parts of the world (e.g., Scotland), Hong Kong has more colorectal cancer patients under 40 years old (2). The disease meets the requirements of the WHO for screening (3).

At least 10–20% of colorectal cancer may be accounted for by hereditary factors (4, 5). The level of risk depends on the number of close relatives with colorectal cancer and their age of onset. There are two genetic forms of colon cancer: HNPCC³ and FAP syndrome. The genetic cause for most cases of HNPCC has been shown to arise from a defect in the DNA repair mechanism, and the onset is usually before age 50 (6). FAP is a precancerous hereditary disease of the gastrointestinal tract with often >100 mushroom-shaped polyps, which have high potential to become malignant, on the surface lining of the large intestine. Genetic testing for APC gene mutation to identify the altered gene carriers for continued medical surveillance is now possible. Such testing allows >80% identification of asymptomatic persons (7). In Hong Kong, the first Hereditary Gastrointestinal Cancer Registry was established in 1995, and it has been the only registry for hereditary colorectal cancer in Hong Kong since then. The registry is based at the Queen Mary Hospital, which is the teaching hospital of the University of Hong Kong. In the past 2 years, the registry is financially supported by the Hong Kong Cancer Fund, and the clinical work was shared by the Department of Surgery, the Department of Pathology, and the Cancer Centre at the Queen Mary Hospital. The mission of the registry is to prevent colorectal cancer in high-risk families in Hong Kong through early detection, timely treatment, education, and ongoing research. The registry receives referral for proven or suspected hereditary colorectal cancer syndrome families from both medical professionals or from family members. Participation in the genetic screening testing is entirely voluntary. If an individual decides to participate in the genetic testing, the registry will perform clinical (pedigree) and laboratory testing to verify whether he/she is suffering from hereditary colorectal cancer syndrome. The registry will also provide genetic counseling in the form of either individual counseling or psychoeducational seminar. Individual genetic counseling will be offered on three occasions: before genetic testing; upon disclosure of genetic testing result; and at ~2 months after disclosure of genetic testing result. During the

³ The abbreviations used are: HNPCC, hereditary nonpolyposis colorectal cancer; FAP, familial adenomatous polyposis; HADS, Hospital Anxiety and Depression Scale; MBSS, Miller Behavioral Style Scale; LOT, Life Orientation Test; ICC, intraclass correlation coefficient.

pretest counseling, information on hereditary colorectal cancer syndrome, estimated colorectal cancer risk level based on the family tree as well as the pros and cons of genetic testing (including employment and insurance discrimination), will be given. Other alternatives to genetic testing will be discussed. After the counseling session, an individual will be given a period of time for consideration before deciding whether he/she will undergo genetic testing. Upon disclosure of genetic testing result, implications of the result for the individual as well as for his/her offspring will be explained. The individual's lifetime risk of colorectal cancer will be revised based on the genetic testing result. For mutated gene carrier, appropriate clinical surveillance protocol will be devised and explained. The individual concerned will be contacted by phone ~2 months after disclosure of genetic testing result to find out his/her adaptation to the new genetic status. If required, additional counseling will be arranged. Regular educational seminar will be organized to disseminate information on different aspects of genetic colon cancer screening to the registrants.

Up to September 2000, the registry had 264 registrants. Among them, 81 individuals had been proven by genetic testing to be mutated gene carriers for either FAP or HNPCC, 73 individuals had been shown to be normal gene carriers and hence had been discharged from additional clinical screening, and another 60 individuals were waiting for their genetic testing results. The remaining 50 people met the clinical criteria for hereditary colorectal cancer (polyposis phenotype for FAP and Amsterdam criteria for HNPCC), but genetic testing was not feasible either because there was no surviving index patients to test for the causative mutation, or mutation is not found using current techniques.

Psychological Consequences of Genetic Testing. Genetic testing has potential benefits and harms for recipients. Although noncarriers may experience relief from their test results, they may exhibit some negative psychological reactions, including feeling of survivor guilt, disbelief about their test results because of preconceptions of susceptibility, and repercussions on family relationships (8). In contrast, the gene carriers can reduce their cancer risk by using available primary and secondary prevention options, as well as presymptomatic genetic diagnosis for cancer susceptibility. However, positive genetic test results may psychologically harm carriers. People who are unprepared for the carrier status may be shocked and upset by their testing results and may exhibit feelings of anger, anxiety, disbelief, despair, guilt, and depression. Those with positive results have to face their long-term fears of the onset of cancer, as well as their concerns about passing the altered gene to their children (8–10). In addition, there are other social risks such as loss of privacy and genetic discrimination (10–12). However, despite these possible negative consequences, a positive result does only indicate an increased susceptibility to develop cancer (11). A gene carrier may or may not develop cancer, and the age of onset for those who will cannot be predicted. Medical decisions following a positive result are therefore difficult to make (10). This uncertainty may create a lot of anxiety for people receiving genetic screening. The decision to receive genetic testing is clearly not a simple one. People's decisional consideration in the process of genetic testing for colon cancer should be a significant area for study. Clinically, it is important for health-care professionals to have a proper understanding of people's appraisals of the potential benefits and harm involved so that appropriate support can be provided (13, 14).

Decisional Consideration in Genetic Testing. Decisional consideration can be defined as the "extent to which a person

values or prioritizes the positive and negative aspects of a particular behavior" (5). Systematic study on decisional consideration of genetic testing of colon cancer is scarce. One exception is a study conducted by Vernon *et al.* (5). The researchers developed a 14-item questionnaire to measure the decisional consideration of individuals undergoing genetic testing for colon cancer. Vernon *et al.* (5) then examined the associations between decisional balance and intention to learn genetic testing results. Decisional balance represented the trade-off between the pros and cons of learning the genetic testing results as appraised by the subjects. It was reported that those who intended to learn about their genetic testing results emphasized more on the positive than the negative consequences in their decisional consideration processes.

Note that Vernon *et al.* (5) used decisional consideration as an independent variable and studied its effect on intention to learn genetic testing result. To date, no study has been conducted to examine factors affecting the decisional consideration of individuals undergoing genetic testing for colon cancer (*i.e.*, with decisional consideration as a dependent variable). It has been well established in cross-cultural psychology that Chinese people are more relational and interdependent oriented compared with people in Western societies (15, 16). Our clinical experience informed us that in making important health decisions such as knowing the results of genetic colon cancer screening, Chinese people often consider the well-being of their significant others even more than their own well-being. This study is conducted to investigate the above clinical observation. Its objectives are: (a) to study the decisional consideration process of Hong Kong Chinese toward genetic testing of colon cancer, and (b) to examine factors affecting decisional consideration of colon cancer genetic screening testing.

This study is the first psychosocial study conducted by the Hereditary Gastrointestinal Cancer Registry to investigate factors associated with people's attitudes toward genetic testing for colon cancer risk. At present, there is a paucity of such information among Chinese (17). This study is the first to provide systematic data on the psychological reactions of Hong Kong Chinese adults toward colon cancer genetic testing.

Materials and Methods

Participants and Procedures

The study was conducted in September 2000. The assessment package was sent to 264 registrants of the Hereditary Gastrointestinal Cancer Registry of the Queen Mary Hospital in Hong Kong. The assessment package contained an informed consent form, a personal data form, and a set of psychological inventories. All questionnaires were set in Chinese. The coordinator of the registry is a registered nurse and was readily available to answer questions from the participants over the phone. The registrants were asked to either mail the completed package back to the registry or submit it during a psychoeducational seminar organized by the registry. Participants under the same household were instructed to complete the questionnaires on their own without discussion it with others. One telephone reminder was made by the coordinator of the registry to those registrants who had enrolled in the psychoeducational seminar to increase the response rate.

Sixty-two registrants from 35 families returned the assessment package to us, representing a response rate of ~23.5%. Sixteen of 35 families (45.7%) had more than one respondent. There were 24 women (38.7%) and 38 men (61.3%). Thirty-four subjects (54.8%) were used full-time. The others were: housewife ($n = 17$); employed part-time ($n = 3$); retired ($n =$

Table 1 Participant Profile

	Total registrants as of September 2000 (N = 264)			
	Respondents (n = 62)		Nonrespondents (n = 202)	
	n	%	n	%
Gender				
Male	38	61.3	78	38.6
Female	24	38.7	124	61.4
Type of colorectal cancer				
FAP	25	40.3	81	40.1
HNPCC	37	59.7	121	59.9
Genetic testing results				
Mutated gene carrier	16	25.8	65	32.2
Normal gene carrier	12	19.4	61	30.2
Pending genetic testing result	20	32.3	40	19.8
Genetic testing not feasible or not yet done	14	22.6	36	17.8
Age (yr)				
Mean		42.0		38.0
SD		9.9		13.5

3); and unemployed ($n = 5$). Age ranged from 18 to 68 years old (mean = 42.0 years, $SD = 9.9$ years). Table 1 compares the demographic profile of the respondents and the nonrespondents. Our sample had higher mean age [$t(262) = -2.20$; $P < 0.05$] and more women [$\chi^2(1) = 9.90$, $P < 0.01$] as compared with the nonrespondents on the registration list. There were no significant differences between the respondent and nonrespondent groups on cancer types and genetic carrying status [cancer types: $\chi^2(3) = 6.45$, $P > 0.05$; genetic carrying status: $\chi^2(1) = 0.25$, $P > 0.05$].

Measures

The dependent variable was the decisional balance of the pros and cons of genetic testing results. The independent variables were: attitude and beliefs toward genetic testing; depression and anxiety; coping styles; and optimism. All predicting variables except optimism were used in a previous study by Vernon *et al.* (18). Optimism was included because more optimistic people are thought to have less susceptibility perception (called unrealistic optimism; Ref. 19) and higher pros and lower cons appraisals. It is of interest to compare how this variable affects decisional balance.

Decisional Consideration. This construct was measured by a 14-item questionnaire adapted from a questionnaire developed by Vernon *et al.* (5). It has four subscale scores namely, pros of learning genetic results (4 items), cons of learning genetic results (4 items), pros of informing relatives (3 items), and cons of informing relatives (3 items). Each subscale score reflects people's cognitive appraisal of the positive (pros) and negative (cons) aspects of learning their test results and informing relatives about their results. Internal reliabilities of the subscales according to the present sample were pros of learning genetic results: Cronbach's $\alpha = 0.77$; cons of learning genetic results: Cronbach's $\alpha = 0.87$; pros of informing relatives: Cronbach's $\alpha = 0.95$; and cons of informing relatives: Cronbach's $\alpha = 0.73$. The internal reliabilities of the subscales in the present sample were comparable with or higher than those reported by Vernon *et al.* (5). Similar to Vernon *et al.* (5), two summary indicators were created by (a) converting the cons and pros raw scores into standard T scores (mean = 50; $SD = 10$) and (b) subtracting the cons T scores from the pros T scores for each of the two sets of pros and cons scales (5). These two summary variables are described below.

The Decisional Balance (Self) score represents the balance between the pros and cons of learning genetic testing results. A higher score implies benefits are more important than harms in the decisional consideration process of their learning own genetic testing results.

The Decisional Balance (Relatives) score measures the trade-off between informing relatives about the testing results. A higher score implies positive gains are more important than negative consequences in the decisional process of telling relatives about own genetic testing results.

Attitude and Beliefs about Genetic Testing. A nine-item questionnaire was adapted from a similar instrument developed by Vernon *et al.* (5). Each item was scored according to a 5-point Likert scale (5 = strongly agreed; 1 = strongly disagreed). Similar to the results of Vernon *et al.* (5), attempts to construct a scale with the Attitude and Belief items were not successful. The nine single item measures were thus used in the analysis (refer to Table 4 for the items).

Psychological Distress. The Chinese Hospital Anxiety and Depression Scale was used to measure psychological distress. The original HADS (20) was designed to assess psychological states of patients with physical problems and has proved itself to be useful in psycho-oncology research and practice (21, 22). The Chinese version of the HADS was developed by the Leung *et al.* (23) and has demonstrated good internal consistency and favorable linguistic, structural, and scale equivalence as compared with the English original. Two scores, the HADS Anxiety and the HADS Depression, can be derived from the questionnaire. Higher scores correspond to more symptoms of anxiety and depression, respectively. The Cronbach's α values of the HADS Anxiety and Depression scores from the present sample were 0.84 and 0.82, respectively.

Coping Style. This construct was measured by the MBSS (24). The MBSS is a self-report scale designed to assess individual differences in monitoring and blunting processing style. It contains four stress-evoking scenes that are relatively uncontrollable in nature. Each scene is followed by eight statements about ways of dealing with the situation (four on monitoring and four on blunting). The MBSS Monitoring and MBSS Blunting scores can be obtained by summing the number of monitoring and blunting options endorsed across the four situations. A higher score means more of the corresponding coping style. The Chinese version of the MBSS is developed by Cheng *et al.* (25). The Cronbach's α value for the MBSS Monitoring score was 0.74 and that for the MBSS Blunting score was 0.59 according to the present sample.

Optimism. The LOT (26) was applied to measure optimism. A higher LOT score means higher optimism. The Cronbach's α according to the present sample was 0.67.

Statistical Analysis

Descriptive statistics were computed first. Because some subjects were coming from the same families, the responses to the questionnaire items from individual respondents may be affected by their family memberships (*i.e.*, nonindependence of data are present). The ICC(1) (intra-class correlation) values for both the Decisional Balance (Self) and the Decisional Balance (Relative) scores were computed to examine the independence of data. The ICC(1) value is commonly used to indicate the degree to which group membership influences raw data (27, 28). An ICC value close to zero implies that family membership has insignificant effect on the dependent measures and an independence of data can be assumed (28). Pearson product moment correlations were

Table 2 Mean and SD of decisional consideration items ($n = 62$)

Items	Score	
	Mean	SD
Pros of learning own test results (I would want to find out my genetic testing results because)		
I would be relieved to know I did not have an altered gene for hereditary colon cancer.	3.15	1.10
I want to learn whether my children are at risk. ^a	3.39	1.07
I just want to know.	2.81	0.96
My own experience with cancer makes me more concerned about my family's risk for the disease.	3.15	0.81
Cons of learning own test results (I would not want to find out my genetic testing results because)		
I am afraid I would get too upset.	1.92	1.36
I am not sure if the test is accurate.	1.66	1.33
I am concerned about my family's reactions. ^a	1.98	1.41
I just don't want to know.	1.28	1.32
Pros of informing relatives of own test results (I would want to share my genetic tests results with my relatives)		
Because my relatives could do something to reduce his/her risk of cancer. ^a	3.35	1.03
Because I have a responsibility to let my relatives know that he/she may be at greater risk of colon cancer.	3.23	1.07
So my relatives can make family planning decisions.	3.23	1.10
Cons of informing relatives of own test results (I would not want to share my genetic test results with my relatives because)		
My relative would be worried about getting colon cancer. ^a	1.75	1.47
I would have to talk to a family member whom I prefer not to talk to.	1.52	1.32
Talking to my relative about his/her risk of hereditary colon cancer could hurt our relationship.	.57	1.10

^a Highest scored items. All are relational or interdependent oriented. Original items are set in Chinese and are translated from a study by Vernon *et al.* (5).

then used to examine association between the independent variables and decisional consideration variables. Regression analyses were used to compare the predictive power of those variables significantly correlated with the dependent variables.

Results

Preliminary analyses showed no significant differences between men and women on all variables, except with MBSS Monitoring, women tended to use more monitoring coping than men ($t(58) = -2.78, P < 0.01$). Therefore, we collapsed data across gender.

Descriptive Statistics of the Decisional Consideration Items. The means and SDs of the Decisional Consideration items are shown in Table 2. Note that all of the highest scored items in each category (with asterisk) were related to the well-being and reactions of the significant others.

Intraclass Correlation Coefficients. The ICC(1) values for the Decisional Balance (Self) and the Decisional Balance (Relative) scores were 0.15 and -0.12 , respectively. Both ICC(1) values were small (27), and therefore, we treated all data as independent measures in the subsequent analyses.

Intercorrelation of Variables. Descriptive statistics of all variables are shown in Table 3. Both the Decisional Balance (Self) and Decisional Balance (Relatives) scores were negative, which implied that participants focused more on the potential harm than gain in their decision-making processes regarding learning about own genetic testing results and informing their relatives about the results.

Pearson product moment correlational analyses were

Table 3 Mean and SD of variables ($n = 62$)^a

Variables	Score			
	Min.	Max.	Mean	SD
Decisional consideration—learning own test results				
Pros	3.00	16.00	12.45	3.09
Cons	0	16.00	6.76	4.70
Decisional balance (self)	-1.60	0.80	-0.57	0.46
Decisional consideration—informing relatives				
Pros	0	12.00	9.82	3.02
Cons	0	12.00	3.82	3.15
Decisional balance (relatives)	-1.20	1.20	-0.60	0.40
Coping style				
MBSS-monitoring	3.00	16.00	11.07	3.16
MBSS-blunting	2.00	15.00	8.35	2.80
Psychological distress				
HADS anxiety	4.00	21.00	15.26	3.62
HADS depression	3.00	21.00	16.80	3.54
Optimism				
LOT	4.00	20.00	12.45	4.01

^a The Decisional Balance (Self) and the Decisional Balance (Relatives) scores represent the balance between the pros and cons of learning genetic testing results and informing relatives about the test results, respectively. Negative scores imply negative consequences are more important than positive gains in the decisional consideration processes.

Table 4 Interrelations between decisional balance scores and the attitude and belief items ($n = 62$)^a

Attitude and belief items	Decisional balance (self)	Decisional balance (relatives)
Item 1 I believe that being tested for hereditary colon cancer will help my family prevent cancer	-0.20	-0.09
Item 2 I am worried that I may carry the altered gene for hereditary colon cancer	-0.35^b	-0.08
Item 3 I am able to cope with any problems regarding my genetic test results	0.01	-0.23
Item 4 Cancer is God's will	-0.07	0.05
Item 5 The way stress is handled has a lot to do with a person's chances of getting cancer	-0.03	-0.20
Item 6 If I found out that I carried an altered gene, I would feel singled out	0.15	0.01
Item 7 Going through genetic counseling is too much trouble for what I would gain from it	0.07	0.10
Item 8 It's hard to believe that finding out my genetic testing results will help me or my family	0.40 ^c	0.48 ^c
Item 9 Cancer is because of bad luck	0.12	0.31 ^b

^a All attitude and belief items were rated according to a 5-point Likert scale (5 = strongly agree; 1 = strongly disagree). A positive correlation means individuals with a stronger belief on an item tend to focus more on the pros than the cons in their decisional consideration process.

^b $P < 0.05$.

^c $P < 0.01$.

used to investigate the associations between the variables. Decisional Balance scores were used in the analyses because they provided a summary of a person's appraisals of the positive over the negative aspects of a particular behavior, *i.e.*, learning about test results and sharing them with relatives. The correlations between the Decisional Balance scores and the nine Attitude and Belief items are shown in Table 4. Item 8 ("It's hard to believe that finding out my genetic testing results will help me or my family") was positively correlated with both the Decisional Balance (Self) and Decisional Balance (Relatives) scores. Individuals who

Table 5 Interrelations of the decisional balance scores and other independent variables ($n = 62$)

	1	2	3	4	5	6	7
1. Decisional Balance (Self)		0.46 ^b	0.00	-0.07	-0.15	-0.30 ^a	0.32 ^a
2. Decisional Balance (Relatives)			0.05	-0.14	-0.23	-0.46 ^b	0.27 ^a
3. MBSS-Monitoring				-0.13	-0.18	0.02	-0.04
4. MBSS-Blunting					0.20	0.19	-0.34
5. HADS Anxiety						0.65 ^b	-0.51 ^b
6. HADS Depression							-0.46 ^b
7. Optimism							

^a $P < 0.05$.^b $P < 0.01$.

believed that genetic testing is not useful (item 8) tended to have less concern about the potential harm of learning own test results as well as informing others. In addition, individuals with higher perceived susceptibility of being a gene carrier (item 2) tended to focus more on the potential harms of knowing own test result. Besides, individuals who believed that cancer is because of bad luck rather than personal factors (item 9) tended to focus less on the negative aspects when making the decision of whether to inform relatives about the results or not.

Table 5 shows the association between the two Decisional Balance scores and other independent variables. Our results showed that both the Decisional Balance (Self) and Decisional Balance (Relatives) scores were significantly correlated with HADS Depression and Optimism.

Regression Analysis. Two regression analyses were conducted to investigate the relative importance of the psychosocial independent variables in predicting both the Decisional Balance (Self) and Decisional Balance (Relatives) scores. Only those psychosocial variables which significantly correlated with the dependent variables were included in the regression analyses. The results are shown in Table 6.

In the first regression equation, the four predicting variables together accounted for 35.6% of the total variation of Decisional Balance (Self), $F(4,43) = 5.94$, $P < 0.01$. Only the two Attitude and Belief items were significant individual predictors. Neither HADS Depression nor LOT were significant after the effect of attitudes and beliefs about genetic testing was taken into account.

Four predicting variables that were significantly correlated with Decisional Balance (Relatives) were included in the second regression equation. The four predicting variables accounted for 35.2% of the total variation of this variable, $F(4,50) = 6.80$, $P < 0.01$. The two Attitude and Belief items as well as HADS Depression scores were significant individual predictors.

Discussion

One objective of this study was to investigate the decisional consideration process of Hong Kong Chinese toward genetic testing of colon cancer. Our results show that most of the highest scored items related to decisional consideration are relational or other focused oriented (Table 2). In other words, when considering the pros and cons of learning about their genetic testing results, as well as informing relatives about the results, our subjects concern more about the well-being and reactions of their significant others rather than themselves. This result is consistent with the well-established finding in cross-cultural psychology that Chinese peo-

Table 6 Regression analyses ($n = 62$)

Variables	Regression coefficient (B)	Standard error of B (SE B)	β
Regression 1: decisional balance (self) as dependent variable			
Worried about carrying gene ^a	-0.17	0.06	-0.34 ^b
Result won't help ^a	0.25	0.09	0.34 ^c
Depression	-0.02	0.03	-0.15
Optimism	0.02	0.02	0.15
R ²	0.36		
F	5.94 ^b		
Regression 2: decisional balance (relatives) as dependent variable			
Result won't help ^a	0.20	0.08	0.33 ^c
Bad luck ^a	0.09	0.05	0.25 ^c
Depression	-0.04	0.02	-0.32 ^c
Optimism	-0.12	0.01	-0.11
R ²	0.35		
F	6.80 ^b		

^a Items from the attitude and beliefs about genetic testing scale: Worry about carrying gene = I am worried that I may carry the altered gene for hereditary colon cancer. Result won't help = It's hard to believe that finding out my genetic testing results will help me or my family. Bad luck = Cancer is because of bad luck.

^b $P < 0.01$.^c $P < 0.05$.

ple are more relational and interdependent oriented as compared with their Western counterparts (15, 16). However, independent data among Western individuals are needed to ascertain whether this result is unique among Hong Kong Chinese.

Another objective of this study was to investigate factors affecting the decisional balance of learning about their genetic testing results. We have found that item 8 ("It is hard to believe that finding out my genetic testing results will help me or my family") is an important predictor for both the Decisional Balance (Self) and Decisional Balance (Relatives) scores (Table 6). The stronger the belief that genetic testing is not useful, the higher the Decisional Balance scores (*i.e.*, less concern about the potential harm). This result can be explained by the hypothesis that people who believe that genetic testing is not useful may appraise the results as irrelevant to them (*i.e.*, an irrelevant appraisal). The transactional model of stress posits that an irrelevant appraisal may make people less focus on the negative effects of a stressful situation (29, 30). For individuals who believe that genetic testing results are not useful in helping themselves and their family members, they may consider the results as less a potential harm to the well-being of themselves or their family members, leading to an overall positive correlation between item 8 and the two Decisional Balance scores.

The regression result (Table 6) also shows that individuals who worry about being a gene carrier tend to give higher priority to the negative consequences than positive gains in their decision-making processes of knowing their own test results. This reflects people's worry about the negative consequences of a self-anticipating altered gene carrier status. This anticipatory anxiety about the consequences if the outcome is undesirable is commonly observed in patients undergoing other medical procedures like bone marrow transplantation (31–33). Psychological counseling to help patients cope with this anticipatory anxiety and the subsequent distress after an altered gene result should be helpful. Consistent with our prediction, individuals who are depressive and

pessimistic focused more on the negative consequences of learning own genetic testing results. Multivariate analyses show that both depression level and optimism cease to be significant factors after the effect of attitudes and beliefs toward genetic testing is taken into account. However, depression level remains to be an important factor in affecting individuals' decisions to share their genetic testing results with relatives even after the effect of perceived susceptibility is taken into account. It seems that providing psychological services to reduce distress among individuals going through the medical procedure is still beneficial.

Finally, the belief that cancer is because of bad luck is positively correlated with the Decisional Balance (Relatives) score. Hence, those who believe that the cause of cancer is because of uncontrollable factors (*e.g.*, bad luck or fate) rather than personal factors tend also to focus more on the positive aspects of sharing the results with relatives. The transactional theory of stress posits that control over a stressful situation can be stress-inducing if one needs to spend a lot of effort to exercise such control (29, 30). This is particular the case for people going through genetic testing. If they believe that having cancer is because of fate or bad luck, they should also believe that their relatives will not have a higher chance to get the disease if they are diagnosed as a gene carrier.

Another contribution of this study is to establish, based on a similar scale developed by Vernon *et al.* (5), a Chinese Decisional Consideration of Genetic Testing scale⁴ for colon cancer. However, similar to the result of Vernon *et al.* (5), attempts to form into subscales were unsuccessful. On the other hand, any alternative scale is unavailable at present among Chinese patients. Our scale can provide a useful tool to facilitate research among Chinese patients.

A limitation of this study is that it used a mail survey method and covered about one-fourth of the eligible participants. The mail survey method, with its retrospective nature, may affect the validity of the data, as well as the response rate of the study. We shall attempt to conduct a larger scale prospective study among new registrants to confirm the results of this study. Finally, because genetic testing is new in Hong Kong, care should be taken before generalizing our results to patients of other countries.

In conclusion, we have demonstrated that our subjects focus more on the reactions of others in their decisional consideration process regarding genetic testing of colon cancer. This relational-oriented attitude is consistent with the interdependence orientation of Chinese. Perceived risk of being a mutated gene carrier is an important factor affecting individuals' decisional consideration in genetic testing of colon cancer. People with higher perceived risk tend to focus more on the negative consequences of knowing the results and sharing them with relatives. Psychoeducational programs to increase patient knowledge about the pros and cons of genetic testing may be beneficial to patients with high susceptibility and benefit perception. We are in the process of developing such psychoeducational program for patients of the registry, as well as conducting a study to evaluate the usefulness of the educational package.

⁴ The scale can be obtained by writing to Dr. Samuel Ho to the address in Footnote 2 or Dr. Judy Ho, Department of Surgery, Queen Mary Hospital, Hong Kong, People's Republic of China.

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