Integrated Information System of Health Promotion for Multiple Cancer Risk Factor Detection

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Abstract

Community based prevention has become a more important strategy in cancer prevention recently. There are two cancer preventions to promote people more healthy: one is to increase people cancer preventing awareness and reminding people to accept a activities health examination; the other is to educate people to avoid the cancer linking risk factor exposure, live a healthy lifestyle, and according personal risk factor to design a personal health examination plan.

Our research is to build a health promotion management information system offered a public database that is structured data type for collecting cancer risk data more instantly. The health promotion management information system also calculates weight of multiple cancer risk automatically to support health promotion worker for reminding people regular to go to health examination and have a healthy lifestyle.

The system can be applied in community health promotion activities and integrate hospital community health team to provide the better quality of community health plan and activities, the activities is as following: First activities provides primary health care, including personal oriented community health promote activities and community oriented health promote activities; second activities is medical care activities, and third activities is following up activities. Our system is constructed by evidence-based reference, and community people data, such as demographic and socio-economic characteristic, health behavior pattern, family history or disease history characteristics. The system generates weight by ranking sequence to determine cancer risk priority, and this system is also helpful for hospital to make decision of the optimal health promote strategies and create a integrated health promote team.

Key words: Multiple cancer risk factors , Community based prevention , Health promotion management information system , Health promotion .

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Received：19 Jan 2007；Accepted:15 Feb 2007

Introduction

Healthy lifestyle promotion is a major task for the disease prevention in Taiwan, unhealthy behavior will cause several cancers and disease, such as cigarette might be a common cause of lung cancer and chewing betel nut might be cause of oral cancer, colorectal cancer. However, The male in Taiwan, there are 50% rate of cigarette smoking and 17.5% rate of betel nut chewing (1).

Cancer is the leading cause of death in Taiwan in the last twenty-four years. In 2005, there are 37,222 people died of cancer and 26.8% of the death rate. Each fourteen minute and seven second have one people died of cancer and each day has 102 people died of cancer.

Significant mortality reductions due to cancer screening have been demonstrated in earlier studies, including breast cancer with mammography, colorectal cancer screening with fecal occult blood testing (FOBT), Papanicolaou(Pap) smear screening for cervical neoplasm, early detection of oral premalignancies and oral cancer in which there is highly frequent use of betel nut(2-11).

Early detect cancer should initially to promote people more concern self cancer risk factors, but it depended on reminding actions to alert people to attendant the activities cancer screening, In Taiwan, the cervical neoplasm screening in female who age over 30 years, the Pap smear attendance rate is 54%, it's lower than Europe and America (1).

However, information asymmetry occurs in health care market, thus many people confused with choosing which kinds of health examination and not enough available health knowledge to know how to keep the lifestyle healthier. These reasons motivate this research to develop a useful information tool to provide the health promotion team to make the optimal cancer prevention policy.

Less disease risk factor detection tool was developed, In, 1976, the Framingham Heart Study has served as a basis for development of a prediction rule for future risk of coronary heart disease and for stroke (12), but in cancer risk factor detection tool is no parallel prediction rule has been developed for overall risk of cancer, in part because of the many types of cancer that may be considered.(13), the nearly reference of Dupont and Plummer have prepared a computer program to estimate absolute risk of cancer given known relative risk estimates(14), but the cancer risk factor always relative many cancer, for overview the whole cancer risk factor map need more efficiency method and powerful information technology rapidly to offer health promotion team to manage the cancer risk factor in community.

Health Promotion Activities

There are three health promotion activities in our study. Each activity needs a risk factor tool for assessment. The first one activity is primary health care activity, this major task is to provide health promotion and prevention activity, such as health examination and health education; the second activity is medical care activity and the third activity is follow up activity. Each three activities depend on health promotion team to provide the constantly service, but it face several difficult problems:

1.the first activity of health promotion activities can separated to personal oriented activity and community oriented activity. In the personal

oriented activities, health promotion workers in community work stations to provide disease screen service or health education, always lack of a powerful investigate tool to collect and analyze the personal health status data in community, thus they cannot to offer the optimal health suggestions to community people while in community sever them. In the community oriented grouping health education activities, it lacks a map to indicate the character of health need from each community to design health education cause, it lead cost inefficiency for the hospital in community activities.

2.the medical care activity: After cancer screening, people coming hospital for more specific diagnostic, in this activity, physician cannot take a overview of the cancer risk factor of the individual, and lack of a structural questionnaire to arrange the optimal cancer screening plan, and health education program.

3. Follow up activities: this activity lacks a tool to follow up people who exposure risk factors or family history individuals to accept the healthy behavior consult.

Objective

Our research is to construct a health management information management system to collect, store, analyze, and automatic reminding health promotion team, it could help health promotion worker rapidly to manage a personal multiple cancer risk factor from the system.

We expect the research bring several effects: 1.People who have cancer risk factors, we could provide the optimal health education face to face, according the individual cancer risk factors to remind to accept cancer screening program and reduce to exposure the cancer risk factors and follow up 2.The Statistic cancer risk factors by living region variable is also helpful to review the character of health need of the community and to develop a community health promotion plan. Multiple cancer risk factors tool is designed for health promotion manager to develop a right health promotion policy, and according the combination of health need to develop health educations and cancer screening program, to arrange the cost distribution more efficiency in the health promotion activities.

Methods

Our research is based on evidence-based reference to discover the multiple cancer risk factors. We discuss with cancer center medical doctors and experts according approximately forty medical references, and construct six cancers, including: head and neck cancer, breast cancer, colorectal cancer, lung cancer, and prostate cancer. To discover the risk factors of each cancer, such as healthy life style, occupation, family history. Finally, according expert' s judgment modifies the questionnaire until specialist validity has confirmed. For more rapidly to provide healthy promotion worker generate the optimal suggestions and analysis health information, we develop a health promotion management information system, the system use the weight to raking multiple cancer risk factor to generate the priority for cancer prevention activity.

Multiple cancer risk factors and system frame work

We constructs our information system by Microsoft Visual Basic 6.0, see figure 1. We collect

questionnaire from attending health examination people and input the questionnaire in database, the variables are demographic and socio-economic characteristic, including age, education, living region, marriage, occupation, family history; disease history; health behavior pattern, including cigarette smoking, alcohol drinking, betel nut chewing, stool-habit, self-reported mental stress status, surgical history, diet habit. The system according variables to generates weight by ranking sequence to determine cancer risk priority, and this system is also helpful for hospital to make decision of the optimal health promote strategies and create a integrated health promote team. In the future, the database will map to Taiwan cancer registry database, to test our research validity, the system framework in figure2.

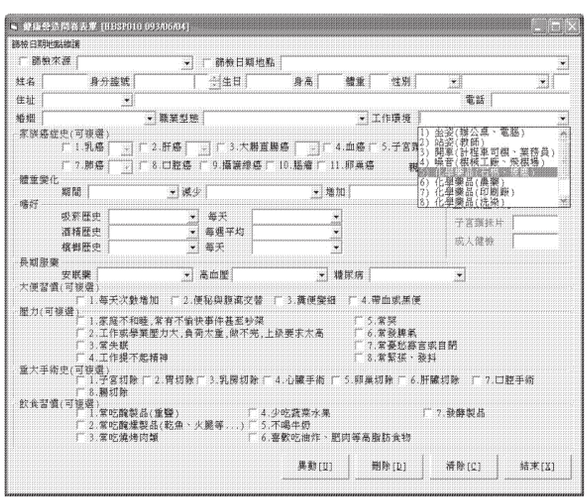

Figure 1.Health promotion management information system for multiple risk factor detection

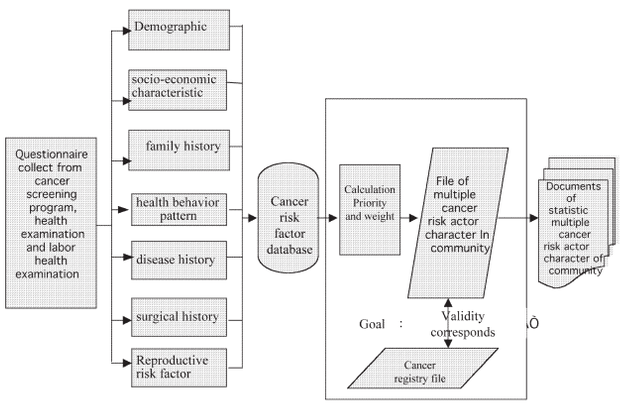

Figure 2.Health promotion management information system framework

Weight and Calculation

1.Personal healthy behaviors

The questionnaire in personal healthy behaviors includes: cigarette smoking, alcohol drinking, and betel nut chewing.

a. Cigarette smoking

Tobacco smoke contains 3,900 toxic chemicals and it may cause cancer (15). Cigarette smoking is association with several common cancers, such as head and neck cancer (16), lung cancer (17-19), and hepatocellular cancer (20-21). There are no strong evidence to indicate that cigarette smoking is related to colorectal cancer, but some evidence to indicate is association with colorectal adenomatous polyp (22), so that long term cigarette smoking habit may increase the risk of colorectal cancer (23).

b. Alcohol drinking

Mass alcohol drinking population in Taiwan especially of teenager, alcohol drinking population is still climbing; approximately 60% male have alcohol drinking habit and 20% female have alcohol drinking habit (24)，alcohol drinking is association with head

and neck cancer(25-26) and liver cancer(27-28).

c. Betel nut chewing habit

There are 80-90% oral squamous cell carcinoma patient and 82.8% tongue cancer patient have betel nut chewing habit (29).

We defined cancer risk factor i , each person have K kinds of risk factors; $i = 1.....k$;and each risk factor in which related cancer is named A_n , $n = 1.....l$, calculate the weight from multiple cancer risk factors $i \times A_n$. Each cancer (A_n) will corresponding to a risk factor (i),for example: when a man who have cigarette smoking habit, alcohol drinking habit and betel nut chewing habit, the risk factor correspond to the number of cancer is A_n , $_{n=1...4}$, A_1=head and neck cancer , A_2=lung cancer , A_3=liver cacer , A_4=colorectal cancer , thus we could generate the first sequence from calculating the weight of multiple cancer risk factor that is $3A_1$, A_2 , $2A_3$, A_4 , see figure 3, and we rank the priority of the weight of the new cancer risk factor sequence that is $3A_1 \rightarrow 2A_3 \rightarrow A_2 \rightarrow A_4$, and the system could remind health promotion worker to notice the individual to avoid the head and neck cancer risk factors initially.

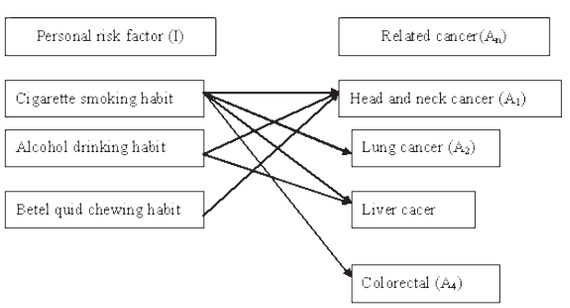

Figure 3.Multiple cancer risk factor of health behavior patterns associate with cancers

2.Occupation

Occupations and industries associated with asbestosis are related to head and neck cancer and lung cancer. Head and neck cancer is association with the industries relating chemicals, radiation, and asbestosis. Asbestosis also effect lung cancer (30-32), when a person who have Cigarette smoking habit, alcohol drinking habit and betel nut chewing habit, and also occupation exposure the chemicals, radiation, and asbestosis the risk factor cause the number of cancer will generate a another sequence, after ranking weight the priority is $6A_1 \rightarrow 2A_2 \rightarrow 2A_3 \rightarrow A_4$, in figure 4.

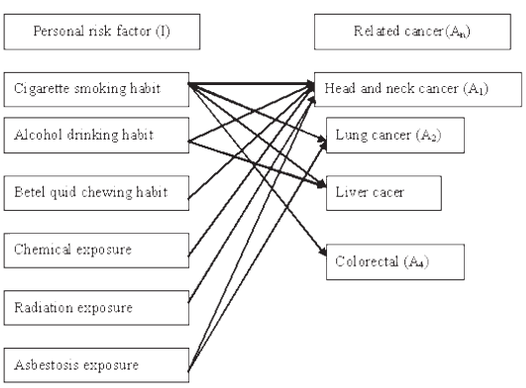

Figure 4.Multiple cancer risk factor of health behavior patterns and occupation and industries associate with cancers

3.Disease history and surgical history

Disease history and surgical history not correspond to multiple cancer risk factor, but several reference indicate hepatitis B and hepatitis C related to the liver cancer (33-37), and the diabetes mellitus (38-40) and gallbladder incision are related to colorectal cancer (41-42).

4.Reproductive risk factor

Reproductive risk factor not correspond to multiple cancer risk factor, but several reference indicate some factor is association with breast cancer, including mother or sister with breast cancer, early menarche, late menopause after 55 years, late age at first full-term pregnancy after 30 years, hormone replacement therapy, and using contraceptive pills (43).

Integrated Health Information in Each Health Promotion Activity

1.Primary care activity

a. Personal oriented

Health promotion worker provide cancer screen service in community to collect personal risk factor in work station in community, according multiple cancer risk factor calculate the weight and ranking the priority, and reminding health promotion worker to generate optimal health plan.

In figure 6, in the primary activities, health promotion worker according the personal health behavior, disease history, to suggest the initially optimal health educate and cancer screen plan. In figure 6, a female, 44 years old, cigarette smoked habit over 26 years, never pregnancy, last pap smear five years ago, the weight of cancer risk factor sequences ranking priority is head and neck cancer, lung cancer, liver cancer, colorectal cancer, breast cancer, and cervical cancer, the health promotion worker in work station in community will evaluate this person to join the stop smoking plan and arrange to attendant pap smear.

b. Community oriented

In figure 5, when health promotion worker to go to a community to educate disease prevention, the community oriented is useful to create a library in the information system index by living region variable, and according this library we can analyze the character of cancer risk factor (I) or the related cancer (An), and rapidly mining the data to store in meta-data to figure out the multiple risk factor from people in different communities and statistic the risk factor distribution in which community, according it to design a multiple health educate program, increasing the cancer prevention efficiency in health promote, such as a course of "head and neck cancer prevention" in Shalu, instead of different course separated two "Stop chewing betel nut prevention" and "Stop smoking education", it obviously the resources are repeat.

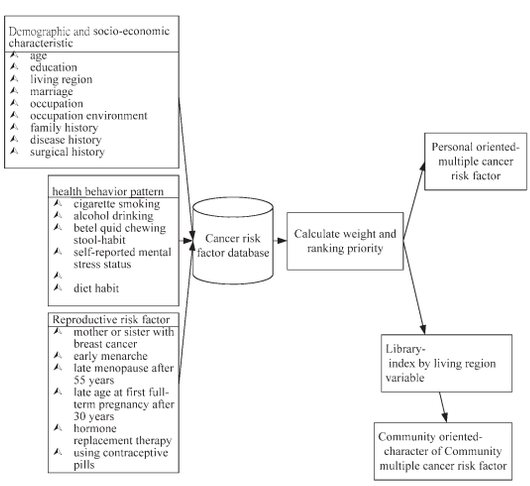

Figure 5. Community library framework of health promotion management information system

2.Medical care activity

In the medical activity, in figure 6 the female go to hospital for diagnostic the positive Pap smear test after attendant the community screen, the physicians can use the multiple cancer risk information to

understand the individual health status and construct a health examination program, to provide the stop smoking program and medical therapy.

3.Follow-up activity

In the follow-up activity, the hospital can use this information system to follow-up the personal health status and healthy lifestyle from female (see figure 6), and the case manager will follow-up the health behavior improvement by telephone, and to update the improvement to restore the new data in information system and we send the healthy education post to the individuals.

In figure 6, if the female join the stop smoking program, the case manager will follow up the smoke behavior continuously.

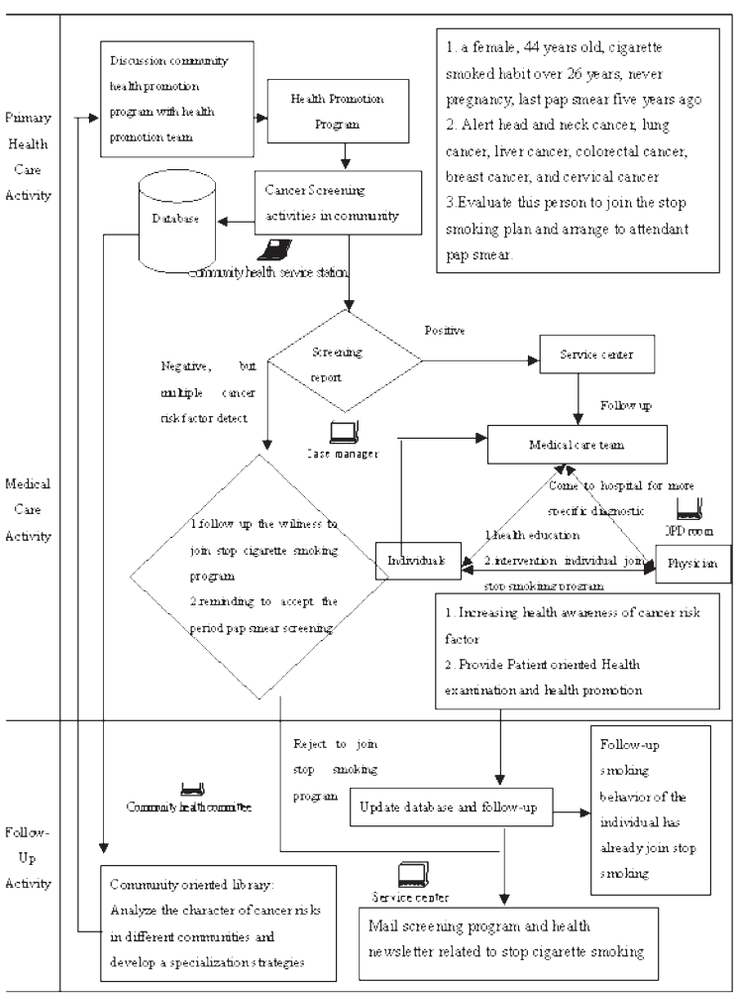

Figure 6. Work flow of multiple risk factor management in each community health promotion activity

Discussion

Our system can expect bring several benefit:

1.integrated the medical care and health promotion team

a.To direct medical care and health promotion team more specific and efficacy health promotion goal in specific community and more risk factor focused. The system provides an overview of cancer prevention character of community and individual health promotion need. Through the system it vertical integrate and horizontal integrate different department to provide more specific community oriented or personal oriented health plan.

b.To prevent the risk factor exposure combine with community health building project, help people self-empowered to reduce self risk factor exposure, people will more concern the healthy life style, and health promotion worker will follow up personal health behavior improvement more easily and continuously.

2.Ealier manage the high cancer risk people; earlier remind period cancer screening

Through the system management the personal health status, health promotion worker can earlier intervention the healthy behavior, reminding people who have occupation risk and family cancer risk regular to accept period cancer screening, people gain more accessibility service of screening and education in community. Through the efficiency health education plan, can avoid people information explosion in accepting not well programmed and repeatedly health.

3.Develop hospital health promotion activities strategies will more competition and specialization:

Provide the multiple risk factors education and screening according from multiple cancer risk factor systems will increasing cost efficiency in community activity, through the system support hospital provide more variety and specialization services, also increasing people's satisfaction in the community.

Future

In the future, our multiple cancer risk factor screen system will map to cancer registry to test the validity and continually to study more evidenced based reference to modify our questionnaire, even invest the association of cancer and personal risk factors in different nearby community.

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建構整合型健康促進資訊系統-以多重癌症危險因子偵測爲例

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摘 要

近年來，以社區爲導向的預防醫學成爲健康促進工作中相當重要的一環，其中癌症防治工作方面更是不遺餘力，而欲使民眾獲得良好的癌症防治手法有兩種，一是建立民眾對於癌症警訊認知，提醒民眾養成定期癌症篩檢習慣；二是除了透過定期癌症篩檢進行癌症早期發現、早期治療外，更進一步就個人危險因子暴露情形，量身訂做適合個人需求的健康檢查計畫，並宣導民眾避免接觸個人危險因子，以促進健康生活型態。

本研究即是發展一個決策支援系統，提供即時資訊的資料庫管理工具，供社區現場工作人員快速建立民眾資料、進行多重癌症危險權重運算、擷取資料與進行檢索，並利用系統支援社區工作人員於社區健康服務現場，管理民眾危險因子並進行資源整合，以提醒民眾定期接受檢查、對民眾癌症危險因子提出警訊並協助民眾建立健康生活型態。

本研究將社區健康促進活動分爲三種活動週期加以進行系統的應用，並且以系統功能提升社區健康促進服務團隊活動品質，此三種活動週期分別爲初級健康照護(primary health care)、醫療照護(medical care)及追蹤活動(follow up)。初級健康照護又包括個人層次(personal oriented)之危險因子管理及社區層次(community oriented)之危險因子主題地圖分佈管理。本系統之建立乃是以實證醫學的文獻探索以及收集民眾資料(人口、社經地位、健康行爲、家族史、疾病史等)爲基礎，再計算優先性排序序列方式發展多重癌症危險之權重，依此建立癌症危險因子健康管理資訊系統，此資料庫對於擬定社區健康計畫，及團隊整合建構相當有幫助。

關鍵字：多重癌症危險因子，社區導向預防醫學，健康管理資訊系統，健康促進

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收件日期：2007年1月19日；接受日期：2007年2月15日