RESEARCH ARTICLE

Total Delay for Treatment among Cancer Patients: a Theory-guided Survey in China

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Abstract

__Purpose:__ This study aimed at exploring treatment delay (TD) among cancer patients in China with an attempt to develop a practical methodology facilitating frontline Chinese clinicians in promoting earlier cancer diagnosis and treatment. __Materials and Methods:__ The study comprised framework development, qualitative interviews and paired factor rating. Framework development utilized systematic literature review, soft systems thinking and consensus groups. Qualitative interviews employed a checklist of open questions soliciting information about all the domains included the framework from cancer patients drawn via stratified randomized sampling of inpatients at 10 hospitals in Hefei, China. Paired factor rating used a self-developed computer aid and the interviewed patients as referring cases to weigh the relative importance of the factors listed in the framework in terms of their contributions to specific components of total delay (TD). __Results:__ a) A conceptual framework was proposed consisting of a 6-step path to TD and 36 category determinants. b) A total of 227 patients were interviewed; their TD was 267.3 mean or 108 median days ranging from 0 to 2475 days; average appraisal, illness, behavioral, preparation and treatment delay accounted for 52.1%, 9.4%, 0.30%, 8.8% and 29.4% of the TD respectively. Individual side factors were rated substantially more important than environmental side factors (60% vs. 40%); most influential TD factors included cancer symptoms, overall health, family relations and knowledge about cancer and health. __Conclusions:__ The framework proposed together with the interviewing and rating approaches used provide a potential new methodology for understanding cancer patients' TD and promoting earlier cancer treatment.

Keywords: Cancer - treatment delay - determinants - theoretical model

Introduction

Cancer has become one of the most important threats to human life and health. Its incidence and mortality rates have been increasing steadily since the beginning of the 20th century. People diagnosed with cancer and died of the disease reached 10.1 million and 6.2 million respectively in 2000 and increased to 12.67 and 7.56 million eight years later (Dong et al., 2002; Stewartbw et al., 2003). It is estimated that, by 2020, people living with cancer will reach 30 million and annual new cases and deaths of the disease will rise to 15 million and 10 million (Parkin et al., 2005). There is strong evidence that detection and treatment of cancer at an early stage improves the prospects for long-term survival (Richards et al., 1999; Fiona et al., 2012; Feng et al., 2012). On one hand, most cancer patients present after symptoms occur, rather than through various screening programs. On the other, the earlier the diagnosis of cancer, the lower the possibility of microscopic metastasis and hence the higher the chance of removal of the primary tumor being curative. Richards et al. (1999) reported that breast cancer patients with total delays of 3 to 6 months have significantly worse survival than those with delays of less than 3 months. Tetyana Pedchenko, et al. revealed that a set of serological biomarkers may offer cost-effective ways for early detection of lung cancer, and by detecting non-small cell lung cancer early in its course patients could be provided a better chance for a cure (Pedchenko et al., 2013). Kumar et al. (2001) found that the low survival rates of oral and oropharyngeal cancer have been accredited to advanced age and advanced clinical stage at presentation that is directly linked to the delay in seeking treatment on part of patients.

Worldwide, tremendous efforts have been invested researching into the magnitude and determinants of total delay for treatment or symptom-to-treatment delay among cancer patients. Numerous studies have documented various extent of cancer TD among different type of patients and in different countries ranging from 1 month to 8 months (Caplan et al., 1993; Richards et al., 1999; Arndt et al., 2002; Montazeri et al., 2003; Moul et al., 2004; Freedland et al., 2006; Unger-Saldaña et al., 2009; Berraho et al., 2012; Hsieh et al., 2012 Pedersen et al., 2013;

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Tata et al., 2013; Sawicki et al., 2013;). Comparatively, published researches addressing cancer TD in China are scarce. Our systematic literature review identified only a dozen of related studies. Most of these studies were small scale (12 to 87 cases) analysis on misdiagnosing cancers as other diseases and reported 30% to 70% of misdiagnosis due to lacking of awareness and knowledge etc. There were only 4 studies carried out in China exploring TD. Lam WWT et al performed a qualitative interview with 37 Hong Kong women awaiting for their first consultation at public hospitals for self-detected breast symptoms and provided clues of factors leading to delayed care-seeking (Lam et al., 2008).

Liu (2010) surveyed 40 inpatients from a single general hospital on treatment for various cancers (including cerebral, breast, lung, gastric and esophagus cancers) and found that 52.5% of the patients delayed their treatment for over 3 months. Deng et al. (2012) interviewed 364 inpatients newly diagnosed with colorectal cancer at a large municipal hospital and revealed that mean TD was 82 days for colon cancer and 114 days for rectal cancer. Wang et al. (2008) conducted a similar survey of 80 esophagus cancer patients at another large hospital and found a TD of 2.1 months on average ranging from 0.5 to 24 months.

The complexity of pathways to TD cannot be over estimated. Although systematic reviews of high quality researches revealed only a few related (e.g., older age) and unrelated (e.g., marital status) factors with strong evidence (Ramirez et al., 1999), a whole range of variables have been studied in explaining TD including gender and age of patient (Elwood et al., 1985), site of tumor (Williams 1981), feature of symptoms (Husein-Elahmed et al., 2013), rural/urban difference (Kumar et al., 1993), fear of mutilating surgery (Esteva et al., 2013), coping style (Tromp et al., 2004), personality (Berndt et al., 1980), service procedure (Rivera et al., 2012), etc. Most of these factors interact with each other and makes not only traditional analysis methods based on linear and independent variables inappropriate but also understanding and application of the pathways to TD challenging enough for most clinicians. Approaches based on well conceived theoretical models may provide useful solutions in tackling this complexity issue. To date, there exist few frameworks developed specifically for cancer service utilization, yet the Anderson model has been cited widely in this area (Fiona et al., 2013).

There are reasons to believe that TD of cancer treatment in China may differ substantially from that in other countries. In addition to various policies and management procedures evolved from a long history of peculiar political contexts, China's health system comprises two independent yet interacting medical care provision systems i.e., western medicine and traditional Chinese medicine systems. Patients especially those faced with long-term and life-threatening diseases often switch and compare their diagnosis and treatment between the two systems. Chinese also share a strong sense of concerns for close relatives even general others. In order to avoid potential worries caused by misdiagnosis, Chinese clinicians tend to prescribe more than necessary tests, examinations, and tentative treatments so as to assure correct cancer diagnosis and tend to refer patients highly susceptive of cancers to other (usually higher level) hospitals so as to avoid directly telling them cancer diagnosis, a stressful and challenging task. Similarly, relatives and friends of cancer patients in China often try their best to hide the diagnosis from the patients themselves and seek various sources of information and help in confirming a "definite" diagnosis and selecting an "optimal" treatment. These unique beliefs and practices may have profound effects on cancer TD.

This study aims at exploring TD among cancer patients in China using a semi-quantitative strategy and tries to develop a practical methodology facilitating frontline Chinese clinicians in promoting earlier cancer diagnosis and treatment. Given the evidences linking TD and disease outcomes, the sheer number of annual new cancer cases (over 280, 0000), the unique socio-cultural contexts, the lack of related researches in China and the complexity of TD, there is a clear need for researches of the kind.

Materials and Methods

This study comprised three major components, i.e. framework development, qualitative interview and paired factor rating.

Framework development utilized systematic literature review, soft systems thinking and consensus group. The literature review aimed at generating a comprehensive list of factors leading to TD and involved: a) retrieval of publications on determinants of TD by patients with cancer from PubMed and CNKI (China National Knowledge Infrastructure) using the following search terms ((Cancer OR tumor OR tumour OR neoplas* OR oncolog*) AND (service AND (utilization OR use OR seeking) OR treatment delay)), where * represents wildcard characters; b) identification of specific TD factors from the publications retrieved above by two independent researchers via manual paper by paper reading; c) combining the two lists of TD factors identified by the two researchers into one long yet distinct TD factor list via discussions between the researchers. Soft systems thinking served a key approach in producing a pragmatic model for comprehending TD determinants through: a) clarifying and grouping items in the long TD factor list generated above into a hierarchy of categories; b) deciding upon a level of factor categories to be included into our objective framework so as to enable constructing a balanced model (not too complex, nor too simple); c) conceiving relationships and interactions between the TD categories. Group consensus took place after completion of the preliminary model in which a panel of 12 informants (3 cancer patients, 3 clinicians and 3 nurses on oncology and 3 researchers on health service utilization behavior) joined a half-day discussion and reached agreement on refining the framework.

Qualitative interview employed a checklist of open questions (see annex 1 for details) soliciting information about all the factors included the framework developed above (annex 2). The interviewees were drawn via stratified randomization in which 10 hospitals were first randomly selected from a inclusive name list of hospitals

Annex 1 Checklist for Qualitative Interviews

1. Do you know what disease are you suffering from? When and how did you know your current diagnosis?

2. In general, professional medical service seeking involves 6 steps, namely, "detects symptom(s), infers illness, decides to seek attention, choose hospital, goes to seek attention and begins treatment". Please recall each of these processes regarding your current illness.

a) First, step one, "detects symptoms". What were the earliest symptoms or signs of your current illness? How and when did you find them?

b) Next, step two, "infers illness". What were you thinking about when you found the symptoms initially? When did you think that the signs were due to some illness?

c) Step three, "decides to seek attention". When did you decide to see a doctor after having recognized that you were sick? What did you think of during this decision-making? Did you consult or talk with others? How long did each of these take?

d) Step four, "chooses hospital". Which hospital did you chose at first? What did you think of in making the decision? Did you consult or talk with others? How long it took?

e) Step five, "goes to seek attention". When did you first see your doctor for your current illness? What had you prepared before seeing your doctor? Did you ask help of friends during this process? How did you go there and who accompanied you? How long did it take you to go there? How long you waited for seeing your doctor?

f) Step six, "begins treatment". When did you begin your cancer treatment? What happened to you from you first saw your doctor until you began your treatment? How long did each of these take?

3. Now, please tell me your specific experience in each hospital:

a) When and which kind of hospital you went first? What did you tell the doctor and what did he/she tell you? What kind of examinations and treatments did you get? How were the effects or bad feelings? Did you encounter any difficulty in this hospital? How was the attitude of the doctors? Did they care for patients? How long did you stay in the hospital? How much was your total expense? How much you spent on traditional Chinese medicine, traveling and chaperone fee etc. respectively?

b) (If applicable) Which kind of hospital did you go next? When and why did you go there? What did you tell the doctor and what did he/she tell you? What kind of examinations and treatments did you get? How were the effects or bad feelings? Did you encounter any difficulty in this hospital? How was the attitude of the doctors? Did they care for patients? How long did you stay in the hospital? How much was the total expense? How much you spent on traditional Chinese medicine, traveling and chaperone fee etc. respectively?

c) (If applicable, repeat b until all the patient's hospital services is discussed)…

4. Please recall what influences your relatives, friends and neighbors have had on your service seeking:

a) How many members are there in your family and who are they? Who have known your disease up to now? What have they done for you ever since they knew your disease? Do they worry about you? Who worry most and how? Did they tell you the cancer status at the very beginning? (If not) How and when did you know it?

b) Do you have any close friends? Do you want to tell them about your condition and why? Who have already known that you are sick? How did they know? Do you feel any changes in their attitudes towards and contacts with you since they had known your cancer status? (If yes) What are the specific changes? What opinions and suggestions about service seeking they had proposed? What assistances they had offered?

c) Did you want to tell your neighborhoods and colleagues about your disease and why? Who have already known that you are sick? How did they know? Do you feel any changes in their attitudes towards and contacts with you since they had known your cancer status? (If yes) What are the specific changes? What opinions and suggestions about service seeking they had proposed? What help they had offered?

5. Please recall what influences your job, resource and structural contexts have had on your service seeking:

a) What's your job? Do you often have rigid time schedule? Have you ever slowed or accelerated the aforementioned six steps to treatment because of competing tasks? (If yes) Please describe in detail?

b) How is your financial situation? Has it ever slowed or accelerated your service seeking? (if yes) Please recall the specific process.

c) What reimbursement to service expenditures you can get from the government and society? Has it ever slowed or accelerated your service seeking? (If yes) Please recall detailed process.

d) Where do you live? Urban or rural? Has it ever slowed or accelerated your service seeking? (If yes) Please recall the details.

6. Please recall what influences your knowledge, attitude and health related practices have had on your service seeking:

a) How much do you know about health? (If the patient do not know his/her cancer status) Can you name a few common chronic diseases? How much do you know about cancer? Do you know its symptoms, harms and treatment measures? Do you know about the effects and side effects of these treatment measures respectively? When did you know these? Has any of the aforementioned six steps of your service seeking been slowed or accelerated because of your health knowledge? (If yes) Please tell the details.

b) Do you care about your health? Why and how? Have you ever smoked? (If yes) How many years had you been smoking before your current illness? How many cigarettes you smoked a day? Are you still smoking now and how many cigarettes are you smoking a day? Do you know what harms smoking does? Have you ever tried giving up smoking? (If yes) How many times and for how long? Have you ever practiced exercises before your illness? (If yes) What were they? How often and for how many years? Do you do some exercises now? (If yes) What are they and how often? What were your diet habits before illness? How often and how much you ate fruits and vegetables? Have you ever done self-care for your current illness? (If yes) Please tell the details.

c) Whom you care most? What are your concerns for them? Have you slowed or accelerated the aforementioned six processes because of them? (If yes) Please tell the details.

d) What are your attitudes and believes towards doctors and hospitals? How about their competence and skills? Do you trust them? Do they care about patients? Have you slowed or accelerated the aforementioned six processes because of your these attitudes or believes? (If yes) Please tell the details.

7. Please recall what influences your age, abilities and models have had on your service seeking:

a) How old are you? Do you think there should be differences for different age groups in self care, caregiver and therapy selection? (If yes) What's the specific difference? Have you slowed or accelerated the aforementioned six processes because of your age? (If yes) Please recall the details.

b) How many years of your education do you have? What's your expertise? How about your interpersonal skills? What's your assessment about your efficacy and competence of dealing with affairs? Have you slowed or accelerated the aforementioned six processes because of your personal ability? (If yes) Please tell the details.

c) How will you describe your personality and coping style? Do you like completing your tasks immediately or postponing them as later as possible? Have you slowed or accelerated the aforementioned six processes because of your character? (If yes) Please tell the details.

d) Do you believe in fate or religion? What do you think is the most important factor in accomplishing a task (endeavor/fate/others)? What determines your health and life expectancy? Do you like making decisions by yourself or consulting others? Have you slowed or accelerated the aforementioned six processes because of your strategy in dealing with affairs? (If yes) Please tell the details.

8. Please recall what influences your health and quality of life conditions have had on your care seeking:

a) How do you feel at present? How is your overall health? Please estimate the influence of your current disease on your health? What's your prediction of your future health and why?

b) At present, how are your physical and mind conditions? Tell me about all your physical sufferings and uncomfortable feelings. What do you worry about most? How do you feel about your strength and energy? Are you easy to get tied? How is your appetite and sleeping? Have you ever felt distressed or cried for your own health?

c) What examinations have you underwent? What are the results? What are the worst results?

d) Has the disease made any influences on your life, including your study, work, career, family relationships and long-term plans? (If yes) what are the specific influences?

e) Have you slowed or accelerated the aforementioned six processes because of the above symptoms, feeling, etc.? (If yes) Please recall the detailed.

Annex 2 Factors Included in Conceptual Framework

I1a Knowledge about cancer: what is cancer and signs, symptoms, examinations, treatments, prevention measures of cancers etc.

I1b Knowledge about health services: the best choice of hospitals for given diseases under concern; the hospitals with excellent skills, better attitude and lower charge; experts who is good at dealing with their suffered disease etc.

I1c Attitudes toward cancer/health: importance or value attached to self health; viewing cancer as a frightened or deadly disease etc.

I1d Attitudes toward beloved/related: seeing relatives as more important than patients themselves; preferring bear pain by patients themselves than bring burdensome to their beloved etc.

I1e Protective behaviors: exercises, healthy diet, eating vegetables and fruits, regular medical and self-examinations etc.

I1f Risk behaviors: smoking, drinking, drug use, high salt diet etc.

I2a Demographics/anthropologies: age, gender, race etc.

I2b Acquired abilities/qualities: education, interpersonal skills, communication skills, analysis ability, critical thinking etc.

I2c Interpersonal coping style: attachment styles, dependence vs. independence, being considerate vs. inconsiderate etc.

I2d Task management style: order vs. disorder, planned vs. unplanned, sluggish vs. swift etc.

I2e Religions and enduring models: locus of control, faith in Buddhism/Islam/Christian etc.

I2f Service seeking abilities: judging providers' service quality; assessing diagnose and treatment schemes etc.

I3a Cancer symptoms/conditions: masses, pain, hematochezia, weakness, fatigue etc.

I3b Non-cancer symptoms/conditions: hypertension, diabetes, phthisis etc.

I3c Biophysical indicators: histopathological diagnosis, body mass index, genetic mutations, blood pressure, etc.

I3d Psychological status/measures: anxiety, stress, depression, hopelessness, impaired cognition etc.

I3e Health-related quality of life: activity limitations, physical and mental functioning, role limitations (efficacy of work and study) etc.

I3f Overall health, patients' perceived health in general.

E1a Dispensable money/resources, available money for service seeking: income, deposits, assets etc.

E1b Time/activity contingency: competing tasks, busy time schedule, rigid job shifts etc.

E1c Insurance/security incentives: government and commercial health insurance systems; company health insurance systems etc.

E1d Policy/recruitment requirements: required medical checkups for job recruitment and for army and college enrollment etc.

E1e Transportation/communication: availability of public and private transportation vehicles; convenience communicating with service providers and relatives etc.

E1f Environment triggers/barriers: bad weather, chemical linkage by a local factory, media coverage of cancer diagnosis of a highly recognized figure etc.

E2a Common beliefs about cancer: cancer is a deadly disease, there is no cure for cancer, cancer treatments also do great harm to human health etc.

E2b Norms/conformant responses: avoiding mentioning cancer before cancer patients, concealing cancer diagnosis from the cancer patient under concern etc.

E2c Acceptance/stigmatization: discriminative job recruitment/retirement policies, difficulties for cancer patients to get married etc.

E2d Family support/interactions: nursing care, financial support, advices on treatment and future life plans etc. from family members.

E2e Peer influence group: psychological supports, service seeking advices, work assistance etc. from co-workers, classmates and neighbors.

E2f Relationships with service providers: fiend doctor or a sister nurse with a hospital etc.

E3a Responsiveness/environment: carefulness of doctors, kindness of nurses, privacy of clinics etc.

E3b Education/promotion programs: availability of cancer-related educational programs, information and communication materials etc.

E3c Direct/indirect cost: medication fee, surgery fee, transportation fee, logistic fee, etc.

E3d Availability/accessibility: distance between hospitals and patients residence, procedures required to get certain cancer treatments etc.

E3e Service procedure/techniques: queuing for hospital beds or laboratory tests, procedures for arranging inter-department consultations etc.

E3f Treatment effects/side effects: removed tumor, released pain, recovered physical strength, alopecia, emaciation, nausea, etc.

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with oncology department (s) in Hefei, the capital city of Anhui province China and then 23 inpatients per hospital capable of completing the interview were randomly chosen from all the inpatients being on treatment for cancer in the selected hospitals at the time when the interview took place. One single senior researcher performed the interview at a physician office or ward with adequate privacy. Each interview with a single patient lasted about 1 to 1.5 hours and started with a brief introduction of the interviewer, study purposes, participation benefits and risks followed by consent signature and open questions and responses. All the interviews were audio-recorded first and then translated, by graduate students, into scripts for further analysis.

Paired factor rating used the interviewed cancer patients as referring cases to weigh the relative importance of the factors listed in the framework in terms of their contributions to specific components of TD. More specifically, three researchers rated the factors independently on a case by case base using a self-developed computer aid: (1) the computer aid selected a case patient interviewed (say case x1), presented the transcripts of the corresponding audio-recording and asked the rater to read it carefully; (2) the computer aid selected two factor categories (say factor f1 and factor f2) from the 36 categories listed in the framework and asked "Given case x1, which of the following factors contributed more to the treatment delay? a) factor f1; b) factor f2; c) hard to tell"; (3) the computer aid assigned values to the factors under consideration according to the rater's response (i.e., if the rater selected a, factor f1 was given 1 and factor f2, 0; if b, factor f2 was valued 1 and factor f1, 0; and if c, both factors were assigned 0.5); (4) the computer aid selected another pair of factors and repeated steps 2 and 3 until all possible combinations of factor pairs were considered; (5) the computer aid selected another patient case and repeated steps 1 through to 4 until all cases interviewed were analyzed; (6) the computer aid added up all the ratings of influences of each factor on each components of TD by the raters and translated the sum into equally and differentially weighted influence scores (percentages). Equally weighted influence scores was used for examining influences of factors on specific TD components and was calculated by giving all components of TD an even percentage weight, i.e., 20% for each path to TD (TD1 to TD5); while differentially weighted scores was used for checking actual importance of factors to TD and was produced by giving different TD components a weight equivalent to their percentage contributions to the actual TD. For example, if patient A reported that his/her treatment was delayed 30, 20, 10, 20, 20 days in the 5 paths to TD respectively, the differential weight to TD1, TD2, TD3, TD4 and TD5 for this specific patient A was 30% (30 days divided by 100 days, i.e., total days delayed), 20%, 10%, 20% and 20%.
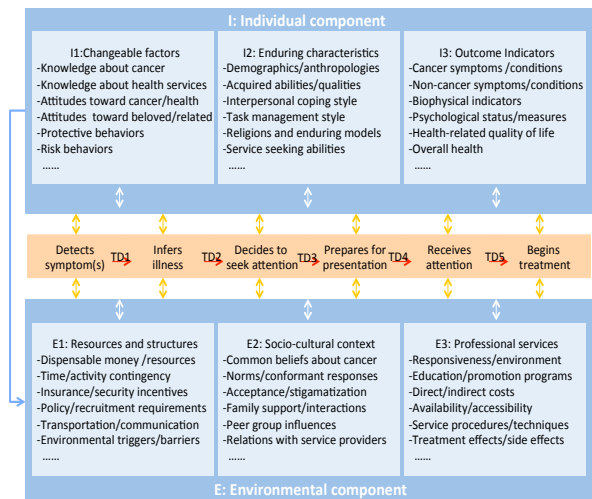
Figure 1. Determinants of Cancer Treatment Delay.
TD1: appraisal delay; TD2: illness delay; TD3: behavioral delay; TD4: preparation delay; TD5: treatment delay

Table 1. Patients Interviewed and Their Delay for Cancer Treatment

Patient group	Number of patients	Days delayed (median *vs* mean)			
		TD1	TD2-4	TD5	Total
Gender					
Male	134	31 (115.4)	1 (62.6)	20 (86.1)	108.5 (264.1)
Female	93	25 (174.1)	2 (30.9)	21 (67.0)	93 (271.9)
Age (years)					
≤45	35	24 (81.7)	0 (40.2)	27 (69.4)	75 (191.3)
-55	66	31 (120.7)	2 (36.6)	22 (112.5)	121 (269.7)
-65	62	16 (123.3)	2 (79.5)	16.5 (66)	108 (268.9)
≥65	64	31 (205.9)	1 (39.2)	23 (59.8)	112 (304.9)
Years of education					
≤5	107	31 (138.8)	2 (67.5)	17 (62.7)	109 (269.0)
5–12	100	31 (151.9)	1 (30.1)	24.5 (94.4)	108 (276.5)
≥12	20	31 (79.9)	0 (51.8)	27 (80.9)	101.5 (212.5)
Type of cancer					
Gastric cancer	53	25 (115.6)	2 (24.6)	28 (81.5)	91 (221.8)
Colorectal cancer	49	31 (185.5)	1 (43.1)	18 (89.9)	112 (318.8)
Lung cancer	27	27.5 (90.2)	0 (43.5)	21.5 (72.5)	93 (272.3)
Breast cancer	21	14 (95.4)	5 (166.7)	13 (46.1)	93 (308.3)
Lymphoma	19	62 (204.4)	1 (30.3)	30 (166.7)	260 (401.4)
Others	58	29.5 (138.9)	2 (36.6)	19.5 (44.2)	109 (219.7)
Total	227	31 (139.4)	1 (49.6)	21 (78.3)	108 (267.3)

Results

Conceptual framework derived

The conceptual framework come out of our study is given in Figure 1. It consists of three parts. Located in the middle of the figure is the process from unexplained signs and symptoms to professional treatment. This process follows primarily the Anderson model of total patient delay consisting of appraisal, illness, behavioral, scheduling and treatment delays (Fiona et al., 2013). Appraisal delay describes the time a person detects unexplained symptoms or signs and takes to evaluate a symptom as a sign of illness; illness delay, the time the person takes from the first sign of illness until deciding to seek professional medical care; behavioral delay, the time between a person deciding an illness requires medical care and act on this decision; and treatment delay, the time between presentation to doctor and onset of treatment. Given that patients in China seldom make appointment before seeking a doctor, we modified Anderson' original step "makes appointment" into "prepares for presentation (e.g., gets leave approval from job, books tickets for traveling to remote hospitals etc.)" and thus Anderson's "scheduling delay" into "preparation delay" denoting the time between deciding to act on the decision to seek help and actually making necessary preparations for service seeking.

The TD is influenced by a whole range of factors falling into two major categories, i.e., individual (I) and environmental (E) components. Either of these components is further divided into three sub-domains. More specifically, I consists of I1 (relatively easy to change factors), I2 (enduring or hard to change characters) and I3 (outcome variables); and E comprises E1 (resources and structures), E2 (socio-cultural context) and E3 (professional services). Listed under each of these subareas are the six most important determinants of TD, e.g., knowledge about cancer, attitudes toward beloved, protective behaviors etc under domain I1 and common beliefs about cancer, norms and conformant responses etc under domain E2.

Patients interviewed and their treatment delay

Table 1 summarizes selected information about patients interviewed and their treatment delay. A total of 227 cancer patients completed the interviews consisting of 133 males and 94 females each and aged 29 to 86 years (57.3 on average). Three of the patients were not able to participate due to tight treatment arrangements. Most commonly encountered types of cancers were gastric cancer, colorectal cancer, lung cancer, breast cancer and lymphoma. Their time interval between first detection of cancer-related signs to beginning of cancer treatments was 267.3 days on average or 108 median days ranging from 0 days to 2475 days. Statistically significant differences in mean delays were found between patients groups with different ages and cancer types but not education levels. Mean TD among lymphoma patients was nearly two folds that of gastric cancer patients (401.4 vs. 221.8 days). Younger patients tended to present shorter TD. Average appraisal delay (D1), illness delay (D2), behavioral delay (D3), preparation delay (D4) and treatment delay (D5) accounted for 52.1%, 9.4%, 0.30%, 8.8% and 29.4% of the TD respectively in terms of mean delays. The majority of delays occurred between the first two steps ("detects unexplained signs" and "infers illness") and last two steps ("receives attention" and "begin treatment") of patient path to treatment.

Individual determinants of treatment delay

As shown in Figure 2, putting together, all the individual domain factors (I) gained an equally weighted average score of 55.3 (I, right hand bar) and differentially weighted total score of 59.3 (I, left hand bar). For TD components, equally weighted scores of I domain factors on D1 through to D5 were 13.6, 12.0, 10.7, 9.5 and 9.4 respectively; while differentially weighted scores of I on these same TD components, 34.0, 9.5, 0.3, 1.2 and 14.4. For sub-domains under I, the influence of I1 (changeable factors), I2 (enduring characteristics) and I3 (outcome indicators) on TD were rated as 56.0 (57.9), 47.2 (51.6)
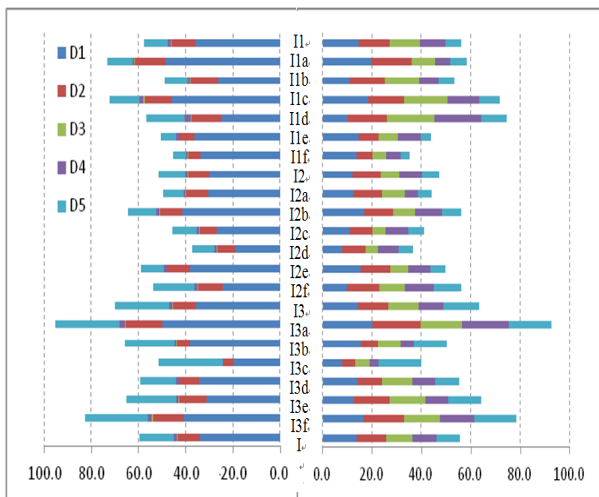
Figure 2. Individual Side Determinants of Cancer Treatment Delay. TD1: appraisal delay; TD2: illness delay; TD3: behavioral delay; TD4: preparation delay; TD5: treatment delay. Colored bars represent scores gained from paired relative importance ratings between diferrent factors on given type of delays. Left hand bars stand for ratings weighted against actual percentages of TD1 to TD5 to total treatment delay; while right hand bars, ratings weighted against an equal percentage (20%) for each of TD1 to TD5. I1:changeable factors;I1a:knowledge about cancer;I1b:knowledge about health services;I1c: attitudes toward cancer/health; I1d: attitudes toward beloved/ related; I1e: protective behaviors; I1f: risk behaviors; I2: Enduring characteristics; I2a: demographics/anthropologies; I2b: acquired abilities/qualities; I2c: interpersonal coping style; I2d: task management style;I2e: religions and enduring models; I2f: service seeking abilities; I3: Outcome Indicators; I3a: Cancer symptoms/conditions; I3b: Non-cancer symptoms/conditions; I3c: Biophysical indicators; I3d: Psychological status/ measures; I3e: quality of life; I3f: Overall health; I: individual side factors.

and 63.3 (69.3). With regard to differentially weighted scores of specific factors under I (left hand bars in figure 2), I3a (cancer symptoms/conditions) was rated the highest (92.6), followed by I3f (overall health, 78.2), I1a (knowledge about cancer, 74.4), I1c (attitudes toward cancer/health, 71.6) and I3e (quality of life, 64.1); while specific factors scored the lowest were I1f (risk behaviors, 35.2), I2d (task management style, 36.5), I3c (Biophysical indicators, 39.8), I2c (interpersonal coping style, 41.1) and I1e (protective behaviors, 43.7). Looking at equally weighted scores of influences of specific factors under I on TD components, rated influences on D5 witnessed the largest intra component differences, followed by D3, D4, D2 and D1.

Environmental determinants of treatment delay

As depicted in figure 3, the whole set of factors under environmental domain (E) earned an equally weighted score of 44.8 (E, right hand bar) and differentially weighted score of 40.9 (E, left hand bar) on average. As for TD components, equally weighted scores of E domain factors on D1 through to D5 were 7.2, 8.4, 10.1, 9.7 and 9.1 respectively; while differentially weighted scores of E on these TD components, 18.0, 6.7, 0.3, 1.0 and 14.3. Turning to sub-domains under E, the influence of E1 (resources and structures), E2 (socio-cultural context) and E3 (professional services) on TD were rated as 40.7 (34.0),
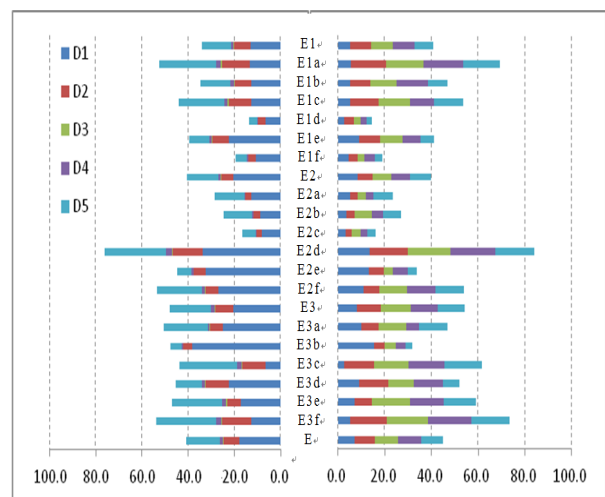
Figure 3. Environmental Side Determinants of Cancer Treatment Delay. TD1:appraisal delay; TD2: illness delay; TD3: behavioral delay; TD4: preparation delay; TD5: treatment delay. Colored bars represent scores gained from paired relative importance ratings between diferrent factors on given type of delays. Left hand bars stand for ratings weighted against actual percentages of TD1 to TD5 to total treatment delay; while right hand bars, ratings weighted against an equal percentage (20%) for each of TD1 to TD5. E1: resources and structures; E1a: dispensable income/money; E1b: time and activity contingency; E1c: insurance/security incentives; E1d: policy/ recruitment requirements; E1e: transportation/communication; E1f: environmental triggers/barriers; E2: sociocultural context; E2a: common beliefs about cancer; E2b: norms/conformant responses; E2c: acceptance/stigamatization; E2d: family support/ interactions; E2e: peer group influences; E2f: relations with service providers; E3: professional services; E3a: responsiveness/ environment; E3b: education/promotion programs; E3c: direct/ indirect costs; E3d: availability/accessibility; E3e: service procedures/techniques; E3f: treatment effects/side effects; E: evironment side factors

39.7 (40.7) and 54.1 (48.1). Referring to differentially weighted scores of specific factors under E (left hand bars in figure 3), E2d (family support/interactions) was rated the highest (76.2), followed by E3f (treatment effects/ side effects, 53.8), E2f (relations with service providers, 53.5), E1a (dispensable income/money, 52.6) and E3a (responsiveness/ environment, 50.6); while specific factors scored the lowest were E1d (policy/recruitment requirements, 13.8), E2c (acceptance/stigamatization, 16.5), E1f (environmental triggers/barriers, 19.5), E2b (norms/ conformant responses;, 24.6) and E2a (common beliefs about cancer, 28.7). Looking at equally weighted scores of influences of specific factors under E on TD components, rated influences on D4 witnessed the largest intra component differences, followed by D2, D3, D5 and D1.

Discussion

The time interval between first detection of cancer-related signs to beginning of cancer treatments among cancer patients varies greatly across nations and patient groups (Caplan et al., 1993; Richards et al., 1999; Arndt et al., 2002; Montazeri et al., 2003;Moul et al., 2004; Freedland et al., 2006; Unger-Saldaña et al., 2009; Berraho

et al., 2012; Hsieh et al., 2012; Pedersen et al., 2013; Tata et al., 2013; Sawicki et al., 2013; Zahid et al., 2013) . The TD among our patients, i.e., 267.3 mean or 108 median days, is moderate compared with published estimations worldwide suggesting that the issue is at least of same (if not greater) importance in China as it is in other countries. Our findings that some types of cancers were more likely to get treated sooner than others do and that younger patients tended to respond to cancers quicker are consistent with published researches (Richards et al., 1999). However, our statistics about non-significant relationship between education years and TD contradict related results derived from researches carried out in other countries (Richards et al., 1999). Research methodology may have some role to play in this difference. In our qualitative interview, all interviewee patients were encouraged to identify the earliest cancer signs and more educated patients may be keener at recalling and relating relevant symptoms. This points to the need for careful consideration, in future related researches, of strategies addressing TD information solicitation and standards for judging TD time points.

A wide range of heterogeneous factors are believed to be directly or indirectly linked with the timeliness of cancer patients' treatment. This complexity of factors and relations between them poses great challenge for clinicians and policy- makers to take specific actions promoting earlier treatment. This study addresses the complexity using a different strategy. It is true that our approach depends heavily on subjective rating or judgment, yet it avoids some of the major drawbacks of traditional statistical analysis that requires a huge number of subjects so as to derive a meaningful model for such a complex system of TD determinants. Perhaps, our study provides not only a relatively comprehensive framework for understanding TD but also semi- quantitative clues for identifying priority factors to tackle in leveraging timely cancer treatment. Although readers are reminded of differences in social cultural contexts in China (Feng et al., 2013), the framework developed and methodology used in weighing TD determinants may be applicable in other countries. And there is a general lack of efforts in addressing TD using proven theories (Maryam et al., 2013).

The framework guiding our interviews utilized the paths to TD proposed by Anderson et al (Fiona et al., 2013) as the "backbone" with minimum modifications to suit Chinese socio-cultural contexts. Analysis of our interviews confirmed that all the six steps (i.e., detecting signs, inferring illness, deciding on seeking attention, preparing for presentation, receiving attention and beginning treatment) were identifiable with almost all the interviewed patients. This suggests that the paths to TD included in our framework are logically sound. However, our interviews also revealed that not all the paths were of same significance. The majority of time delay by the interviewed patients occurred between the first and second steps and the fifth and last steps, accounting for 52.1% and 29.4% of the TD respectively; yet time delayed between the second and third, the third and fourth, and the fourth and fifth were much shorter. In addition, most of the patients were able to recall the exact

date when they first detected signs of cancer, presented to a service provider and began cancer treatment; while it was rather hard for some cancer patients to draw clear cutoff time points for steps 3 and 4. For example, some patients reported that deciding on seeking attention and planning for presentation were often intertwined with each other. These findings are consistent with Walter et al' suggestion that the six steps leading to TD in Anderson model should better be reduced to five (Fiona et al., 2012) and components of TD, be reduced to four, i.e., appraisal, help-seeking, diagnostic and treatment delays. Given the difficulties encountered by our patients in dividing the middle steps and that making appoint seldom happens in China, we suggest a four step TD model for future researches and interventions in China, i.e., detects signs, infers illness, seeks attention and begins treatment.

As the grand total differentially weighted scores in figures 2 and 3 show, individual side factors were rated substantially more important than environmental side factors (60% vs. 40%), indicating that patients themselves (I) were accountable for most of their TD yet environmental factors (E) also played an important role. The diminishing gaps (from 34.0 vs. 18.0 to 14.4 vs. 14.3) between the differentially weighted scores of the influences of I on D1 through to D5 and that of E on these TD components suggest that I and E may contribute differently during the paths to TD with individual side factors taking the lead at the early stages while environmental factors play more and more important roles at later steps. Inter-factor variations reflect differences in relative influence on or importance to TD between a group of factors and the need for differential coping or intervention strategies. The differences presented in our equally weighted scores by TD components (figures 2 and 3) suggest that factors under I contributed more evenly to TD than do factors under E. And both I and E factors contributed more equally to D1 and D2 than to D3, D4 and D5.

The highs and downs in the scores of specific factors should inform cancer service delivery and interventions in China with added attention being paid to factors with higher ratings. Across I and E domains, I3a (cancer symptoms/conditions) gained the highest score. This is consistent with most published researches (Tomlinson et al., 2012; Veneroni et al., 2013). Urgent (e.g., sever pain, bleeding) and specific (e.g., lump without pain, dry cough) symptoms were often followed by immediate service seeking; while benign and confounding symptoms like tonsillitis, constipation, fatigue etc., were easily neglected or mistaken by both patients and clinicians. I3f (Overall health) was rated as the second important factor. "I had been well all my life and never thought of having major diseases"; "I had been suffering from hypertension, diabetes and nephritis for a long time, so I don't care much about further health problems". The third highest score was given to E2d (family support/ interactions). Although it is not difficult to find positive associations between family interactions and TD from previous studies (Maryam et al., 2013), such a high rank for E2d in our study merits particular attention. It may reflect a strong family relation in China. "I know there is no cure for cancer and I'd rather not seek treatment

and cause burden on my family." "I didn't mean to seek any service; it was my son who insisted and urged me to come here". Most Chinese view their family members as more important than themselves and see diagnosis of cancer as tremendous psychological burden or suffering for the patients under concern. Therefore, they try their best to hide cancer diagnosis from their suffered family members. As a result, over 90%, of the cancer patients we interviewed reported that their cancer status had been kept a secret between the clinicians and their family members until they happened to know their real diagnosis by chances. These make subtle changes to all the steps in cancer service seeking. The next highly rated factor was I1a (knowledge about cancer and health). This is consistent with both published researches and related findings in this study. Our patients aged 57.3 on average. Nearly half of them had less than 5 years education and over 91%, less than 12 years education. Unaware cancer signs were very common among these patients.

Finally, readers are cautioned about limitations of this study. As mentioned earlier, our methodology depends heavily on subjective judgment and the ratings may be biased by the raters' background knowledge and beliefs. Yet this kind of biases could be reduced to a minimum by repeated pilot ratings and discussions so as to reach consensus between raters and by measuring inter-rater consistency. The patients interviewed in this study were inpatients drawn from hospitals located in a large city. Their TD and TD determinants may be different from that of non-inpatients and that from hospitals in smaller cities.

Acknowledgements

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