

The Feasibility analysis of Disease Management Programs in Japan

—The Literature Review in the Occupational Health Setting—

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Abstract

In May, 2006, the Ministry of Health, Labor and Welfare published a part of the results of the Comprehensive Survey of Living Conditions of the People on Health and Welfare 2005. The report has clarified that one of two men and two of five women from 40 to 74 years old are regarded as the Metabolic syndrome or suspicious cases. In order to counteract these situations, much concern is given for the Disease management programs that have been developed in the USA. In Japan, traditionally a various health promotion activities have been organized in the occupational setting under the Occupational safety and Health Law. These activities can be regarded as disease management (DM) programs. In this perspective, the authors have conducted a literature review about health promotion programs conducted in the occupational setting. The authors have reviewed 30 articles by the formative evaluation using DM concept. In fact there were many DM like programs conducted in the Japanese workplaces. However, it is very difficult to develop the effective DM program directly from these experiences under the actual situation. The most important problem to be solved is the fact that there is no standardized methodology for intervention and evaluation. The authors concluded that it might be pragmatic to develop the Japanese DM programs based on the experiences in occupational settings with combination of the American sophisticated DM framework.

Key words: disease management, life-style related diseases, metabolic syndrome, occupational health

❖ Introduction

In May, 2006, the Ministry of Health, Labor and Welfare published a part of the results of the Comprehensive Survey of Living Conditions of the People on Health and Welfare 2005. The report has clarified that one of two men and two of five women from 40 to 74 years old are regarded as the Metabolic syndrome or suspicious cases. The definition of Metabolic Syn-

drome is as follows:

- 1) Visceral fat accumulation (the indispensable condition)
Abdominal circumference is 85 cm and more for men and 90 cm and more for women.
- 2) More than two situations of followings;
 - i) Hypertension
 - ii) Hyperlipidemia
 - iii) Hyperglycemia

This result was very shocking and so that the MHLW has decided to strengthen the health programs for metabolic syndrome from 2008.

Regarding this situation, many health business organizations have been concerned about the possibility of Disease Management programs in Japan. Traditionally health related programs have been strictly

Received: January 5, 2007

Accepted: May 16, 2007

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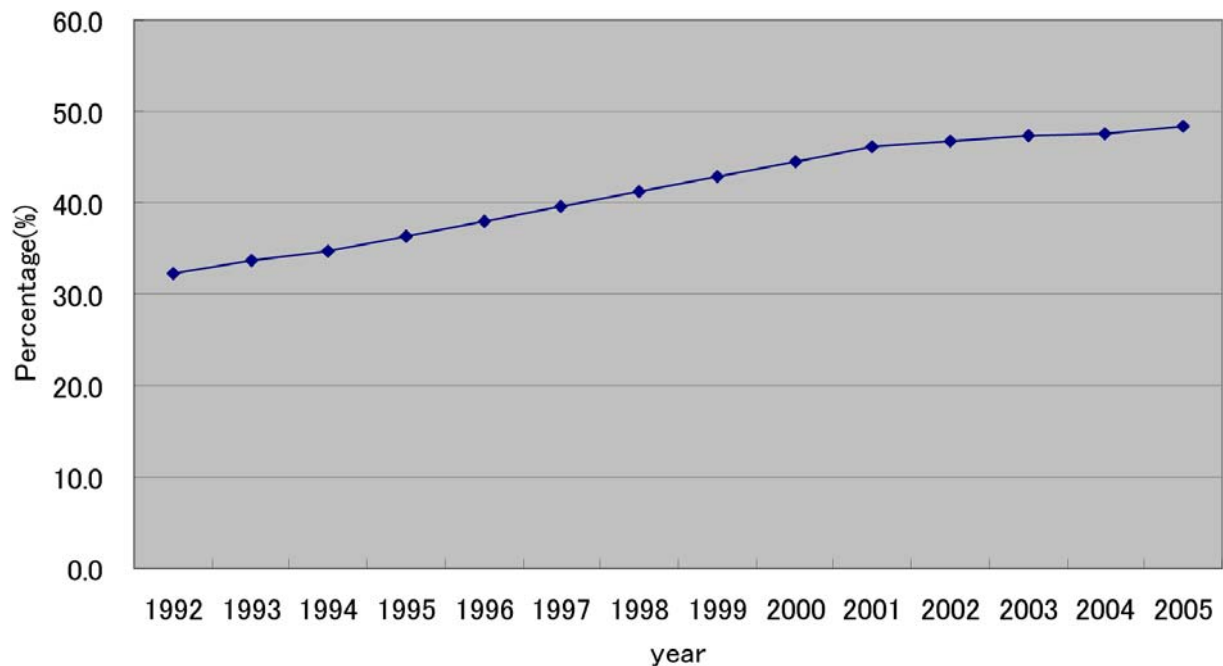


Figure 1. The percentage of abnormal data

limited to health professionals in Japan. However, the new law on health promotion programs in 2006 indicates that the health education programs for the persons with Metabolic syndrome can be offered by qualified private health business organizations, such as Disease Management (DM) companies under the direct contract with insurers. The Japan Medical Association presents the strong warning for such programs because of quality issues. It expected, however, that the privatization of health promotion activities will be promoted within the coming few years and that health related business will be developed in Japan.

The DM programs have been more developed in USA. The DMAA defined the Disease Management as follows:

“DM is a system of coordinated health care interventions and communications for populations with conditions in which patient self-care efforts are significant.” The role and the feature of DM is “to support the physician or practitioner/patient relationship and plan of care”, “to emphasize prevention of exacerbations and complications utilizing evidence-based practice guidelines and patient empowerment strategies,” and “to evaluates clinical, humanistic, and economic outcomes on an on-going basis with the goal of improving overall health.” And the basic processes of DM are identification, assessment, stratification,

intervention, measurements, and continuous reassessment.

It has been clarified that such DM programs are useful for amelioration of QOL of chronically ill-patient, prevention of aggravation of disorder and finally reduction of medical expenditures. In fact, the CMS (Center for Medicare and Medicaid Services) has adopted some DM programs for the purpose of reduction in medical expenditures. Thus it is very reasonable that many Japanese insurers are conscious about DM programs.

The present situation of Occupational Health Programs in Japan

Recently, the number of workers who have some lifestyle related diseases has been increasing in Japan. The background factors of this phenomenon are the westernization of Japanese society and ageing. The recent annual report on Occupational Safety and Health has indicated that the percentage of worker with abnormal data in the annual health checkup was 48.4% in 2005. This means that half of the workers have some kinds of health problems. Further more, this average has been increasing year by year (Figure 1). As shown in Table 1, the lifestyle related diseases are the most frequently detected abnormality, such as hyperlipidemia (29.35%), hypertension (12.29%),

Table 1 Results of health check up under the OSH law (2000)

| Item | Prevalence rate (%) |
|----------------------------------|---------------------|
| Physical examination | 3.2 |
| Acuity (1000 Hz) | 4.4 |
| Acuity (4000 Hz) | 9.7 |
| Chest X ray examination | 2.7 |
| Examination of sputum | 1.1 |
| Hypertension | 9.3 |
| Anemia | 6.0 |
| Liver dysfunction | 13.1 |
| Hyperlipidemia | 22.0 |
| Urine glucose | 3.4 |
| Urine protein | 3.0 |
| Electro Cardiogram (ECG) | 8.3 |
| Person with any abnormal results | 39.5 |

Source: MHLW (2003).

hyperglycemia (8.30%), and liver dysfunction (15.57%).

According to the Occupational Safety and Health Law (enacted in 1972), the occupational health staffs have to organize a various kind of health education programs for such workers with abnormal data.

The new law requires that OSH professional also actively contribute to the action against the metabolic syndrome. The MHLW tries to develop a standardized program for this purpose. In the case of Japan, however, we have to review the past experiences of

health promotion activities that have been conducted under the different settings. Especially, we think that the annual health checkup and the following health education programs in the Japanese occupational setting, can be regarded as the Disease Management.

So that we have reviewed the previous literatures about health promotion programs in the occupational setting in order to summarize a proposal on the Japanese Disease Management Programs.

❖ The Literature Review in the Occupational Health Setting —Method and Result—

We have reviewed all the articles included in the Journal of Occupational Health from 2002 to 2005, including the supplements for annual meeting of the Japan Society for Occupational Health. We have evaluated the articles according to the three basic processes and main activities of Disease Management as shown in Figure 2.

In total 30 cases were reviewed and summarized as shown in Table 2—target diseases, the object number of people, how to grasp the object people, presence of randomization, presence of control, how to intervention, index of appraisal, and result¹⁻³⁰). A various kind of health promotion programs have been organized in the Japanese workplaces. The life-style related diseases such as Hypertension, Diabetes Mel-

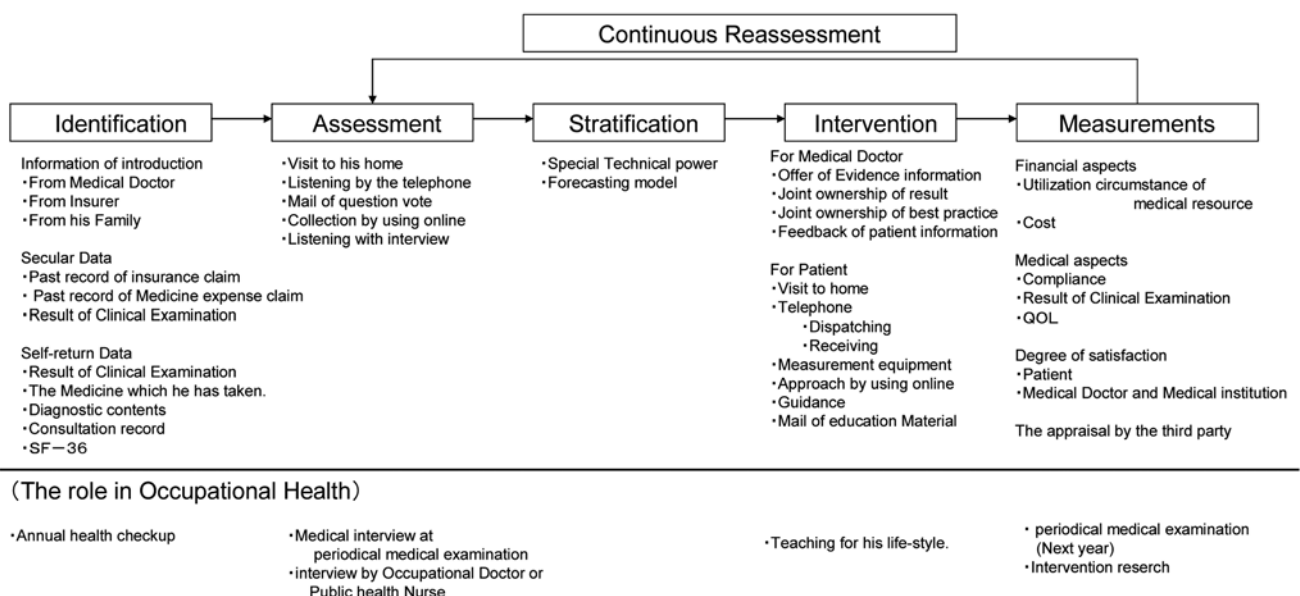


Figure 2. The basic processes and main activities of Disease Management —Compared with Occupational Health—

litus, hyperlipidemia, obesity are major targets.

As most of the programs have been conducted in relatively small workplaces, it is very difficult to evaluate the effectiveness of the programs.

According to the results of current review, it seems that it must be very difficult to develop the effective DM program directly from these experiences. The most important problem to be solved is the fact that there is no standardized methodology for intervention and evaluation.

❖ Conclusion

The health reform program in 2006 was the biggest one for the last 30 years in Japan. According to the plan a nation-wide health promotion program for healthier population will be introduced. As a main program of health promotion, the specified health checkup and follow-up health guidance and intervention program will be introduced from 2008. This program might be a Japanese Disease Management program.

It is no doubt that the Disease Management programs developed in USA will be applicable and effective for the Japanese situation. However, it is very important to know that various health promotion activities have been organized under the different schemes in Japan. Especially the experiences in the occupational setting are very precious and suggestive. Before introducing the American methodology, we have to review the past experiences under the DM concept. As shown by Ito in this volume³¹⁾, it is reasonable to use the current occupational setting for the implementation of the Japanese Disease Management programs because of its enough experiences in operation of programs. However, the most important weak-point of Japanese experiences is the lack of standard for intervention and evaluation. The new law 2006 plans to establish such standards.

Considering the actual situation, the authors think that it might be pragmatic to develop the Japanese DM programs based on the experiences in occupational settings with combination of the American sophisticated DM framework.

❖ Acknowledgement

This study was conducted by a Health and Labor Sciences Research Grants of Ministry of health, Labor

and Welfare (Comprehensive Research on Cardiovascular and Life-style related Diseases).

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Table 2 Results of literature review in the occupational health setting

| Case* | Target Disease | N | Object | | | Intervention Method | Result | Indicator for evaluation |
|-------|----------------|---------------------------|-----------------------|---------------|--|--|--|----------------------------|
| | | | Method of selection | Randomization | Control group | | | |
| 1 | Hypertension | 2792 | Annual health checkup | | | <ul style="list-style-type: none"> • Check sheet for Blood Pressure • Check sheet for life-style • e-Mail | The percentage of participation is 26.9%. The percentage of completing curriculum is 46.0%. 35.1% of completed persons were changed his Blood pressure to normal. The most important reasons for not-participation is difficulty of measurement. With easier systems, it will be possible to apply this program for more target people efficiently. | Blood Pressure |
| 2 | Hypertension | 285 (Effective reply 149) | Annual health checkup | | | <ul style="list-style-type: none"> • Health education | When we compared before and after attendance of the lecture, consciousness increase was observed for 80% of participants in all stage of the health belief model. The level of perceived severity was originally high for the participants in the contemplation stage and action stage. The participants in the precontemplation stage (30 people) felt the necessity to change their life-style. Finally the participants in the contemplation stage and action stage have increased for 85 and 64 peoples, respectively. | Health belief model |
| 3 | Hypertension | 236 | unclear | | + Program completion level | <ul style="list-style-type: none"> • Individual health education (2 times per month) | For blood pressure level, sex distribution, and age distribution, there were no differences among the groups before intervention. After ten months intervention, the average blood pressure was changed from 148.1/88.5mmHg to 139.4/82.1mmHg for full participation groups ($p<0.001$). For the group with only one time intervention, the average blood pressure was changed from 147.0/87.6mmHg to 141.6/83.4 mmHg ($p=0.001$). In both group the modification of lifestyle was observed as follows: there were improvements in 3 of 11 eating habits items, and 2 of 5 physical examination items. Sleeping duration was extended. The fatigue and stress level were decreased. In the case of full participation group, more improvement was observed for diet habit, fatigue and stress, and total score of healthy lifestyle and subjective health score. | Blood Pressure, life-style |
| 4 | Hypertension | 200 | Annual health checkup | | + Existence of follow-up intervention | <ul style="list-style-type: none"> • Follow up intervention for Blood Pressure | The number of follow-up group and control group were 96 and 79 peoples, respectively. Significant improvement was observed for follow-up intervention group. The persons who modified their lifestyle healthier were 68.7% for follow-up intervention group and 59.5% for control group ($p<0.05$, chi-squared test). | Blood Pressure, life-style |
| 5 | Hypertension | 133 | Annual health checkup | + | + (Setting for 3 groups) | <ul style="list-style-type: none"> • Guidance for healthier life-style • Guidance for healthy life-style and distribution of the urine test paper for sodium concentration • Without any intervention | The systolic blood pressure was decreased in all three group. The group with health guidance and urine check has shown the largest decrease in systolic blood pressure (12mmHg). | Blood Pressure |

| Case* | Target Disease | N | Object | | | Intervention Method | Result | Indicator for evaluation |
|-------|---------------------|------|--|---------------|---|--|--|--|
| | | | Method of selection | Randomization | Control group | | | |
| 6 | Hyperlipidemia | 91 | Annual health checkup | | + (program participants and non-participants) | <ul style="list-style-type: none"> • Health education • Follow up monitoring by e-mail | Participant was 68 peoples (74.7% of all persons with annual health check-up). There were no remarkable differences in the changes of labo-test and lifestyle between intervention and control groups. | Life-style Annual health checkup and medical interview |
| 7 | Hyperlipidemia | 30 | The member who take the classes about how to control the Cholesterol | | Matched by age, the year of the classes, smoking habits, Total Cholesterol | <ul style="list-style-type: none"> • Health education, Walking class (1 or 2 times per month), health education letter | In both group, total cholesterol level was improved after 6 months. The intervention group maintained the effect for three years. On the contrary, non-intervention group's data became worse after 1 year. | Serum Cholesterol |
| 8 | Cholesterol | 1422 | Annual health checkup | | | <ul style="list-style-type: none"> • Health education class and campaign for reducing cholesterol level • Self check of physical activity by step counter | Serum cholesterol level has decreased for both groups, but the participants group showed more decrease (Male: 8.2 vs 6.5, Female: 7.2 vs 5.6). | Serum Cholesterol |
| 9 | Hyperglycemia | 46 | Annual health checkup | | + (Setting for 3 groups; Improvement group, invariable group, get worse group) | <ul style="list-style-type: none"> • Health education by Occupational Health Physician and Dietitian | According to the results of OGTT in June 1997 and January 1998, participants were categorized into the 3 groups; Improvement (15 peoples), No change (11 peoples), and Worsened (11 peoples). According to the results of annual health checkup in March 1999, the improvement group kept their well-controlled level, but other two groups showed worsened results. The result of March 2000 showed worsened data for all three groups. | OGTT |
| 10 | Glucose intolerance | 30 | Annual health checkup | | | Individual health education using following items; Laboratory data, Step counter, Health interview, Self check of blood sugar level, Body weight measurement, Check for dietary habits, Blood pressure measurement, Physical exercise with examination of physical fitness, Leaflet for healthy life, Measurement of waist and hip ratio | All the participants have completed the 6 months program. Six peoples have shown more than 10mg/dl decrease in FBS, and 2 peoples had shown more than 0.3% decrease in HbA1c. Significant improvements were observed for body weight, BMI, waist and hip ratio, and physical fitness test. | FBS, HbA1c, Total Cholesterol, Wt, BMI, W/H ratio, Blood Pressure, Physical fitness test |

| Case* | Target Disease | N | Object | | | Intervention Method | Result | Indicator for evaluation |
|-------|-------------------|------|-----------------------|---------------|---------------|---|--|--|
| | | | Method of selection | Randomization | Control group | | | |
| 11 | Diabetes Mellitus | 8473 | Annual health checkup | | | <ul style="list-style-type: none"> HbA1c is more than 7.0 percent; Hygienic education HbA1c is more than 8.0 percent; Restriction for working status (no night shift, for example) | For both groups, statistically significant improvement was observed for HbA1c level, Total Cholesterol level and BMI. On the other hand, there was no improvement observed in the groups with HbA1c level of 6.0 to 6.9 and of less than 6.0%. | HbA1c, BMI, Blood Pressure, Total Cholesterol, HDL-Cholesterol, Triglyceride |
| 12 | Diabetes Mellitus | 13 | Annual health checkup | | | <ul style="list-style-type: none"> Check sheet (Blood sugar level 2 hours after meal, contents of meal, behavior) Self-evaluation Health education follow-up by e-mails | Statistically significant improvement was observed for average level of BMI(24.9 to 24.3), Weight (70.3kg to 68.7kg), Systolic Blood Pressure (135.3 to 132.3), Diastolic Blood Pressure (79.4 to 77.6), and Blood Sugar after two hours from last meal (212.6 to 118.3) have improved. Life-style was also improved. | 2hPG, BMI, Wt, BP, life-style |
| 13 | Diabetes Mellitus | 884 | Annual health checkup | | + | <ul style="list-style-type: none"> Small group lecture and individual health education by using check sheet (For example, basic knowledge about Diabetes, self check about his risk, goal setting, self measuring of glucose by using small self-check machine, and so on) | In the case of intervention group, improvement was observed for 71.0% of participants. On the other hand, only 53.2% of control group showed improvement. | Blood Sugar |
| 14 | Diabetes Mellitus | 100 | Annual health checkup | | | <ul style="list-style-type: none"> Health education by VTR on prevention of Diabetes (Diet and exercise) | After the intervention, significant improvement was observed for BMI, percentage of body fat, and Blood sugar level. No change was observed for abdominal circumference. | 75 g OGTT, Weight, Percentage of body fat, examination of urine, Abdominal circumference, HbA1c, F-IRI |
| 15 | Diabetes Mellitus | 108 | Annual health checkup | | + | <ul style="list-style-type: none"> A group lesson about prevention of DM Self measuring of Blood glucose | For the group with self-measuring blood sugar, significant decrease was observed for HbA1c and BMI. On the contrary the group without self-measuring blood sugar did not show improvement. For HbA1c level, significantly decrease was observed for the group with self-measurement of blood sugar level 6 months after the intervention. | BMI, HbA1c, Blood Sugar |
| 16 | Diabetes Mellitus | 49 | 75 g OGTT | + | + | <ul style="list-style-type: none"> Lecture about the diabetes prevention (2 times Group Lessons, 3 times of nourishment guidance, 1 time of healthy dinner, 6 times of individual education) A document about weight loss Control | The intervention group had significantly improvement in weight, BMI, percentage of body fat, circumference of waist and hip. Improvement in HbA1c, insulin resistance, Blood Pressure, Total Cholesterol, HDL-Cholesterol, and Triglyceride were also observed (without statistical significance). After 6 months of the lecture, there were also the tendency of improvement in Weight, BMI, Percentage of body fat, Girth of waist, Girth of hip, F-IRI, Total Cholesterol, HDL-Cholesterol, and Triglyceride for the intervention group. On the contrary, there was no tendency of improvement for control group. | Weight, BMI, Percentage of Body fat, Blood pressure, HbA1c, Total Cholesterol, HDL-C, Triglyceride, Fasting Blood Sugar, F-IRI |

| Case* | Target Disease | N | Object | | | Intervention Method | Result | Indicator for evaluation |
|-------|-----------------------------|-----|--|---------------|--|---|--|---|
| | | | Method of selection | Randomization | Control group | | | |
| 17 | Life-style related diseases | 57 | Recruitment from member of health insurance organization | | | <ul style="list-style-type: none"> • Questionnaire • Labo Data • Individual interview • Group health education • Online health education | About behavior modification of exercise, the percentage of "precontemplation stage" and "preparation stage" had decreased (11% to 5% and 53% to 19%, respectively) and the percentage of "action stage" had increased (37% to 75%). About behavior modification of nutrition, the percentage of "precontemplation stage" and "preparation stage" had decreased (21% to 11% and 47% to 7%, respectively) and the percentage of "action stage" had increased (32% to 81%). About POMS, as a whole, activity characteristics improved, and minus factors such as strain, depression, anger had decreased. | The stage of behavior modification, POMS |
| 18 | Life-style related diseases | 762 | Voluntary participation from a workplace | | | <ul style="list-style-type: none"> • Letter of health education (Published once a month) | After the distribution of evaluation sheet for the program, there were answers from 452 of 762 peoples (correspond rate is 60%). 285 people (64%) replied that they have read the letter. 164 peoples (36%) have not read. The stage of behavior modification was as follows; action stage: 38%, preparation stage: 56%, precontemplation and contemplation stage: 6%. Peoples with action stage read paper more frequently than peoples with low concern stage. The percentage of persons with behavioral change for healthier lifestyle was also more observed for the action stage group. | The stage of behavior modification |
| 19 | Life-style related diseases | 62 | The person who attended the life-style related disease improvement classes | | | <ul style="list-style-type: none"> • Labo Data • Individual education • Group education (7 times) • Online education (once a week) • daily elf-report on body weight, blood pressure, physical examination | Weight, blood pressure, and arteriosclerosis-related hormone had tendency to improve for the participants. 42% of participants attend to the online health education. The frequency of attendance for on-line education had shown a positive correlation with change for healthier lifestyle. | Weight, Blood Pressure, arteriosclerosis-related hormone |
| 20 | Life-style related diseases | 200 | Annual health checkup | + | | <ul style="list-style-type: none"> • Annual health checkup only • Annual health checkup and health education (once a year) • Annual health checkup and health education (once a month) | People with more frequently attend to health education class, showed a significant decrease in ALT and AST, and significant increase in HDL-Cholesterol. Annual health check-up group showed higher triglyceride level and blood pressure level with statistical significance compared with health education groups. There was no significant difference in Uric acid and BMI. | Blood Pressure, AST, ALT, Serum Cholesterol, Uric acid, BMI |
| 21 | Life-style related diseases | 855 | Annual health checkup | | + (Intervention group; 639 persons, Non-intervention group; 216 persons) | <ul style="list-style-type: none"> • Health education | Comparison of data between 2000 and 1999 showed that only intervention group had significant improvement in Total Cholesterol, Triglyceride, HDL-Cholesterol, HbA1c, and Uric Acid. BMI, Glucose, Hb, GOT, and GPT. No significant improvement was observed for γ -GTP. Both intervention group and non-intervention group had significant improvement in systolic and diastolic Blood Pressure. | Weight, BMI, Blood Pressure, Total Cholesterol, Triglyceride, HDL-Cholesterol, Blood Sugar, HbA1c, Uric acid, Hb, GOT, GPT, γ -GTP |

| Case* | Target Disease | N | Object | | | Intervention Method | Result | Indicator for evaluation |
|-------|-----------------------------|-----|---|---------------|--|---|--|--|
| | | | Method of selection | Randomization | Control group | | | |
| 22 | Life-style related diseases | 877 | The interview after the annual health checkup | | | <ul style="list-style-type: none"> Individual declaration for healthier lifestyle Questionnaire | According to the answer of questionnaire after three months, 71% people had been keeping their declaration, but after one year, it was only 30% that the healthy declaration was kept. The improvement rate is quite different according to the age category. The young group keep a high improvement rate, and people with 50 years old and more showed low improvement rate. For labo data, GOT, GPT, Total Cholesterol, Triglyceride, FBS and HbA1c had showed significant improvement. The people with healthy life declaration about exercise and drinking showed the improvement in HbA1c level. | GOT, GPT, Total Cholesterol, Triglyceride, FBS, HbA1c |
| 23 | Life-style related diseases | 437 | The person who audited the total health promotion private program | | Matched by age, sex, and the percentage of overweight | <ul style="list-style-type: none"> Total Health Promotion guidance | Before indentation, there were already significant differences between THP group and control group in diastolic Blood Pressure, Healthiness, habit of drinking, and habit of meals. In THP group, Obesity index, Blood Pressure, and life-styles had been improved. Serum Cholesterol had decreased after intervention with THP group. But after one year, there was no significant difference in Obesity index, Blood Pressure between the two groups. On the other hand, in control group, smoking prevalence and γ -GTP level had increased. Other data showed no change. | Waist Obesity index, Blood Pressure, Total Cholesterol, Triglyceride, GOT, GPT, γ -GTP, life-style |
| 24 | Life-style related diseases | 140 | Random sampling | + | Matched by the type of occupation, the number of staff, the average age, and the structure of age (122 people) | <ul style="list-style-type: none"> Activity of the making of health that a place of work played a key role that were supported by Public health nurse (Theme: stress, Cholesterol, meal and exercise) | The office where wrestled with stress, stress degree by simple questionnaire about occupation-related stress had a tendency to improve. The office where wrestled with Cholesterol, abnormal data of Triglyceride was fell down significantly ($p < 0.05$). The office where wrestled with meal and exercise, the life-style was improved significantly. All three offices, consciousness to health and life-style were more improved than control office. | Simple questionnaire about occupation-related stress, Cholesterol, Life-style, Percentage of body fat, Liver function |
| 25 | Metabolic syndrome | 193 | unclear | | | <ul style="list-style-type: none"> Educational program for metabolic syndrome (Abdominal obesity) To recognize the risk of one's health by oneself To clarify the action that should be improved Based on the results of learning, choose programs for healthier lifestyle by himself Social support from a peer group and family member for customizations of healthier lifestyle | For the body weight and waist circumference, yearly improvement was observed. After 4 years intervention, most of the data had been improved significantly (Weight, waist and hip circumference, Waist and Hip ratio, Skin fold thickness, physical fitness test, Blood Pressure, Total Cholesterol, LDL-Cholesterol, phospholipids, Free fatty acid, Blood Sugar). But no improvement was observed for Triglyceride, HDL-Cholesterol, and HOMA-IR.. | Weight, Girth of waist, Girth of hip, Waist and Hip ratio, Skin fold thickness, the number of standing from chair, One step width, Blood Pressure, Total Cholesterol, LDL-Cholesterol, HDL-Cholesterol, phospholipids, Free fatty acid, Blood Sugar, HOMA-IR |

| Case* | Target Disease | N | Object | | | Intervention Method | Result | Indicator for evaluation |
|-------|----------------|---------------------------------------|--|---------------|---|--|--|---|
| | | | Method of selection | Randomization | Control group | | | |
| 26 | Obesity | unclear | unclear | unclear | | <ul style="list-style-type: none"> • CT examination of visceral fat • health education text • Diet diary • Check sheet about eating habit • Questionnaire about life-style | By the intervention, the visceral fat area was decreased from 170.6 square meter to 97.1 square meter in three months. | CT examination on visceral fat |
| 27 | Obesity | 97 (37 persons completed the program) | The medical interview of annual health checkup | | Completed person and Non-completed person | <ul style="list-style-type: none"> • Individual health education by public health nurse by using health note (education by correspondence) | Only 37 persons completed the program. The authors examined the differences in characteristics between the completed group and non-completed group. More preparation stage persons were included into the completed group. The average weight of completed group was significantly decreased from 71.7Kg to 70.4kg (p<0.01). About the improvement of life-style, it seem that exercise habit was more effective than dietary habit. | Weight, BMI, life-style |
| 28 | Obesity | 29 | Voluntary participation | | Matched by age and BMI | <ul style="list-style-type: none"> • Intranet • Lecture • Questionnaire about life-style • Exhibition of the weight • Group work • Measurement of body weight • circumference of the abdomen • Percentage of body fat • Life skills training for appetite control • The weight measurement 3 times a day | Weight, percentage of body fat, and circumference of Abdomen were decreased significantly for the intervention group. On the contrary, only circumference of Abdomen was decreased significantly in control group. The ratio of decline in intervention group was significantly higher than control group. Furthermore, there was no people whose weight increased in intervention group. | Weight, Percentage of body fat, Girth of Abdomen, Labo data |
| 29 | Obesity | 51 | Participant for obesity control class | | Matched by age, sex, and BMI | <ul style="list-style-type: none"> • Health education about Obesity | According to the comparison of the data between participant group and control group, Systolic Blood Pressure, Diastolic Blood Pressure, Triglyceride, and HDL-Cholesterol were significantly decreased in the participant group after one or two years from intervention. | BMI, Systolic Blood Pressure, Diastolic Blood Pressure, Triglyceride, Total-Cholesterol, HDL-Cholesterol, GOT, GPT, γ -GTP, Uric acid, HbA1c |
| 30 | Obesity | 200 | Annual health checkup | | | <ul style="list-style-type: none"> • Campaign about walking • Intranet | 2.4% of average weight loss were observed at the end of the campaign. | Weight, BMI |

*: Number of case corresponds to the that of reference.