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Proceedings of
2nd Asian Preventive Cardiology
and
Cardiac Rehabilitation Conference
cum
7th Certificate Course in Cardiac Rehabilitation

22-25 November 2008
Hong Kong Convention and Exhibition Centre
Hong Kong

Bridging the Gap: From Evidence to Practice

Organized by
Hong Kong College of Cardiology

Supported by
Department of Health, Hong Kong SAR
Alice Ho Miu Ling Nethersole Hospital
Cardiac Rehabilitation & Prevention Centre of Tung Wah Hospital
Cardiac Rehabilitation & Resource Centre of Tung Wah Eastern Hospital
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Community Rehabilitation Network of the Hong Kong Society for Rehabilitation
Preventive Cardiovascular Nurses Association
Princess Margaret Hospital
The Chinese University of Hong Kong
The Hong Kong Heart Foundation Limited
The University of Hong Kong
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- Standard abbreviations should be used for all measurements (SI units).

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- The text should follow the abstract and begin on a new page, as should References, Tables, and Legends.
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- References should be cited in numerical order, as should tables and figures.

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- Number in the order in which they appear in the text.
- Abbreviate titles of periodicals according to the style of the Index Medicus.
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Periodicals
   (if more than three authors, please use "et al." after the third).

Books (edited by other authors of article)
   (if more than three authors, please use "et al." after the third).

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4. Same as periodicals and followed by "(abstract)".

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- Tables should supplement, but not duplicate, the text.
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- Abbreviations used in the table should be foot-noted and explained in the order in which they appear in the table, if they have not been previously used.
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- Be sure that legends and figures correspond.
- Identify all abbreviations used in a figure at the end of each legend, if the abbreviation has not been used in the text.
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Preface

Our hearty welcome to you all to this 2nd Asian Preventive Cardiology and Cardiac Rehabilitation Conference cum 7th Certificate Course in Cardiac Rehabilitation. Once again, we are able to have collaboration and support of overseas organizations such as Preventive Cardiovascular Nurses Association (PCNA) of the USA and many local organizations including Government, non-government, academic, service organizations as well as patient group to hold this event. Control of risk factors is the target of intervention in prevention and cardiac rehabilitation. Despite of evidence and availability of effective therapy, there is always a gap in reaching these treatment targets well documented in guidelines. We try to bridge the gap by involving every stack holder who has a role to play in heart disease prevention. In depth psychological and behavioral management was also emphasized since knowledge alone will need further action to bring it into practice.

Overseas and local healthcare personnel will present their research and special findings in the free paper and poster sessions. Two best paper awards will be given to the two best oral presentations.

The symposiums will commence with the Heart Foundation Lecture and included topics ranging from primary prevention in schools to rehabilitating patients with coronary heart disease and heart failure; from epidemiology, exercise, control of risk factors to contemporary cardiac care.

Concurrenty, there will be the Rotary Heart Health Public Conference consisting of a whole day conference and workshop to enhance the knowledge and skills in self-management of patients and their carers. In collaboration with International Chinese Heart Health Network (ICHHN) and supported by the Jump Rope for Heart, a workshop for teachers and parents on Successful Marketing of Heart-Smart Eating Program in Schools will be held.

Secondary prevention having proven benefits is worth doing despite the difficulties. The 7th Cardiac Rehabilitation Workshop emphasizing on practical and behavioral issues will be conducted to enhance the skill of healthcare workers in organization and running of the programs.

Prevention is better than cure. To achieve management to target in the whole population, we have to educate the public, the healthcare personnel and most important of all, the policy makers to help create an healthy environment and facilitate building up of healthy lifestyle. Let us all join hands to make prevention, the dream of this medical era come true by collaborating to combat the threat of the cardiovascular diseases.

Prof. Chu-pak LAU  
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Dr. Suet-ting LAU  
Co-Chairman  
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2nd Asian Preventive Cardiology and Cardiac Rehabilitation Conference cum 7th Certificate Course in Cardiac Rehabilitation

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Chairman of Department of Physical Medicine and Rehabilitation, Mild Subspecialty Hospital, Iran

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Dr. Yu-tak HUNG

Miss Snowball IP
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Dr. Steve Wai-keung LAI
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Prof. Doris Sau-fung YU
Dr. Chi-wai YUE
Congratulatory Message for
2nd Asian Preventive Cardiology and Cardiac Rehabilitation Conference cum
7th Certificate Course in Cardiac Rehabilitation

It is my great honor to attend the 2nd Asian Preventive Cardiology and Cardiac Rehabilitation Conference cum 7th Certificate Course in Cardiac Rehabilitation. I would like to express my heartiest gratitude to Hong Kong College of Cardiology for her invitation.

In last two decades, Hong Kong College of Cardiology made a noticeable contribution to the substantial development of Cardiology in Hong Kong, promoting the care of patients in cardiovascular medicine. The conference today is promisingly an excellent opportunity for the medical and paramedical profession to share their experience. I would like to extend my appreciation to all who have participated in and generously supported this conference.

Dr. Ka-lau LEUNG
Legislative Council Member
(Medical Constituency)
PROGRAMME

(A) 2nd Asian Preventive Cardiology & Rehabilitation Conference cum 7th Certificate Course in Cardiac Rehabilitation

SATURDAY, 22 NOVEMBER 2008

08:00-16:00 REGISTRATION
(Venue: Room 601)

09:00-10:30 ABSTRACT PRESENTATION (ORAL)
(Venue: Room 601)

Moderators: Dr. Kin-wing CHAN
Dr. Tak-sun TSE

1. Improving Quality of Life of Patients with Cardiac Problems through Health Qigong Program
Ms. Athina POON

2. Cardiovascular Risk Profile in Individuals with or without History of Cardiovascular Disease
Dr. Suet-ting LAU

3. Prevent Rehospitalisation Program for High Risk Heart Failure Patients
Dr. Kai-chi LEUNG

4. Outpatient Cardiac Rehabilitation for Cardiac Surgery Patients in National University Hospital – Report on Retrospective Data
Prof. Kayambu GEETHA

5. Detection of Coronary Artery Disease in Asymptomatic High Risk Individuals with Coronary CT Angiography
Dr. Raymond Ho-ming CHAN

6. Cardiovascular Risk Factors, Echocardiographic Parameters and 2 Years Outcome in End Stage Renal Disease Patient
Dr. Ying-keung LO

7. To Investigate the Effectiveness of Cardiac Rehabilitation Program for Patients Utilising the Exercise Prescription Program Based on American College of Sports Medicine Exercise Prescription Guidelines in Changi General Hospital
Mr. Mingxian LIM

8. Review of Cardiac Rehabilitation Outcome Achievements
Ms. Yee-man FONG

9. Comparison of Treatment Outcome and Health-related Quality of Life in Acute Coronary Syndrome Patients of Three Age Groups: <60, 60 to 80, and >80 Years
Dr. Ruijie LI

10:30-11:00 TEA BREAK
(Venue: Room 603-604)

POSTER EXHIBIT

11:00-12:30 ABSTRACT PRESENTATION (ORAL) – BEST PAPER AWARDS
(Venue: Room 601)

Moderators: Dr. Kai-fat TSE
Dr. Charles Kau-chung HO

10. CHF-HOME (Congestive Heart Failure – Home Community Monitoring and Exercise) Program: A Multidisciplinary Program to Improve the Outcome of Patients with Congestive Heart Failure
Dr. Hiu-lam CHAN

11. Perioperative Negative Emotions and Quality of Life Six Months after Cardiac Surgery
Mr. Phillip TULLY

12. Community Cardiac Rehabilitation Program – Local Experience in a Regional Rehabilitation Centre
Dr. Kai-chi LEUNG
13. Affective Disorders as Risk Factors for Delirium after Cardiac Surgery
Mr. Phillip TULLY

14. Hypertension in Pregnancy is an Independent Risk Factor for Hypertension Later in Life
Dr. Vensa GAROVIC

15. Clinical Outcomes of Cardiac Rehabilitation Program on Functional Capacity, Biochemistry and Physiological Changes
Dr. Supak KANCHANAPORN

12:30-14:00 LUNCH BREAK

14:00-14:30 OPENING CEREMONY
(Venue: Room 601)

14:30-15:30 SYMPOSIUM 1 - Hong Kong Heart Foundation Symposium: Targets for Prevention
Moderators: Prof. Chu-pak LAU
Dr. Suet-ting LAU

CVD Prevention: How Low to Go in 2009?
Dr. Sandeep GUPTA
The Role of Fitness and Physical Activity in Heart Disease
Prof. Terence KAVANAGH

15:30-16:00 TEA BREAK
(Venue: Room 603-604)

16:00-17:30 SYMPOSIUM 2 – From Prevention to Treatment
(Venue: Room 601)

Moderators: Dr. Regina Cheuk-tuen CHING
Dr. Patrick Tak-him KO
Dr. Chris Kwok-yiu WONG

EatSmart at School – From Survey to Practice
Dr. Christina Kit-chee MAW
Metabolic Syndrome Identification and Treatment
Ms. Kathy BERRA
Recent Advance in Heart Failure Treatment
Prof. Cheuk-man YU

∗∗∗∗∗∗∗

SUNDAY, 23 NOVEMBER 2008

08:30-09:00 REGISTRATION
(Venue: Room 601)

09:00-10:30 SYMPOSIUM 3 – Perspectives in Cardiac Rehabilitation
(Venue: Room 601)

Moderators: Dr. Leonard Sheung-wai LI
Dr. Sum-kin LEUNG
Dr. Shu-kin LI
Prof. Stephen Wai-luen LEE
Dr. Kei-pui LEUNG
Dr. Andy Wai-kwong CHAN

Models for Cardiac Rehabilitation
Prof. Visal KANTARATANAKUL
Coronary Artery Disease Club – One of the Experience of Cardiac Rehabilitation in Guangdong
Dr. Lan GUO
Health Experience of Chronic Ischemic Heart Disease in Malaysia
Dr. Lydia Abdul LATIF
Outpatient Phase III Cardiac Rehabilitation and the Training System of the Masters of Cardiac Rehabilitation in Japan
Prof. Masahiro KOHZUKI
Schedule of Cardiac Rehabilitation in Iran
Dr. Farzaneh TORKAN
Medicine and Spirituality: A New Task for Heart Friends Around the World
Dr. Flavio BURGARELLA

10:30-11:00 TEA BREAK
POSTER EXHIBIT

11:00-12:30 SYMPOSIUM 4 – Contemporary Cardiac Care
(Venue: Room 601)
Moderators:
Prof. Cheuk-man YU
Dr. Chi-ming WONG
Dr. Albert Wai-suen LEUNG

Ethnicity: The Other CV Risk Factor?
Dr. Sandeep GUPTA
Towards Person-related Cardiac Care: Weighing the Evidence on Type D Personality
Dr. Johan DENOLLET
An Update on the Treatment of Stable Angina Pectoris
Ms. Kathy BERRA

12:30-14:00 LUNCH BREAK

14:00-15:30 SYMPOSIUM 5 – Essential Component: Exercise
(Venue: Room 601)
Moderators:
Dr. Chung-seung CHIANG
Dr. Kathy Lai-fun LEE
Dr. Ngai-yin CHAN
Dr. Chiu-sun YUE

Effect and Molecular Mechanism of Physiological Ischemia
Prof. Jianan LI
Training of Skeletal Muscle on Angiogenesis at Remote Sites with Pathological Ischemia in Rabbit Models of Coronary and Peripheral Artery Stenosis
Exercise Prescription in Cardiac Patients
Dr. Farzaneh TORKAN
Electrical Stimulation of Skeletal Muscles in Patients with Heart Failure: An Alternative to Aerobic Training?
Prof. Masahiro KOHZUKI
Exercise and Hypertension
Prof. Chul KIM

15:30-16:00 TEA BREAK
POSTER EXHIBIT

16:00-17:30 SYMPOSIUM 6 – Control the Risks
(Venue: Room 601)
Moderators:
Dr. Chun-ho CHENG
Dr. Kam-tim CHAN
Prof. Kam-sang WOO

Is Cardiovascular Disease Preventable?
Prof. Bernard Man-yung CHEUNG
The Malignant Threat of Hypertension
Ms. Nancy Houston MILLER
How to Achieve Regression of Atherosclerosis
Prof. Brian TOMLINSON

♦♦♦♦♦♦
(B) ICHHN Workshop on Successful Marketing of Heart-Smart Eating Program in Schools

SATURDAY, 22 NOVEMBER 2008

14:30-14:45 REGISTRATION

14:45-14:55 Opening Remarks & Souvenir Presentation

14:55-15:15 How to be Heart Healthy

15:15-15:35 Facts & Traps

15:35-16:05 Be a Smart Customer – read the labels

16:05-16:35 TEA BREAK

16:35-17:05 Promotion of Healthy Eating in Schools

17:05-17:30 EatSmart at School – From Survey to Practice

17:30-17:45 Closing Remarks

(Venue: Room 606-607)

(C) Rotary Heart Health Public Conference
Update in Cardiac Treatment and Rehabilitation
扶輪健心公眾研討會暨工作坊「心臟復康治療新趨勢」

SUNDAY, 23 NOVEMBER 2008

09:00-16:00 REGISTRATION

09:30-10:00 Opening Remark

10:00-11:00 LECTURES

Moderator: Dr. Kin-ming TAM

Update in Medical Treatment
Update in Intervention Treatment and Rehabilitation

11:00-11:25 Q&A

11:25-11:40 BREAK

11:40-12:10 LECTURES

Moderator: Dr. Yu-tak HUNG

Update in Exercise and Cardiac Rehabilitation
Update in the Rehabilitation of Heart Failure

Dr. Regina Cheuk-tuen CHING
Mrs. Chu-eng TAN
Dr. Patrick Tak-him KO
Dr. Nanley CHENG
Ms. Shanna WU
Ms. Fanny CHAN
Dr. Christina Kit-chee MAW
Dr. Kenneth NG
Dr. Suet-ting LAU
Mrs. Chelsia TO
Dr. Yat-yin LAM
Dr. Albert Wai-suen LEUNG
Dr. Leonard Sheung-wai LI
Dr. Kei-pui LEUNG
12:40-13:00 Q&A

13:00:14:30 LUNCH BREAK

14:30-17:00 ✧WORKSHOP 1
Healthful Eating for a Healthy Heart
Ms. Selina KHOR

✧WORKSHOP 2
Nourish Your Heart: Say Goodbye to Stress
Prof. Cecilia Lai-wan CHAN
Ms. Celia Hoi-yan CHAN
Mr. Andy Hau-yan HO

✧WORKSHOP 3
Exercise for Cardiac Patients
Mr. Frederick Kin-wa LI
Ms. Eva AU

✦✦✦✦✦

(D) 7th Certificate Course in Cardiac Rehabilitation

MONDAY, 24 NOVEMBER 2008

09:00-10:30 WORKSHOP 1 – Conducting Cardiac Rehabilitation Program
Moderator:  Dr. Ngai-yin CHAN

Inpatient Cardiac Rehabilitation
Dr. Farzaneh TORKAN
(Assistant: Dr. Laleh HAKEMI)

Outpatient Cardiac Rehabilitation
Dr. Farzaneh TORKAN
(Assistant: Dr. Laleh HAKEMI)

10:30-11:00 TEA BREAK

11:00-12:30 WORKSHOP 2 – Behavior Modification
Moderators:  Prof. Sek-ying CHAIR
Dr. Michael Kang-yin LEE

Behavioral Skills Training
Ms. Nancy Houston MILLER

Updates on Smoking Cessation
Dr. Ronald LAM

Motivational Interviewing and Smoking Cessation: What Is It and Is It Effective?
Dr. Douglas Tat-chau LAI

12:30-14:00 LUNCH BREAK

14:00-15:30 WORKSHOP 3 – Patient Education
Moderator:  Dr. Thomas Wai-cheong YIP

Type II Diabetes – A 6-week Patient Education Program for Cardiac Rehabilitation Professionals
Ms. Kathy BERRA

15:30-16:00 TEA BREAK
16:00-17:30 WORKSHOP 4 – Exercise  
*Moderator:* Dr. Polly Mo-ye LAU

How to Make People Exercise  
Prof. Visal KANTARATANAKUL  
(Assistant: Ms. Metta JARUKITJAROON)

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**TUESDAY, 25 NOVEMBER 2008**  
*(Venue: Room 601)*

09:00-10:30 WORKSHOP 5 – Diet  
*Moderator:* Dr. Shu-keung KWONG

The Influence of Nutrition on Cardiovascular Health  
Ms. Vanessa Lai-fan AU

10:30-11:00 TEA BREAK

11:00-12:30 WORKSHOP 6 – Self Management  
*Moderator:* Miss Mabel CHAU

Facilitating Self-management Behaviors in Cardiac Patients  
Mr. Peter POON

12:30-14:00 LUNCH BREAK

14:00-15:30 WORKSHOP 7 – Exercise  
*Moderator:* Dr. Steve Wai-keung LAI

Exercise in Practice for Cardiac Patients  
Miss Snowball IP  
Ms. Mandy Shun-yan LEUNG

15:30-16:00 TEA BREAK

16:00-17:10 WORKSHOP 8 – Vocation and Driving  
*Moderators:* Miss Stella CHENG  
Dr. Leonard Sheung-wai LI

Return to Work after Acute Myocardial Infarction  
Mr. Tony Ka-keung WONG  
Driver Assessment for Cardiac Patients  
Ms. Jocelyn AU

17:10-17:30 CLOSING REMARK AND CERTIFICATE PRESENTATION
Abstracts Presentation (Oral):

1. Improving Quality of Life of Patients with Cardiac Problems Through Health Qigong Program
   
   **Abstracts Presentation (Oral):**

   **Title:** Improving Quality of Life of Patients with Cardiac Problems Through Health Qigong Program
   
   **Authors:** A POON,^1^ CS YUE,^2^ M WAN,^1^ L MA,^1^ P HUI,^1^ E PO,^1^ B CHEUNG,^1^ WY CHU^3^
   
   **Affiliations:**
   - ^1^Occupational Therapy Department, Medical & Geriatric Department, Cardiac Division, Health Resource Center, United Christian Hospital, Hong Kong
   - ^2^Kwai Tsing Safe Community & Healthy City Association, Hong Kong
   - ^3^Division; 3Health Resource Center, United Christian Hospital, Hong Kong

   **Objectives:** Health qigong practice had been incorporated in our cardiac rehabilitation program phase II since 2000 with proven effects. However, the maintenance effects after the program is still doubtful. The present study aimed at evaluating the physiological and psychosocial effect of this 12-week health qigong (Badunjin) program on cardiac patients. The maintenance effect of the program was also evaluated at post-discharge 12-week from the program.

   **Methods:** A pre-test and post-test control design was adopted. A sample of 57 (39 male and 18 female) subjects was recruited from those patients who had just completed the cardiac rehabilitation program phase II. Thirty-one were allocated to the experimental group with 12-week health qigong program (employing lay leaders and emphasis on self-management principles) and 26 to the control group with no active treatment provided. Patients in the experimental group would attend the program on weekly basis for 12 weeks with home practice not less than five times per week. Outcome measures of blood pressure (SBP & DBP), heart rate (HR), psychosocial functioning, quality of life (C-SF36), readmission and mortality rate were adopted. Outcome data were collected at the point of initial assessment, at the completion of the 12-week program and at 12-week interval after discharged from the program.

   **Results:** Repeated measure of ANOVA revealed that there was reduced HR of patients in the experimental group (p=0.001) with overt improvement in DBP and SBP while patients in the control group showed increase in HR, DBP and SBP. C-SF36 results also indicated that there was general improvement in psychosocial functioning and quality of life in the experimental group. Besides, three patients were readmitted due to cardiac problems in the control group but none in the experimental group. Positive feedback from participants showed that they were more active in daily life with enhanced confidence and self-efficacy in coping with their cardiac problems and dealing with their daily lives. Other factors like the cultural relevant Traditional Chinese Medical components of health qigong, sense of empowerment as in the lay leaders, changes in lifestyle, peer group sharing, learning and support were also identified which had contributed to the positive outcome of the program.

   **Conclusion:** The 12-week health qigong (Badunjin) program was effective not only in improving the quality of life of patients with cardiac problems but their self-efficacy, coping strategies and lifestyle as well. Through the use of culturally relevant health qigong treatment modality, recruitment and training of lay leaders, impacts of group effects and multi-disciplinary collaboration, the program can be considered as a cost-effective intervention to facilitate active lifestyle engagement and long-term community reintegration with possible reduction in the avoidable re-admissions due to cardiac problems.

2. Cardiovascular Risk Profile in Individuals with or without History of Cardiovascular Disease
   
   **Title:** Cardiovascular Risk Profile in Individuals with or without History of Cardiovascular Disease
   
   **Authors:** ST LAU,^1^ A LAI,^2^ YH CHOW, M CHAN, PT TSUI
   
   **Affiliations:** Kwai Tsing Safe Community & Healthy City Association, Hong Kong

   **Background:** Cardiovascular risks are very common amongst the general population. Patients may already had manifestation of diseases such as ischaemic heart disease (IHD) or cerebral vascular disease (CVA) while others has no known disease. Though the methods of detection, monitoring and treatment of the modifiable risks are available, it is not unusual that they not well controlled. This study compares the control of these risk factors in the two categories of patients.

   **Methods:** Community health promotion and screening programs were conducted in 16 housing estates in collaboration with the local District Council in 2006-2007. A self-administered questionnaire with demographics, known history and treatment of hypertension, hypercholesteremia, diabetes mellitus, exercise and smoking history were recorded. Body mass index, blood pressure, spot sugar and total cholesterol were taken. Counseling, health talk and distribution of educational pamphlets were given by healthcare personnel supported by volunteers.

   **Results:** A total of 2463 participants with 492(20%) male and 1589(65%) over 60 years of age were recruited.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>IHD or CVA</th>
<th>No history of IHD or CVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &gt;25</td>
<td>42.4% (429/999)</td>
<td>32.5% (353/1087)</td>
</tr>
<tr>
<td>Smoker or quit &lt;1 year</td>
<td>9.5% (995)</td>
<td>6.3% (66/1047)</td>
</tr>
<tr>
<td>Exercise 3 times per week</td>
<td>67.0% (659/97)</td>
<td>64.4% (676/1050)</td>
</tr>
<tr>
<td>BP &gt;140/90 mmHg</td>
<td>45.8% (103/225)</td>
<td>42.7% (956/2240)</td>
</tr>
<tr>
<td>TC &gt;5.2 mmol/l</td>
<td>21.3% (48/225)</td>
<td>32.6% (730/2240)</td>
</tr>
<tr>
<td>BS &gt;7 mmol/l</td>
<td>37.3% (84/225)</td>
<td>27.5% (615/2240)</td>
</tr>
<tr>
<td>BP &gt;140/90 mmHg Known HT on Rx</td>
<td>55.7% (73/131)</td>
<td>58.8% (378/643)</td>
</tr>
<tr>
<td>TC &gt;5.2 mmol/l Known high TC on Rx</td>
<td>16% (8/50)</td>
<td>34.5% (40/116)</td>
</tr>
<tr>
<td>BP &gt;140/90 mmHg No/Unknown Hx of HT</td>
<td>27.5% (22/80)</td>
<td>34.2% (488/1425)</td>
</tr>
<tr>
<td>TC &gt;5.2 mmol/l No/unknown Hx of high TC</td>
<td>21.2% (28/132)</td>
<td>30.3% (536/1771)</td>
</tr>
</tbody>
</table>

   **Conclusion:** The prevalence of cardiovascular risks is high especially in those with history of IHD or CVA. Hypertension is notoriously poorly controlled even in those with known history of cardiovascular diseases. Additional efforts and resources should be put in the control of these modifiable cardiovascular risks in our population for prevention of cardiovascular diseases.
3. Prevent Rehospitalisation Program for High Risk Heart Failure Patients

K C Leung, K P Leung, K M Chan, S W Tang

Cardiac Rehabilitation & Resources Centre, Tung Wah Eastern Hospital, Hong Kong

Background:
1. Heart failure (HF) has become a worldwide health and economic burden with high mortality rate and rehospitalisation rate. Around 25-50% of hospitalized patients will be readmitted within 6 months after discharge.
2. In 2006, there were about 16,000 HF admissions to HA hospitals (~2000 in HKEC), accounting for 1.4% of total hospital admissions. In HKEC, each HF patient had an average of 1.4 admissions per year. Around 100 high risk HF patients (~10% of all HF patients) had ≥4 cardiac hospitalizations in one year.
3. Meta-analysis revealed that specialized multidisciplinary team disease management could decrease mortality and hospitalization.

Objective:
To utilize a case-managed HF program in reduction of rehospitalization, length of stay (LOS) in these high risk HF patients

Program Outline:
A. Eligible participants
- HF patients who had ≥2 or 4 HF hospitalizations in past 6 and 12 months respectively (high risk group)
B. Format
1. Case managed approach
2. Medical follow up started 1 week after discharge and then every 1-2 weeks till stable.
3. Subsequent follow up interval will be extended and thereafter, nurse led follow up will provide continuation of care

C. Components of the program include
1. Aggressive titration of anti-HF medications by physician
2. Surveillance and management of salt and fluid status
3. Multidisciplinary input (nurse- as case manager, dietitian, physiotherapist and occupational therapist) for education and skills on self management strategies
4. Supervised exercise training to improve functional capacity and other vascular benefits

Results:
In 2007, 20 patients were recruited. Mean age was 73.2 (range 48 to 90). Fifteen (75%) were male. Mean Ejection fraction was 30.9%. Over 70% belonged to New York Heart Association Functional Class II. Fifteen (75%) patients had participated in exercise training.

A. Exercise capacity
Mean 6-minute walking test improved from 349 to 463m (p=0.02) or 32.3% increase.

B. Mortality rate (6 month)
2 (10%) died within 6 month after recruitment. Both were at extreme age (86 and 90) with many co-morbidities and accounted for all 4 admissions in this study.

C. Admission rate and LOC (6 month)

<table>
<thead>
<tr>
<th></th>
<th>Pre-program</th>
<th>Post-program</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 6-month cardiac related admissions</td>
<td>77</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Mean 6-month cardiac related admission rate</td>
<td>3.85 times/person</td>
<td>0.2 times/person</td>
<td>(p &lt; 0.0001)</td>
</tr>
<tr>
<td>Total 6-month LOS (days)</td>
<td>909</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Mean 6-month LOS</td>
<td>45.5 days/person</td>
<td>2.5 days/person</td>
<td>(p &lt; 0.0001)</td>
</tr>
</tbody>
</table>

1. 6-month cardiac related admission rate showed an average reduction of 3.65 times.
2. 6-month mean LOS reduced by 42.9 days

D. Drug utilization
At the end of the program, around 95% patients was receiving optimized anti CHF medications (i.e. ACEI or Angiotension II blocker and beta-blocker)

Conclusion:
A case managed model for high risk CHF patients was clinically beneficial and highly effective to reduce hospitalisations and LOS.

4. Outpatient Cardiac Rehabilitation for Cardiac Surgery Patients in National University Hospital – Report on Retrospective Data

K Geetha, P F Lee, Y H Chan, Y Liang

National University Hospital, Department of Rehabilitation, Physiotherapy National University of Singapore, School of Medicine, Singapore

Background:
The 6 minute walk test (6MWT) is a simple test administered to observe the exercise tolerance and the effectiveness of cardiac rehabilitation programs (CRPs). However, the number of patients referred to such CRP continues to be low and the fallout rate of these patients is common due to complications. In this study, the 6MWT is used as an assessment tool to observe the exercise tolerance and the effectiveness of a CRP for a group of cardiac surgery patients.

Materials and Method:
One hundred patients who had undergone coronary artery bypass graft surgery (CABG) were enrolled into the National University Hospital Outpatient CRP (NUHCRP). Patients were selected based on inclusion criteria of completion of at least one phase of the NUHCRP and the 6MWT pre and post rehabilitation. Thirty-four patients [91% males, mean age (59±9); 9% females, mean age (61±5)] were selected from this group for the 6MWT analysis. Twenty-seven percent of the patients had a valve surgery with a CABG (CABG + valve) and 73% had a pure CABG. The patients underwent a short length of inpatient rehabilitation and enrolled into the NUHCRP. Rehabilitation comprised of 1.5 hrs of intensive aerobic and strengthening exercises conducted by a physiotherapist, for 12 to 24 sessions over two and a half months. A regression equation derived in a 6MWT study was used to determine the predicted total distance walked.

Results:
One way ANOVA and Spearman’s correlation were used to determine differences in the 6MWD (Diff6MWD) and selected variables. Based on the regression equation, 30% of patients exceed the predicted distance in post 6MWT. Ninety-seven percent of the patients walked an absolute distance more than 300m post 6MWT. Mean distance walked pre-test was (46±87m) and post-test (485±85m). Patients ≥70 years old walked a mean Diff6MWD of (60±58m) with the largest increase in distance against all the age groups ranging from 50 to ≥70 compared < 50 years old (44±76m). Mean ejection fraction of the patients was (52±13%). Diff6MWD walked in the diabetic group compared to the non-diabetic group was not found to be different; however patients with a smoking history walked a mean difference of (25±67m) as compared to the non-smokers (20±94m). CABG patients had increased Diff6MWD (36±63m) compared to CABG + valve patients. Seventy-one percent of patients who did not have ECG changes after cardiac surgery had a Diff6MWD of (31±89m) as compared to those with ECG changes. Sixty-eight percent of the patients showed ≥10% increase in distance walked between the two tests. The pre 6MWD was found to be positively correlated to post 6MWD (r= 0.612, p<0.01) and negatively correlated to the difference in the distance walked (r= -0.558, p<0.01).

Conclusion:
Our data suggests that 6MWD is feasible and tolerated in older patients after cardiac surgery. Following NUHCRP, cardiac surgery patients showed significant improvement in the 6MWD, which is a true improvement in functional capacity as a true consequence of therapeutic intervention.
5. Detection of Coronary Artery Disease in Asymptomatic High Risk Individuals with Coronary CT Angiography
RHM CHAN, S JAVALI, T SHETH
McMaster University, Hamilton, Ontario, Canada

Background: Few studies have looked at the prevalence of obstructive coronary artery disease (CAD) in asymptomatic patients with multiple CAD risk factors.

Methods: We performed a retrospective pilot study of asymptomatic high risk patients who were referred to a single computed tomography coronary angiography (CTA) center for evaluation of CAD from January 2007 to July 2008. Patients with previously documented CAD were excluded.

Results: Of the 26 patients identified, 79% were male. Average age was 58.4. 34% were of advanced age (male >60, female >70), 54% had hypertension, 15% were diabetic, 19% were current smokers, 65% had hyperlipidemia, and 42% had a positive family history. Average number of risk factors was 2.4. Fifty-four percent had ≥3 CAD risk factors. Atherosclerotic plaques were identified in 81% of the asymptomatic patients. 35% had CAD with stenosis of <70% diameter, while 42% had CAD with severe (>70% diameter) stenosis in one or more vessels. Furthermore, 20% had severe (>70% diameter) plaques identified in either their left main or proximal left anterior descending (LAD) artery.

Conclusion: Prevalence of obstructive CAD is very high in asymptomatic patients with multiple coronary risk factors, with a significant proportion with severe stenosis detected, some of which were in either left main or proximal LAD lesions. CTA has the potential to be used as a tool to identify occult high risk lesions in this population. Further research is needed to determine the optimal management strategy for these patients.

6. Cardiovascular Risk Factors, Echocardiographic Parameters and 2 Years Outcome in End Stage Renal Disease Patient
YK LO, CL LAU, CC CHOY, ST LAU
Department of Medicine and Geriatric, Princess Margaret Hospital, Hong Kong

Background: Cardiovascular disease is common amongst end stage renal failure patients. The combination of cardiovascular disease and renal disease amplifies the progression of disease in the individual system. Their presence and association await further investigation in our local setting.

Objective: To assess the cardiovascular risk factors, echocardiographic parameters and their 2 years cardiovascular morbidity and mortality in patients on renal replacement therapy.

Methods: 101 end stage renal failure (ESRF) patients receiving renal dialysis for more than 6 months were followed up since 6/2006. Baseline epidemiological data, cardiovascular risk factors, echocardiographic parameters were assessed. Cardiovascular morbidity and mortality were recorded till 31/7/2008.

Results: 101 dialysis patients were studied. 87.1% and 42.6% of the patients were hypertensive and diabetic respectively. 18.8% had ischaemic heart disease. 4% had a previous cerebrovascular event. 22.8% had been hospitalized because of heart failure symptoms. 27% had blood pressure equal or lower than 130/80 mmHg. 38.6% were taking angiotensin converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB) and 55.4% were taking beta-blocker. 21.8% were on lipid-lowering agents. 67% had left ventricular hypertrophy while 81.2% had diastolic dysfunction. 31.7%, 13.9% and 5% patients had mildly impaired ejection fraction (50-59.9%), moderately impaired ejection fraction (35-49.9%) and poor LV contraction (EF less than 35%) respectively. During the two years follow up, 12% patients had an episode of cerebrovascular event requiring hospitalization. Twenty-four percent had been hospitalized because of acute coronary syndrome. 23% had succumbed during the 2 years follow up (11 patients died of infection, 7 patients died of acute coronary syndrome, 4 patients died of cerebrovascular event, 1 patient died of hepatocellular carcinoma and 1 patient died of unknown cause).

Conclusion: End stage renal failure patients have very high prevalence of cardiovascular risk factors, related morbidity and mortality. More attention and better preventive measures should be carried out to improve their disease outcome.
9.
Comparison of Treatment Outcome and Health-related Quality of Life in Acute Coronary Syndrome Patients of Three Age Groups: <60, 60 to 80, and >80 Years

RH LI, M ZHANG, Q ZHANG, Q H ZHANG, CP CHAN, GWK YIP, M DONG, D DING, BRYAN P YAN, EB WU, CM YU
Institute of Vascular Medicine and Division of Cardiology, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong

Objective: Prevalence of octogenarians presenting with acute coronary syndrome (ACS) is increasing as the population ages. This study evaluated the effect of age on health-related quality of life (HRQOL) in 3 age groups presenting with ACS.

Methods: We prospectively analysed 429 patients presenting with ACS admitted to our institution with ACS from Feb 2006 to March 2008. SF-36 was used to assess HRQOL at baseline and 6-month. Baseline characteristics, treatment & HRQOL were compared across 3 age groups (<60, 60-80 & >80 yrs). Multivariate linear regression was performed to identify predictors of improvement in SF-36 and its physical & mental component scores.

Results: 108 Patients (25.2%) were <60 yrs, 236 pts (55.0%) between 60-80 yrs and 85 pts (19.8%) >80 yrs. Elderly pts were more likely to be female (19 vs. 36 vs. 50%, p<0.01), less likely to present with ST-elevation myocardial infarction (44 vs. 31 vs. 25%, p=0.01) & to undergo coronary revascularization (62 vs. 48 vs. 23%, p<0.01). Six-month mortality increased incrementally by age group (2 vs. 6 vs. 19%, p<0.01). SF-36 and its physical component score (PCS) improved significantly at 6 month in all the 3 groups (Table). Increasing age was associated with lower baseline HRQOL but more improvement of SF-36 score (+5.4±7.5 vs. +11.9±18.9 vs. +12.9±19.7, p=0.03). Age (β±2/10 yrs; 95%CI 1.2-5.1) and PCI (β=0.12; 95%CI 0.01-9.0) were independent predictors of improvement in SF-36 at 6 months.

Conclusions: Increasing age was associated with worse HRQOL & mortality in ACS pts at 6 months. However, octogenarians experienced more improvement in HRQOL than the youngest age group despite lowest rate of revascularization. Thorough clinical evaluation is mandatory in the management of the elderly to balance benefits in mortality vs. HRQOL.

<table>
<thead>
<tr>
<th>HRQOL</th>
<th>SF-36</th>
<th>PCS</th>
<th>MCS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>6 Month</td>
<td>p</td>
</tr>
<tr>
<td>&lt;60 yrs</td>
<td>54.1±17.8</td>
<td>58.9±12.9</td>
<td>0.01</td>
</tr>
<tr>
<td>60-80 yrs</td>
<td>44.4±18.7</td>
<td>56.6±18.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;80 yrs</td>
<td>39.4±17.1</td>
<td>51.5±17.2</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

p value: <0.01, 0.07, <0.01, 0.02, 0.44, 0.07
10. CHF-HOME (Congestive Heart Failure - Home, cOmunity, Monitoring and Exercise) Program: A Multidisciplinary Program to Improve the Outcome of Patients with Congestive Heart Failure

TS TSE, 1 YFT LEE, 1 HL CHAN, 1 SF YEUNG, 1 R WONG, 1 KW WONG, 1 WK CHEUNG, 1 CHB CHAU, 1 KL WU, 1 SHG CHEUNG, 1 CY CHEUNG, 1 YNA NG, 1 D WONG, 1 A LI, 1 HY CHO, 1 SW WONG, 1 KL TSUI, 1 KK CHAN, 1 SK LI 1

1Department of Medicine; 2Community and Patient Resource Centre; 3Department of Physiotherapy; 4Department of Dietetics, Pamela Youde Nethersole Eastern Hospital, Hong Kong

Introduction: Congestive Heart Failure (CHF) is a growing public health problem in Hong Kong. In Pamela Youde Nethersole Eastern Hospital, numbers of admissions for CHF continued to increase, with 1.5 fold increase from 2001 to 2005. It is one of the leading causes of hospitalization in individuals older than 65 years of age. Readmission rate for CHF is very high, with 33% of patients readmitted or died within 60 days.

Objective: To improve the clinical outcome of patients with CHF, and reduce hospital admissions and resources utilizations.

Methodology: A multidisciplinary heart failure management team was established in October 2007 to identify, assess, intervene and monitor selected patients admitted with CHF, i.e., in-patient clinical assessment, predischarge education and counseling, post-discharge management plan, telephone follow-up and enquiry service, early clinic follow-up. Clinical outcome of those patients with history of recurrent CHF, i.e., 60 days readmission with CHF before and after enrollment into this program were analyzed.

Results: A total of 173 patients were enrolled between 3rd October and 30th June 2008. Ninety-eight patients had history of recurrent admission for CHF. Their mean age was 74.75 yrs. The numbers of 60 days readmissions for CHF amongst these 98 patients were 29 before enrolling into this program, and were reduced to 16 after enrolling into this program (P=0.04). A total of 264 telephone follow-up and 49 telephone enquiry service were provided. Thirty-five episodes of early evidence of CHF were recognized, which were settled without hospital admissions. Drug and dietary advice, awareness of CHF disease and symptoms, importance of home care and self-assessment were reinforced through these services.

Conclusions: CHF-HOME Program improves the clinical outcome of patients with CHF, and reduce hospital admissions and resources utilizations.

11. Perioperative Negative Emotions and Quality of Life Six Months after Cardiac Surgery

PJ TULLY, 1, 2 RA BAKER, 1 DA TURNBULL, 2 HR WINEFIELD 2

1Cardiac Surgery Research Unit, Flinders Medical Centre; 2School of Psychology, The University of Adelaide, South Australia

Objective: Specific syndromal aspects of depression and anxiety have not been explored in relation to changes in health related quality of life (HRQOL) after cardiac surgery. The purpose of this study was to examine the impact of depression, anxiety and general stress on quality of life (QOL) after coronary artery bypass graft (CABG) surgery. Utilizing a tripartite conceptual model of depression and anxiety as a theoretical framework, we hypothesized that general stress symptoms, rather than unique depressive or anxiogenic symptoms, will predict lower improvement in QOL after CABG surgery.

Methods: Elective CABG patients (n=226) completed baseline self-report measures of negative emotions and HRQOL and 193 patients completed these measures at six-month follow-up. Multi-level modeling analyses were performed to test the hypothesis.

Results: Depression and anxiety symptoms simultaneously tempered gains in HRQOL domains tapping into vitality, social functioning, general health, bodily pain and physical role functioning (all \( p<0.05 \)). General stress, in combination with depressive symptoms, mediated HRQOL in the areas of general mental health and emotional role functioning (all \( p<0.05 \)).

Conclusion: This study adds to previous research by outlining discrete associations between specific HRQOL domains, and is perhaps the first to test a theoretical model of depression and anxiety in relation to CABG patients' perceptions of HRQOL. These findings encourage further research on negative emotions and HRQOL in cardiac surgery patients.
Community Cardiac Rehabilitation Program – Local Experience in a Regional Rehabilitation Centre

KC LEUNG,1 KP LEUNG,1 SW TANG,1 KM CHAN1

1Cardiac Rehabilitation Team, Tung Wah Eastern Hospital; 2Tung Wah Group of Hospitals Ko Wong Mo Ching Memorial Holistic Health Care Centre; 3Haven of Hope Community Rehabilitation Day Centre, Hong Kong

Introduction: Comprehensive Cardiac Rehabilitation Program (CRP) has been shown to have positive health benefits in particularly cardiopulmonary fitness. In 2006, only 15.2% of HKEC in-patients discharged with coronary heart disease had participated in the exercise-based CRP. To cope with the increasing demand of CR and widen the service provision in terms of more flexible time and convenient place, a community based CRP through partnership with NGOs was set up to enhance patient’s early community reintegration with positive health-related outcomes while decreasing the service demand of HA.

Purpose of the Project: To study the feasibility of a community based, high quality CRP in utilization of community resources and to evaluate the improvement of health parameters.

Methods / Program Outline:

1. Eligible participants
   - patients with coronary heart disease (CHD) or with multiple cardiovascular risk factors (referred from acute hospital without prior rehabilitation training and belonged to low risk group)

2. Format
   - An initial multidisciplinary assessment in Tung Wah Eastern Hospital (TWEH)
   - In addition to individualized home exercise program, six exercise sessions (once per week) were conducted in 2 community centers with physiotherapy guidance ± TWEH nurse or physiotherapist support as necessary

3. Outcome Measures (initial assessment and one week after the sixth training session)
   - maximum aerobic capacity and Heart rate parameters (measured by exercise stress testing)
   - lipid profile
   - quality of life

Results:
- From May 2007 to May 2008, 36 patients were recruited. 30 (83%) were male and the mean age was 58.1 (Range 43 to 79).
- Thirty patients had CHD and 6 had multiple cardiovascular risk factors. Twenty-one patients (58%) had percutaneous angioplasty done.
- All of them completed the program uneventfully. No exercise related complications occurred.

A. Aerobic capacity
There was significant improvement in mean aerobic capacity from 10.4 to 12.9 METS, i.e. 2.5 ± 1.3 METS (p < 0.0001) or 24% increment which was comparable to hospital based model.

B. Mean lipid profile
Improvement in mean lipid profile was noted.

<table>
<thead>
<tr>
<th></th>
<th>Change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cholesterol</td>
<td>↓0.8±0.95</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Triglyceride</td>
<td>↓0.35±0.76</td>
<td>&lt;0.013</td>
</tr>
<tr>
<td>HDL-Cholesterol</td>
<td>↑0.01±0.12</td>
<td>NS</td>
</tr>
<tr>
<td>LDL-Cholesterol</td>
<td>↓0.6±0.85</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Around 72% of patients achieved target LDL-C <2.6 mmol/L after the program.

C. Mean resting and submaximal workload HR (Bruce Protocol)

<table>
<thead>
<tr>
<th>HR (beats/min)</th>
<th>Change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resting</td>
<td>↓8.6±11.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>stage 1</td>
<td>↓12.2±10.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>stage 2</td>
<td>↓14.1±11.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>stage 3</td>
<td>↓16.3±13.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>stage 4</td>
<td>↓14.8±10.3</td>
<td>&lt;0.03</td>
</tr>
</tbody>
</table>

D. Quality of Life (measured by WHOQOL)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Health</td>
<td>↑0.5±1.0</td>
<td>0.009</td>
</tr>
<tr>
<td>Psychological</td>
<td>↑0.2±1.4</td>
<td>NS</td>
</tr>
<tr>
<td>Social</td>
<td>↑0.4±1.5</td>
<td>NS</td>
</tr>
<tr>
<td>Environmental</td>
<td>↑0.4±1.3</td>
<td>NS</td>
</tr>
</tbody>
</table>

E. Admission
No mortality and post 6 month CVS related re-admissions and events was noted for these patients.

Conclusion: Community CRP is a feasible model in enhancing service link between hospital and community centres. It was shown to improve health outcomes (comparable to hospital – based model).
13. Affective Disorders as Risk Factors for Delirium after Cardiac Surgery

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1Cardiac Surgery Research Unit, Flinders Medical Centre; 2School of Psychology, The University of Adelaide, South Australia

Objectives: Delirium is a known adverse outcome of cardiac surgery and research has supported an association with depressive symptoms. The objective of this study was to determine the association between incident delirium after cardiac surgery and preoperative affective disorders, and also Type-D personality.

Methods: Ninety nine cardiac surgery patients were assessed preoperatively for mood and anxiety disorders using structured diagnostic interview, and patients completed a Type-D scale. Patients were re-examined for postoperative delirium and results were analysed using Fisher's exact tests.

Results: Postoperative assessment showed that 22 (22.2%) patients met criteria for delirium. The prevalence of affective disorders at baseline was 12.1% for current major depression, 8.1% for panic disorder and 4% for generalized anxiety disorder (GAD). Delirium was associated with major depression (5.2% vs. 36.4%), p<0.001, panic disorder (2.6% vs. 27.3%), p<0.001, GAD (1.3% vs. 18.2%), p<0.01 and current alcohol abuse (0% vs. 9.1%), p=0.05. Social phobia was not associated with incident delirium (1.3% vs. 9.1%), p=0.12. Delirium was associated with high negative affect without social inhibition (23.4% vs. 45.5%), p=0.06, but not in combination with social inhibition (i.e. Type-D personality) where a trend was observed (11.7% vs. 27.3%), p=0.10.

Conclusions: This preliminary study highlights an association between affective disorders and incident delirium following cardiac surgery, while support was also shown for negative affect in isolation without social inhibition. This suggests that current distress rather than distressed personality style is associated with incident delirium. Future research should consider the utility of differential diagnosis for postoperative delirium among cardiac surgery candidates who have a high prevalence of affective disorders and explore rehabilitation options for this precarious population.

14. Hypertension in Pregnancy is an Independent Risk Factor for Hypertension Later in Life

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1Mayo Clinic, Rochester, MN; 2University of Texas, Houston, TX; 3University of Utah, Salt Lake City, UT; 4University of Michigan, Ann Arbor, MI; 5Pacific Health Research Institute, Honolulu; 6University of Mississippi Medical Center, Jackson, MS, USA

Objective: The association between hypertension in pregnancy and hypertension later in life increasingly is being reported. We aimed to assess the role of hypertension in pregnancy as an independent risk factor for future hypertension.

Materials and Methods: Women who participated in the Family Blood Pressure Program study (n=4782) were categorized into women with no history of pregnancy lasting more than 6 months (n=718), women with no history of hypertension in pregnancy (n=3421), and women with a history of hypertension in at least one pregnancy (n=643). We used Kaplan-Meier and Cox proportional hazard models to estimate and contrast the risks of subsequent diagnoses of hypertension among the groups.

Results: Women with a history of hypertension in pregnancy, compared to those without such a history, were at significantly increased risks for the subsequent diagnoses of hypertension (p<0.001). The increased risk for subsequent hypertension remained significant after controlling for race, family history of CVD, smoking, dyslipidemia and diabetes mellitus, with an adjusted hazard ratio (HR) of 1.88, p<0.001.

Conclusions: Our results suggest that hypertension in pregnancy may be an independent risk factor for hypertension later in life.
Clinical Outcomes of Cardiac Rehabilitation Program on Functional Capacity, Biochemistry and Physiological Changes

S. Kanchanaporn, R. Chuanchaiyakul, D. Riannukool
Cardiac Rehabilitation Clinic, Bangkok Heart Hospital, Thailand

Objective: To evaluate the effectiveness of cardiac rehabilitation program impact on functional capacity, biochemistry and physiological changes.

Method: Patient who enrolled to phase 2 cardiac rehabilitation program and attended more than 2 sessions from the period of January 2006 - June 2008. Outcome variables were measured pre and post program including three categories; functional capacity was measured by distance covered in a 6 minute-walk distance (6MWD) and metabolic equivalent (METs) comparison. Biochemistry was measured by fasting plasma glucose (FBS) hemoglobin A1c (HbA1c), lipid profile including LDL, HDL, triglyceride and the last categories were physiological changes that measured by resting heart rate and blood pressure adaptation and body composition.

Result: 420 patients were male 77.1%, female 22.9%, mean aged 59.5 years old. Patients were attended cardiac rehabilitation that was implemented supervised exercise program, counseling of risk factor modification and smoking cessation. Mean duration of cardiac rehabilitation program was 184.6 days and frequency of attention in cardiac rehabilitation program was 1.83 sessions per week. Functional capacity outcome showed significantly improvement. Pre-post program 6MWD was 363.1 ± 141.3 vs 414.5 ± 132 (p=0.001), METs related physical activity was 2.27 ± 0.09 vs 3.34 ± 1.7 (p=0.000). Biochemistry showed significantly reduction in FBS 125 ± 49.3 vs 111.86 ± 30.4 (p=0.003) LDL 112.25 ± 40.4 vs 94.8 ± 29.99 (p=0.000) and triglyceride 135.14 ± 68.3 vs 120.31 ± 49.69 (p=0.048), significant higher in HDL 45.49 ± 14.48 vs 47.65 ± 11.75 (p=0.043) but no significant change in HbA1c 10.27 ± 17.8 vs 7.14 ± 1.14 (p=0.263). Physiological adaptation showed significantly reduction in resting heart 81.17 ± 55.33 vs 74.3 ± 13.7 (p=0.002) no significantly reduction in systolic and diastolic blood pressure 126.12 ± 56.25 vs 121.86 ± 15.01 (p=0.187), 75.09 ± 9.4 vs 74.9 ± 8.7 (p=0.72) respectively. Body composition showed significantly reduction only percentage of body fat 29.31 ± 10.37 vs 26.4 ± 8.4 (p=0.009). No significant changes in waist circumference , body weight and body mass index (BMI) were 36.18 ± 5.9 vs 37.01 ± 9.3 (p=0.429), 72.73 ± 18.73 vs 72.02 ± 18.16 (p=0.561) and 26.25 ± 5.9 vs 26.83 ± 13 (p=0.831) respectively.

Conclusion: Cardiac rehabilitation program significantly improves clinical outcome at the end of rehab measure on functional capacity, fasting blood sugar, lipid profile, resting heart rate and percentage of body fat.
ABSTRACTS

Abstracts Presentation (Poster):

1. **Chronic Kidney Disease, Especially Proteinuria, is a Powerful Predictor for Cardiovascular Events in High-Risk Hypertensive Patients**

   **K UESHIMA, 1 YASUNO, 1 K OBA, 1 A FUJIMOTO, 1 T OGHIARA, 1 T SARUTA, 3 K NAKAO**

   1 EBMR Research Center, Kyoto University Graduate School of Medicine, Kyoto; 2 Osaka General Medical Center, Osaka; 3 Keio University Graduate School of Medicine, Tokyo

   **Objective:** Chronic kidney disease (CKD) is associated with cardiovascular (CV) morbidity and mortality as well as loss of renal function. In this context, we aimed to evaluate the effect of proteinuria and the level of estimated glomerular filtration rate (eGFR) on CV events rate in high-risk hypertensive patients as a subanalysis of CASE-J (Candesartan Antihypertensive Survival Evaluation) trial.

   **Method:** The CASE-J trial enrolled 4,728 high-risk Japanese hypertensive patients, who were randomly assigned to candesartan- or amlodipine-based treatment regimens. This trial disclosed that both two treatment regimens equally suppressed the incidence rates of CV events. Thus, we analyzed the data as an observational study irrespective of allocated drugs. CKD was defined as proteinuria (PU) and/or decreased eGFR (<60 ml/min/1.73 m²) at enrollment. We divided CASE-J patients into two groups (without CKD: n=1983, with CKD: n=2720), and also evaluated the effect of proteinuria and the level of eGFR (cut-off point: 60 ml/min/1.73 m²) on CV events rate (Group A: PU(-) and eGFR≥60, n=1983, B: PU(-) and eGFR<60, n=1815, C: PU(+) and eGFR≥60, n=330, D: PU(+) and eGFR<60, n=575). Hazard ratio (HR) was calculated with multivariable Cox regression analysis adjusted for difference of baseline characteristics.

   **Results:** During 3.2 ± 0.9 years of follow-up, 201 (7.4%) patients with CKD experienced CV events and 67 (3.4%) patients without CKD did (HR: 2.08, 95%CI: 1.57-2.76). In a subgroup analysis, 67 (3.4%) patients in Group A, 95 (5.2%) in Group B, 31 (9.4%) in Group C and 75 (13.0%) in Group D experienced CV events (Group B: HR: 1.38, 95%CI: 1.00-1.90, Group C: HR: 3.07, 95%CI: 2.00-4.70, Group D: 4.00, 95%CI: 2.85-5.59 vs. Group A). These results indicated that proteinuria has an adverse impact on CV events rate independent of the level of eGFR.

   **Conclusion:** The present study shows that CKD, especially proteinuria, is a powerful predictor for CV events. Accordingly, we should pay more attention to presence or absence of proteinuria in risk stratification in high-risk hypertensive patients.

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2. **Predictive Values of Blood Pressure Indexes for Cardiovascular Events in High-Risk Hypertensive Patients: A Subanalysis of CASE-J Trial**

   **YASUNO, 1 K UESHIMA, 1 K OBA, 1 A FUJIMOTO, 1 T OGHIARA, 2 T SARUTA, 3 K NAKAO**

   1 EBMR Research Center, Kyoto University Graduate School of Medicine, Kyoto; 2 Osaka General Medical Center, Osaka; 3 Keio University Graduate School of Medicine, Tokyo

   **Objective:** Systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse pressure (PP) have been reported to be the predictors of CV events. We aimed to compare the associations of SBP, DBP, and PP levels at enrollment with the incidence of CV events in high-risk hypertensive patients as a subanalysis of Candesartan Antihypertensive Survival Evaluation in Japan (CASE-J) trial.

   **Methods:** We analyzed data of 4,703 patients from CASE-J trial who were randomly assigned to either candesartan- or amlodipine-based regimens. We used the multiple Cox regression analysis to estimate the hazard ratio (HR) for CV events adjusted for baseline characteristics. Improvement of likelihood ratio was calculated to compare the predictive utility for CV events among three BP indexes. To perform pairwise comparison, two of three BP indexes were subsequently included in the multiple Cox regression analyses.

   **Results:** The exceptional BP control (less than 140/80 mmHg) was achieved in the present study. Of 4,703 patients (mean age: 63.8 years), 268 (5.7%) patients experienced CV events for a rate of 17.7 per 1000 person-years during 3.2 ± 0.9 years of follow-up. HR for CV events per 1SD increase of SBP, DBP, and PP were 1.19 (95%CI: 1.04-1.36), 0.79 (95%CI: 0.69-0.90), and 1.35 (95%CI: 1.19-1.53). Improvement of likelihood ratios were 6.1, 11.7, and 20.7, respectively. Pairwise comparison revealed that SBP and DBP were not positively associated with CV events in models with PP, whereas a positive relationship with PP was still observed.

   **Conclusion:** The present study showed that PP has a stronger predictive utility for CV events than SBP and DBP in high-risk hypertensive patients. These findings supported the concept that increased PP was associated with advanced atherosclerosis and target organ damage.
ABSTRACTS

Abstracts Presentation (Poster):

3.
The Role of the Health Fitness Programmer for Cardiac Rehabilitation in a General Hospital
T SAKAGUCHI, M CHIBA, R SAKAE, S YANAGIMOTO, Y SAKAMOTO, S TAKAOKA, T HAYASE, K UESHIMA, Y NOGI
Nogi Hospital, EBM Research Center at Kyoto University, Japan

Background: Since 2006, our general hospital, which has 95 beds, has been insurance-approved for Cardiovascular Rehabilitation (CR). In our hospital, 2 Health Fitness Programmers (HFP) are engaged in CR. Although HFP were originally working at sports facilities and fitness clubs, up to 40% of HFP have now begun to work for medical institutions. We will consider the ideal future for HFP in general through examining the operation of our HFP.

Current state: Our HFP are engaged in providing CR and exercise training for patients with diabetes mellitus while in hospital. Also, they work as exercise instructors in our facility in accordance with Article 42 of the Medical Care Law and in a nursing-care facility as exercise trainers. The actual numbers of exercise training given for CR, patients with DM, patients in a facility in accordance with Article 42 of the Medical Care Law, and patients in a nursing-care facility per week were 32, 18, 21, and 4 cases, respectively. Our HFP give questionnaires to their patients periodically, both to improve their exercise instruction, and to revise their exercise programs. Accordingly, patients have not become bored with their physical training, because their requests about exercise programs changes have been accepted.

Perspective: Since other medical staff members are unfamiliar with giving instructions for special physical training and resistance training, HFP should take a major role in these fields. In addition, we are ready to forge a medical partnership with fitness clubs or health promotion facilities. When the partnership is achieved, HFP will mainly concentrate on developing and maintaining good working relationships.

Conclusion: HFP are expected to be important leaders in the fight against lifestyle-related disease and in preventing ischemic heart disease. As the number of HFP who are hired into positions as medical staff leaps upward, HFP should begin to combine both advanced skills in exercise training and comprehensive medical knowledge.

4.
The Accuracy of the New Portable ECG Monitor, HCG-901 and Its Usefulness in Cardiac Rehabilitation
M IMAI, M MASUDA, K UENISHI, M MISHINA, K UESHIMA, H KUZUYA
1Higashiyama Takeda Hospital, Kyoto; 2EBM Research Center, Kyoto University Graduate School of Medicine, Kyoto, Japan

Purpose: As portable ECG monitors are more commonly used nowadays, we evaluated the accuracy of the non-transmission portable ECG monitor, HCG-901 (Omron Healthcare Co., Ltd.) for clinical use and the usefulness of the monitor on non-supervised cardiac rehabilitation.

Method: Ten subjects with the convalescent phase of cardiac diseases (7 males aged 60±8) were enrolled. 1) ECG was recorded simultaneously with HCG-901 and ECG monitoring device during supervised exercise training. Those records were compared with the ones from the other ECG monitoring device. 2) ECG was recorded with internal or external electrodes during exercise training at home, on awakening, after dinner, before bedtime or on the occurrence of subjective symptoms.

Results: 1) The records from both devices were very much concordant regarding R-R interval (r=0.98), QRS complex (r=0.98), T-wave amplitude (r=0.95) and R-wave amplitude (r=0.81), including the ones recorded during exercise. Thirteen cases (26%) of VPC, SVPC as well as ST segment depression recorded during exercise were detected. 2) Patients recorded ECG as followings: Duration: 9.2±2.9 days, Number of records: 53±23, Total number of records: 527. Eight cases of VPC, paroxysmal atrial fibrillation, SVPC, sinus bradycardia or ST segment depression during exercise training were detected. ECG was recorded during exercise training at home while keeping the heart rate between 99.0±11.3.

Discussion: The comparison suggests that ECG recorded with HCG-901 is quite accurate and the analysis result was credible. With the simplicity in use, HCG-901 is expected to be a useful monitoring tool for cardiac rehabilitation.
5. Profitability of the Japanese Cardiovascular Rehabilitation System for a Small General Hospital

SY NAGIMO TO, M CHIBA, Y SAKAMOTO, T HAYASE, K UES HIMA, Y NOGI
Nogi Hospital, EBM Research Center at Kyoto University, Japan

**Background:** Since 2006, our small general hospital, which has only 95 beds, has been insurance-approved for Cardiovascular Rehabilitation (CR). In these small hospitals, maintaining the profitability of medical practice is very important. We calculated the balance of payments of CR performed in our hospital in order to evaluate the profitability of Japanese CR system for small general hospitals.

**Method:** After establishing the CR system in our hospital, we assessed the total income and expenditure for CR. Total income consisted of all fees charged for CR, CR planning, exercise testing, exercise prescription, drug administration guidance, nutritional guidance, and discharge guidance. Total expenses consisted of equipment purchase expenses, depreciation expenses, supply expenses, and personnel expenses.

**Results:** Persistent CR (more than 70% of persistence rate) was performed for 55 patients. Settlements of balance per month including 1) the number of CR cases, 2) total revenue, 3) total expenditure, and 4) profit rate were as following:

- **Fiscal 2006:** 1) 86.7 cases, 2) $6,075, 3) $3,147, 4) 48.2%.
- **Fiscal 2007:** 1) 142.8 cases, 2) $8,203, 3) $3,132, 4) 61.8%.
- **Fiscal 2008:** 1) 137.0 cases, 2) $7,867, 3) $3,127, 4) 59.9%.

We could carry out highly profitable CR in a small hospital because of insurance-approval of our facility for criterion I (high grade), using existing medical instruments and existing manpower, and by maintaining a highly persistent rate of CR.

**Conclusion:** When the CR system is established in a small hospital, it is important to consider profitability as well as necessity. Using our original equipment and manpower, we were able to demonstrate highly persistent and profitable CR. This shows that even in small hospitals, highly profitable CR can operate.

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6. Disclosure of Information on the Internet about Cardiac Rehabilitation in Insurance-Approved Institutes in Japan

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Nogi Hospital, EBM Research Center at Kyoto University, Japan

**Background:** Recently, many kinds of information have become available through the internet about the various medical fields. We evaluated the quality and quantity of information available on the Internet about cardiac rehabilitation (CR) in Japanese insurance-approved institutes.

**Methods:** There are 143 Japanese insurance-approved institutes of CR which are registered on the website of the Japanese Association of Cardiac Rehabilitation (JACR). We evaluated the following data through the web-sites of each institute: 1) the numbers of cardiologists and cardiovascular surgeons, 2) the numbers of registered cardiac rehabilitation masters, 3) the annual numbers of patients with percutaneous coronary intervention (PCI) and patients with cardiac surgery, 4) the annual numbers of patients receiving CR, 5) contents of the CR. We assessed the description rates for each of these information items.

**Results:** Although the mean description rates of the numbers of cardiologists and cardiovascular surgeons were 79% and 67% respectively, the mean description rate of the numbers of registered cardiac rehabilitation masters was only 11% (p < 0.0001). Moreover, while the mean description rates of the annual numbers of patients with PCI and cardiac surgery were 63% and 52% respectively, but the mean description rate of the annual numbers of patients receiving CR was only 13% (p < 0.0001). Only 46% of the institutes introduced their CR system at all.

**Conclusion:** In conclusion, even for the insurance-approved institutes of CR which are registered on the website of the JACR, their description rates about CR on their websites are not very high. Disclosure of information about CR on the Internet should be strengthened in order to promote improved CR in Japan.
ABSTRACTS

Abstracts Presentation (Poster):

7.

The Relationship Between the Intensity of Systemic Hypoxia and Cardiac Autonomic Activity Induced by Physical Stimulation

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Objective: This study investigates how various hypoxic interventions affect cardiovascular autonomic activities during posture change and the Valsalva maneuver.

Materials and Methods: Ten healthy sedentary men exposed to 12%, 15% and 21% O2 for 1 hour in a normobaric hypoxia chamber in a random order. Before and 30 min after various O2 concentrations were administered, subjects performed the sit-up test and the Valsalva maneuver. A spectral analysis of heart rate variability and cardioacceleration response to posture change as well as Valsalva ratio were performed to determine the cardiac autonomic activity.

Result: While the patient rested in a supine position, exposure to 12% O2 reduced total power and high frequency (HF) and increased low frequency (LF) and the ratio of LF to HF. Furthermore, this hypoxic exposure simultaneously (i) lowered the changes of time and frequency domains in HRV and cardioacceleration response induced by the sit-up test, (ii) attenuates the HR responses to the Valsalva maneuver. However, resting and posture change-induced HRV and heart rate response values were not influenced by both 15% and 21% O2 exposures.

Conclusion: Acute hypoxic exposure affects cardiac autonomic activities, with reactions determined by the intervening O2 concentrations. Exposure to 12% O2, but not 15% O2, down-regulates cardiac autonomic responses to posture change and the Valsalva maneuver.

8.

Does the Dialysis Arteriovenous Fistula Possess Homogeneous Mechanical Properties?

PJ KO,1 WC TSAI,2 SH PAO,3 CH WANG,4 TC FU,5 CC HSU5
1Division of Thoracic and Cardiovascular Surgery, Chang Gung Memorial Hospital, Linkou; 2Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Linkou; 3Industrial Technology and Research Institute, Hsinchu; 4Department of Cardiology, Chang Gung Memorial Hospital, Linkou; 5Department of Physical Medicine and Rehabilitation, Chang Gung Memorial Hospital, Keelung, Taiwan

Objectives: To prove that different local hemodynamic characteristics and physical factors cause different clinical manifestations at different segments in the arteriovenous fistula (AVF).

Materials and methods: Six stage 5 chronic renal failure patients, aged about 57 years old, were recruited in a tertiary care hospital. Four of them had patent radiocephalic anastomosis and the remaining had patent brachiocephalic anastomosis. Another four similar aged patients underwent percutaneous transluminal angioplasty owing to radiocephalic shunt stenosis were also enrolled. Peak systolic and end diastolic velocities, diameter at end diastolic phase, intima-media wall thickness, and the maximum strain at the arterial inflow (Segment a), venous anastomosis (Segment b), 1 cm downstream from the anastomosis (Segment c), midway between the anastomosis and the needle puncture site (Segment d) and needle access region (Segment e) were measured with ultrasonography. Pressure recording at the above five locations in the other four patients was done after successful treatment of AVF stenosis. A mathematical model was derived to approximate the intra-access pressure from the brachial artery pressure of uninvolved limbs. Elastic modulus in each segment can then be calculated.

Results: The peak systolic and end diastolic velocities increased after entry into the fistula and the greatest values were 236 cm/s and 128 cm/s respectively at Segment c. They decreased after leaving this area. The maximum strain had the similar trend as the flow velocity. The greatest value was 4.22% at Segment c and the least value was 1.11% at Segment e.

Conclusion: Ultrasonography can successfully evaluate regional hemodynamic characteristics and mechanical properties in the dialysis access. The AVF behaves heterogeneously at different segments.
Effects of Long-Term Exercise with Medium Intensity on Heart Function of Mice and Possible Mechanisms Approach

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Study Objective: Epidemiological data demonstrate that regular exercise can reduce the morbidity and mortality of cardiovascular diseases by 40-50%. One of the mechanisms known is exercise induced myocardial protection. However, the exact mechanisms of myocardial protection are not clear yet. In this study, the effects of long-term exercise with medium intensity on cardiac function, as well as the effects on heat shock proteins (HSPs) and hypoxia-inducible factor-1α (HIF-1α) expression in mouse myocardium were explored. Possible mechanisms of exercise induced myocardial protection were discussed.

Materials and Methods: Sixteen wild-type mice were randomly divided into two groups: control group (n=8) and exercise group (n=8). The mice in exercise group were forced to run with medium intensity on a treadmill for one hour per day, five days per week. All the treatments in control group are the same as in the exercise group except no running exercise involved. After 10 weeks of intervention, (1) mice cardiac function and heart weight were analyzed by echocardiography; (2) left ventricle weight and tibia length were measured after the mice were sacrificed; (3) the medium part of the left ventricle were used for morphology analysis by hematoxylin & eosin (HE) staining and light microscope imaging; (4) the upper part of left ventricle were used for HSPs and HIF-1α gene expression analysis by RT-PCR or quantitative PCR.

Results: (1) Compared to control group, interventricular septum (IVS) ejection fraction (EF) (1.22±0.13 vs 0.80±0.09 P<0.01), posterior wall of left ventricle (LVPW) EF (1.28±0.30 vs 0.79±0.09 P<0.01) of exercise group were significantly higher; (2) Both left ventricle weight to body weight ratio (6.3±0.74 vs 5.0±0.61 P<0.01) and left ventricle weight to tibia length ratio (12.7±1.35 vs 10.2±2.22 P<0.05) were significantly higher of exercise group than those of control group. (3) Light microscope observation showed that cardiac muscle fibers of exercise mice were thickened and cardiomyocytes were augmented than those of control mice. (4) HSP70 (0.59±0.11 vs 0.85±0.32 P<0.01), HSP90 (0.65±0.31 vs 2.29±0.47 P<0.01), HSP 27 (0.98±0.54 vs 2.15±1.22 P<0.05), αβ-lensprotein (0.84±0.39 vs 2.16±1.45 P<0.05) mRNA expression in exercise group were significantly higher than those of control group; HIF-1α expression in myocardium by exercise might be one of the possible mechanisms.

Conclusion: Long-term exercise with medium intensity caused myocardial hypertrophy and better heart function in mice. Inducing HSPs and HIF-1α expression in myocardium by exercise might be one of the possible mechanisms.

(This study is supported by National Natural Scientific Fund. No: 30672213.)
11. Type D Personality in Chinese Patients with Coronary Artery Disease

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Objective: Increasing evidence supports the prognostic impact of Type D personality (i.e., increased negative emotions paired with emotional non-expression) in patients with coronary artery disease (CAD). This study aimed at estimating the prevalence of Type D in Chinese patients with CAD and performing cross-cultural validation of the DS14 in the Chinese culture.

Method: Patients with CAD (N=326) were recruited from a regional university-affiliated hospital and invited to complete the Chinese version of the DS14. The NEO Five Factor Inventory (n=120), the Hospital Anxiety and Depression Scale (HADS) and the Stress Symptom Checklist (SSC) (n=66) were administered to sub-samples to establish construct and discriminant validity, respectively. Administration of the DS14, HADS and SSC was repeated at one month after hospital discharge (n=66). Stability of the DS14 was examined by repeating data collection with another sub-sample (n=100).

Results: The prevalence of Type D personality was 31% in Chinese patients with CAD. Confirmatory factor analysis indicated that there was no cross-cultural variation in the theoretical structure of Type D personality [χ2/df=2.89, RMSEA=0.08, Normal fit index = 0.91, Non-normal fit index=0.91, Comparative fit index = 0.93]. The Negative Affectivity and Social Inhibition subscales of the DS14 were internally consistent (τ=0.89/0.81), measured stable traits (3-month test retest ICC=0.76/0.74), and demonstrated significant correlations with the NEO-FFI neuroticism (r=0.78) and extraversion (r=0.64) subscales, respectively. They also discriminated themselves from the more transient emotional states, as the Negative Affectivity and Social Inhibition scores remained unchanged in patients who reported significant improvement in depressed mood and stress level over the first month of hospital discharge.

Conclusion: Type D personality is a prevalent personality trait in Chinese people with CAD. This study suggests that the DS14 is a valid, reliable, and internally consistent measure when used in the Chinese population. Studies are now warranted examining the prognostic risk of Type D personality in Chinese people with CAD.

12. Return to Work after Coronary Disease – A Retrospective Review

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1Occupational Therapy Department; 2Cardiac Rehabilitation and Prevention Centre, Tung Wah Hospital; 3Department of Medicine, University of Hong Kong, Hong Kong

Objective: To review the rate of "return to work" of patients after completion of cardiac rehabilitation program.

Method: It was a retrospective study covering the period from 01/01/2006 to 31/12/2007. Patients engaged in remunerative jobs prior to the onset of coronary disease were recruited for work status and job nature analysis. Data were collected at 1) Program entry; 2) End of the 8 weeks program; and 3) One year post training.

Results: In the review period, a total of 160 patients had completed the cardiac program in Tung Wah Hospital. Age ranged from 33 to 87 (mean 62±11.7); gender distribution was 127 male and 33 female. Among the 160 patients, only 47% (n=75) was working prior to admission. Age ranged from 33 to 81 (mean 55±9.9); gender distribution was 70 male and 5 female. By the end of 8 weeks’ program, 86.7% (n=65) were able to return to previous or other work; only 9 patients changed the job nature due to cardiac related reasons.

The job natures of the subjects are illustrated in following table:

<table>
<thead>
<tr>
<th>Job nature</th>
<th>Manual laborer</th>
<th>Technical</th>
<th>Clerical</th>
<th>Management</th>
<th>Professional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before onset of CHD</td>
<td>14</td>
<td>15</td>
<td>8</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>After 8-weeks program</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>22</td>
<td>14</td>
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Conclusion: According to Mital (2004), return to work is one of the important markers of the success of cardiac rehabilitation. The work simulation training and work counseling of our program helped to assist clients to face their limitation of physical ability and psychological stress; eventually resumed their work. This was reflected by the relatively high rate of return to work (80%). Our result also showed that age above 65 was still able to sustain their job.

This review indicated our sample tended to skew towards older population (62±11.7) as the tren for aging population. The younger clients who would benefit from such program might be missed because of some other reasons such as lack of time to participate in a cardiac rehabilitation program. Modified rehabilitation program tailored for this group of client could be our future direction.
CVD Prevention: How Low to Go in 2009?

SANDEEP GUPTA

From Whipps Cross and St Bartholomews Hospitals, London, United Kingdom

In a world population of around 6 billion, some 17 million deaths occur from CVD each year... and around 80% of them occur in Emerging/Developing economies. In addition, some 20 million people survive a heart attack or stroke each year, and their risk for further CV events remain 5-8 times greater.

We acknowledge the concept of 'lower is better' for management of key cardiovascular risk factors – such as LDL-Cholesterol, blood pressure, salt intake and BMI. The INTERHEART study emphasizes the impact of established risk factors in all populations, and various International guidelines have set suggested goals/targets for such factors. Compounding this is the debate of 'genes versus environment' in causation of CVD.

Concerted efforts need to be maintained to encourage healthier lifestyles, a focus on primary prevention and addressing the particular needs of individual populations – taking into account cultural variations, metabolism issues and socio-economic factors. In parallel the importance of aggressive secondary prevention – whether CV intervention, pharmaco-therapy or cardiac rehabilitation – for those suffering a first or recurrent CV event, remains.

How stringent we address the CV prevention targets, as we approach year 2009, will be discussed and reflected upon.

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The Role of Fitness and Physical Activity in Heart Disease

TERENCE KAVANAGH

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There is compelling evidence that regular physical activity whether expended at work or during leisure activities, is associated with a reduction in the incidence of heart disease.

As a corollary, since the mid-19th century exercise has also played a role in the rehabilitation of patients with established disease. Initially the approach was pragmatic, with the goal being alleviation of angina and improvement in functional capacity. Subsequently exercise therapy fell out of favour for an extended period and it was not until the 1950's that it re-emerged as a component of cardiac rehabilitation programs. Ensuing research has established its worth.

Physical fitness, considered a surrogate for physical activity, has now been shown to be a significant predictor of cardiac and all-cause mortality. As such, it should be incorporated into a risk stratification procedure for individuals with suspected or established vascular disease. Questions remain as to:

1. The mechanisms by which physical exercise benefits the cardiovascular system,
2. The degree to which one's genotype contributes to exercise capacity, and
3. Whether the improvement in survival in patients attending a cardiac rehabilitation program is associated with an increase in physical fitness or physical activity,
4. These and related subjects will be addressed.

Objectives of the Session

1. Outline the historical background of exercise therapy in ischaemic heart disease
2. Explain the scientific rational for its place in a comprehensive cardiac rehabilitation program
3. Evaluate the role of physical fitness as a prognostic indicator in cardiac rehab patients

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EatSmart at School: From Survey to Practice

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From Central Health Education Unit, Department of Health, Hong Kong

Background & Objectives

With an increasing trend of obesity among primary school students, promoting healthy eating habits has become one of the important initiatives of the Department of Health (DH). In this light, a territory-wide EatSmart@school.hk Campaign was launched in 2006. Following the baseline survey in schools in 2006, another survey was commissioned in 2008 to deepen our understanding on the knowledge, attitudes and practices among students, parents and schools towards healthy eating during this period.

Methods

The 2008 survey was a cross-sectional study conducted in primary schools in Hong Kong in January. Standardised questionnaires were used to collect information from the school management, Primary 4 and 5 students and their parents.

Results

Fifty-one primary schools were recruited with 9152 (81.9%) students and 8265 (73.9%) parents responding. Most students had good knowledge of healthy eating principles though half of them would still choose less healthy food. Girls were more likely than boys to have adequate intakes of fruit and vegetables, and to participate in healthy eating promotional activities. Majority (78.6%) of responding parents considered nutritional value an important factor influencing food selection and they were generally capable of selecting healthier food items. Over half (61.3% to 92.1%) of the parents supported some form of regulation on school lunch and snack provision. Less educated and lower income parents showed lower levels of understanding and support for healthy eating. About half (52.9%) of the schools developed healthy eating policies whereas one-fifth did not participate in any healthy eating promotional activities. Overall, schools that participated in DH healthy eating promotion programmes showed more encouraging results. Compared with 2006, improvements were seen in students' attitudes and practices as well as parents' support for healthy eating and their tighter regulation.

Conclusion

Compared with 2006, this survey showed that parents and children were more supportive towards healthy eating. Gaps were identified for further programme and research planning.
Metabolic Syndrome Identification and Treatment

KATHY BERRA

From Stanford Prevention Research Center, Standford University School of Medicine, California, USA

Metabolic syndrome (MS) [also known as Syndrome X – Insulin Resistance Syndrome – Dysmetabolic Syndrome – Multiple Metabolic Syndrome – The Deadly Quartet – and Cardiometabolic Risk] defines a clustering of cardiovascular risk factors associated with an increased risk of developing Type 2 Diabetes and cardiovascular disease (CVD). These risk factors include: glucose intolerance, dyslipidemia (especially high triglycerides and low HDL cholesterol, small dense LDL, postprandial lipemia and remnant lipoproteins), hypertension, obesity, and increased waist circumference. Other abnormal pathophysiologic processes often accompany MS such as endothelial dysfunction, a prothrombotic state, and increased and levels of inflammatory markers.

Although the term MS is commonly used, the underlying pathophysiology is a condition called "Insulin Resistance" (IR). Not everyone with MS is insulin resistant. However, IR is significantly more common in persons with MS. One’s susceptibility to become insulin resistant is influenced by genetics and lifestyle. Two major lifestyle risk factors for the development of IR are increased weight and decreased physical activity levels.

Researchers are looking for ways to more easily identify those persons with the MS risk factors who are insulin resistant. An important finding by McLaughlin and colleagues was the association between TG/HDL-C ratio and the presence of IR. Their studies indicate that a ratio of ≥3 TG/HDL-C (in persons with a BMI ≥25 and TG >130 mg/dL) is predictive of insulin resistance. In pre-menopausal women this ration is >1.5.

Treatment for MS and IR is multifactorial and is based on key therapeutic lifestyle changes. Improving and maximizing regular aerobic exercise, reaching ideal body weight, and smoking cessation will significantly improve insulin sensitivity thus reducing IR and it's associated negative metabolic processes. A heart healthy diet designed to lower calories, triglycerides, and saturated fat is an additional key component of treating persons with MS and IR. Making these lifestyle changes is critical in preventing the onset of Type 2 Diabetes and cardiovascular diseases. In addition to therapeutic lifestyle changes, medical therapies such as statins, fibrates, niacin, aspirin, hypoglycemics, anti-hypertensives (including Angiotensin Converting Enzyme Inhibitors for persons with renal disease) are recommended for the treatment of associated cardiovascular risk factors. It is important to remember that persons with insulin resistance but without CVD who develop Type 2 Diabetes are considered to be at an equivalent risk for a cardiac event when compared to persons with CVD.

Our challenge is to prevent the development of this constellation of well know risk factors for the Metabolic Syndrome and Insulin Resistance through early therapeutic lifestyle change and cardiovascular risk factor management.

Furture Readings

1. Reaven G. The metabolic syndrome or the insulin resistance syndrome? Different names, different concepts, and different goals. Endocrinol Metab Clin N Am 2004;33:283-303.
Recent Advances in Heart Failure Treatment

CHEUK-MAN YU

From Department of Medicine & Therapeutics, Prince of Wales Hospital; and Institute of Vascular Medicine, The Chinese University of Hong Kong, Hong Kong

Heart failure (HF) is a disease with high morbidity and mortality. It is also the commonest cause of medical ward admission in developed countries. The incidence of HF has been increasing world-wide in the past two decades. With the current state-of-the-art therapy, 3-year mortality remain >30% in NYHA class III HF, and close to 40% in NYHA class IV HF.

Nowadays HF is classified according to its stages into A to D. Stage A: High risk for developing HF, Stage B: Asymptomatic HF, Stage C: Symptomatic HF, and Stage D: Refractory end-stage HF. Most of the clinical trials targeting on Stage C, though some of them also focused on stage B and D. In the diagnosis, the use of natriuretic peptide has shown to be a both sensitive and in particular specific marker, i.e. good as a rule-out test if BNP or NT-proBNP levels are normal. Medical therapy has not been significantly changed in the last few years, but consolidated on the use of neurohormonal blockers, such as ACE inhibitors, beta-blockers, and consider the third drug by either aldosterone receptor blocker or angiotensin receptor in selected patients. These agents are important as survival benefit and reduction of hospitalization rate are clearly demonstrated.

Despite medical therapy which has been rather steady in the past few years, device therapy for HF has been blooming. Studies observed that at least a quarter of patients with heart failure had evidence of electromechanical delay, commonly in the form of left bundle branch block or intraventricular conduction delay on surface electrocardiogram. This condition results in asynchronous contraction, mitral regurgitation and was associated with a poor prognosis. Cardiac resynchronization therapy (CRT) has a potential role in these patients. Initial non-randomized, and subsequently multicenter clinical trials, consistently found the following benefits after CRT: improvement of symptoms and exercise capacity (6-minute hall walk distance), gain in ejection fraction as well as improvement of quality of life. In addition, we have demonstrated that biventricular pacing increases diastolic filling time, reduces pre-systolic time, reduces mitral regurgitation, and decreases left ventricular volume (reverse remodeling). Reduction of all-cause mortality, heart failure event and sudden cardiac death by CRT has also been confirmed by mutlicentre trials (COMPANISON and CARE-HF studies).

Although not every patient response to CRT, the use of echocardiographic imaging has been found highly useful in assessment pre-pacing intraventricular asynchrony and therefore predicting responders of CRT. Another potentially useful device is cardiac contractility modulation (CCM), which is an implantable which boost the intrinsic contractility of the left ventricular by delivering a current to the heart in late systole. Initial results of the device appears promising in Europe, with improvement of symptoms, exercise capacity and ejection fraction. We are currently conducting the only clinical trial outside US and Europe for further evaluation of this new device. Lastly, the use of monitoring device for heart failure is becoming increasingly important in patients receiving HF therapy.

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Models for Cardiac Rehabilitation

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Cardiac rehabilitation is already recognized as the multidisciplinary interventions that assist the patient to learn, to get along and to modify their lifestyle after any type of heart disease. In spite of that cardiac rehabilitation service is still underutilized around the world. There are many models of cardiac rehabilitation: home-based, hospital based and corporate-based and including primary prevention program.

The useful indexes to measure the effectiveness of the model are compliance, cost-effectiveness and reduction of morbidity.

The data from our unit had shown the factors that influence attendance to our program are transportation, working situation, no companion and unrecognized benefits.

Our model combines home-based program with 4-6 visits with our physician during 4-8 months. The patient will be discharge if he/she could reach our goals:
- Exercise at least 20-30 minutes/time for 3 times per week.
- Control weight
- Good control of physiological outcomes: blood pressure, glucose and cholesterol level.

After discharge, all of them will join the STRONG HEART self-help group.

The CARES-THAI already implement CARES-THAI ACTION which adapted concepts from EUROACTION program to set the cardiac rehabilitation after discharge from the hospital by one-week interval visit with our cardiac rehabilitation therapist for one month. The data showed that both models had very high attendance and low dropout with favorable outcome in exercise habit but no significant change in blood chemistry levels.

Further Readings

Coronary Artery Disease Club – One of the Experience of Cardiac Rehabilitation in Guangdong

LAN GUO, PING WANG, GUO-LIN ZHANG, ZHI LIU, GUI-LAN WU

From Guangdong Cardiovascular Institute, Guangdong Academy of Medical Sciences, Guangdong General Hospital, Guangdong, China

Introduction

Cardiac rehabilitation (CR) programs are designed to limit the physiologic and psychological effects of cardiac illness, reduce the risk for sudden death or re-infarction, control cardiac symptoms, stabilize or reverse the atherosclerotic process and enhance the psychosocial and vocational status of the patients. Very few Chinese patients attend the programs because of various reasons. How to motivate patients to participate in the programs is a real problem. Coronary artery disease (CAD) Club is a way to recruit patients and attract them to keep participating in the CR programs. We evaluated the effects of cardiac rehabilitation exercise therapy on quality of life (QOL) in the CAD patients. The psychological and physiological status, the social adaptation ability and knowledge and practices in CHD prevention/control were also studied.

Methods

A CAD Club was set up to recruit patients. A staff performed initial and follow-up patient assessment. Cardiac rehabilitation sessions include a combination of telemetry-monitored exercise, individual counseling, and small and large group education classes. Letters and telephone were used to improve the CR compliance. During follow up of patients in clinics, patients were encouraged to comply with comprehensive second prevention and lifestyle changes (such as stop smoking, regular exercise and dieting). Typical program involves prescribed exercise sessions using THR and RPE. Exercise time is 30 minutes, 3-5 times a week. The follow-up post-CR included 1, 3, 6 months and 1 year post program assessment. 109 CAD patients after percutaneous transluminal coronary angioplasty (PTCA) were randomized. 78 of them were set in the rehabilitation exercise group and 31 in the control group. All patients were tested with the CAD QOL questionnaire. The questionnaire was filled by the patients or assisted by the staffs without any guidance. SPSS 10.0 was use to analyze the data.

Results

125 questionnaires were distributed and 109 were returned, the participating rate was 87%. There was no significant difference between the two groups in sex, age, education, marriage status and occupation. The results showed significant difference in total score (t=2.63, p=0.01) and sub-score of knowledge/practices in CHD prevention/control (t=4.74, p<0.001). The rehabilitation exercise group had higher score than the control. No difference was observed in the scores of psychological and physiological status, of social adaptation ability and social supports.

Conclusion

The total QOL score in CAD patients after PTCA in the CAD Club could be improved by cardiac rehabilitation exercise therapy particularly in knowledge and practices in CHD prevention/control. CAD Club is a useful way to improve the secondary prevention of CAD in China.
Health Experience of Chronic Ischemic Heart Disease in Malaysia

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From Department of Rehabilitation Medicine, Faculty of Medicine, University of Malaya, Malaysia

Introduction

To assess the health experience using the ICF Core Sets for Ischemic heart diseases (IHD) in patients after myocardial infarction, coronary artery by-pass grafting surgery (CABG) and percutaneous transluminal coronary angioplasty (PTCA) were recruited for cardiac rehabilitation. This is the pilot study in initiating the use of ICF Core Sets for IHD.

Methodology

Design

Patient were interviewed using ICF Core Sets for IHD by health professional by a dedicated Cardiac Rehabilitation team of both hospital.

Setting

- 2 public hospitals: A tertiary hospital and a General hospital
- Department of Rehabilitation Medicine, University of Malaya Medical Centre (UMMC) and Rehabilitation Department, Hospital Serdang

Subject

Total of 50 patients after myocardial infarction, coronary artery by-pass grafting surgery (CABG) and percutaneous transluminal coronary angioplasty (PTCA) were recruited for cardiac rehabilitation program and for the trial (25 patients from each hospital).

Main Outcome Measures

Bodily functions and structure impairment, activity limitation, level of functioning and participation were investigated.

Conclusion

The presentation will describe the findings of the above study.

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Outpatient Phase III Cardiac Rehabilitation and the Training System of the Masters of Cardiac Rehabilitation in Japan

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1Department of Internal Medicine and Rehabilitation Science, Tohoku University Graduate School of Medicine; 2Department of Health Service Management, Tohoku Fukushi University, Sendai, Japan

KOHZUKI ET AL.: Outpatient Phase III Cardiac Rehabilitation and the Training System of the Masters of Cardiac Rehabilitation in Japan. Cardiac rehabilitation (CR) is an integral component of the continuum of care for patients with cardiovascular diseases. The CR program usually consists of three stages: the acute stage (phase I), subacute stage (stage II) and maintenance stage (phase III). Phase III CR is recognized as a community or home-based program committed to encourage exercise and a healthful lifestyle with the goal of minimizing the risk of recurring cardiac problems (secondary prevention). The Japanese Association of Cardiac Rehabilitation (JACR) established a certification program for the Master of Cardiac Rehabilitation (MCR) to improve quality of cardiac rehabilitation services and to educate the professionals playing a pivotal role in a primary CVD prevention programs in Japan. The number of certified MCR has increased to 1835 by 2008. JACR also established a non-profit organization Japan Heart Club (JHC) in 2004 and started to publish learning materials for health promotion and prevention of CVD. JHC also provides opportunities to participate in CR programs in the community by the activities of "MedEX Club", a multidisciplinary facility provides MCR-supervised exercise sessions, education for patients, and training classes for citizens and health professionals. There are seven MedEX Club branches and 11 classes are being offered nationwide. The MedEx Club can offer convenient, affordable, safe and enjoyable phase III programs and, in the near future, it may be recognized as a standard model of phase III CR service in Japan. (J HK Coll Cardiol 2008;16 (Suppl 1):A23-A28)

Cardiac rehabilitation, master, phase III, Japan Heart Club, MedEX Club

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Cardiac Rehabilitation Program As a Lifelong, Multidisciplinary Approach

Over the past two decades, risk factor modification programs for cardiac patients, commonly referred to as cardiac rehabilitation (CR), have evolved into a comprehensive management strategy. The...
American Heart Association (AHA) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) define CR programs as, "Coordinated, multifaceted interventions designed to optimize a cardiac patient's physical, psychological, and social functioning, in addition to stabilizing, slowing, or even reversing the progression of the underlying atherosclerotic processes, thereby reducing morbidity and mortality".1

Core components for CR recommend a multidisciplinary approach to CR consisting of trained and competent staffs which include physician, cardiac specialist nurse, physical therapist, dietician, occupational therapist, administrator, social worker, and so on.2 The team should also include, where appropriate, pharmacist, physical activity/exercise specialist, and psychologist. The core components of CR are (1) lifestyle management: (physical activity, diet, weight management, and smoking cessation; (2) education; (3) risk factor management; (4) psychosocial counseling; (5) cardio-protective drug therapy and implantable devices; and (6) long-term management strategy. The content of these components should be developed collaboratively by the core CR team and should be delivered by competent, appropriately skilled professionals.

The CR program usually consists of three stages: the acute stage (phase I), subacute stage (stage II) and maintenance stage (phase III). Phase III CR is recognized as a community or home-based program committed to encourage exercise and a healthful lifestyle with the goal of minimizing the risk of recurring cardiac problems (secondary prevention). For the patients' benefit, phase III CR programs should be convenient, affordable, safe and enjoyable. The European Society of Cardiology also recommends that cardiac patients should be oriented to a long-term maintenance regimen with the use of support systems such as coronary clubs, gymnasiums or other facilities to promote long-term prevention strategies in the community.1 In Germany, a close network of currently approximately 6600 heart groups has been established,4 the concept of cardiac reconditioning centers for the prevention and rehabilitation of coronary patients has been tremendously successful.5

Japan Heart Club and the Certification Program for the Masters of CR

With support of the Japanese Association of Cardiac Rehabilitation (JACR), the Japan Heart Club (JHC), a non-profit organization, was established in 2004. The missions of JHC are to (1) organize scientific meetings and workshops for health promotion and prevention of cardiovascular diseases (CVD); (2) publish journals and learning materials for health promotion and prevention of CVD, (3) conduct research for health promotion and prevention of CVD; (4) organize facilities and develop programs for primary and secondary CVD prevention; (5) offer education programs and certification for the Master of Cardiac Rehabilitation (MCR), and other health-related professionals; (6) collaborate with national and international research institutes.

Certification program for MCR started in 2000. The objectives of the certification program are to improve quality of cardiac rehabilitation services and to educate the professionals playing a pivotal role in a primary CVD prevention programs in Japan. The JACR certifies those who understand the purpose of CR and have knowledge, skills and abilities for providing comprehensive CR program through a comprehensive team approach. Referring to American College of Sports Medicine certification objectives,6 the MCR certification examination is based upon the knowledge, skills and abilities (KSA's) in each of the 11 categories below:

1. Anatomy and Biomechanics (4 KSAs)
2. Exercise Physiology (8 KSAs)
3. Electrocardiology (7 KSAs)
4. Human behavior and psychology (6 KSAs)
5. Pathophysiology (13 KSAs)
6. Clinical diagnosis and treatment (7 KSAs)
7. Health appraisal and fitness testing (10 KSAs)
8. Cardiac rehabilitation (3 KSAs)
9. Secondary prevention and patient education for CAD (11 KSAs)
10. Exercise programing (14 KSAs)
11. Safety, injury prevention and emergency care (3 KSAs)
Minimum requirements for candidates are as follows:
- Candidates must possess any of the following certifications or degrees: physician, registered nurse, physical therapist, occupational therapist, clinical laboratory technician, medical engineer, clinical psychologist, and/or exercise trainer.
- Have been a member of the JACR for more than 2 years.
- Have a minimum of 1 year of experience in a CR program or equivalent, and submit 10 case reports about the diagnosis, tests, treatment, and rehabilitation for patients with CVD.

The number of certified MCR has increased to 1835 by 2008 (Figure 1). As shown in Figure 2, the MCR attracts health-related professionals with various backgrounds some of which include physical therapists (39%), physicians (24%), nurses (18%), and clinical laboratory technicians (13%).

**Community-based Phase III CR and Primary Prevention Programs in Japan**

One of the missions for JHC is providing opportunities to participate in a CR program in the community. MedEX Club, a multidisciplinary facility provides MCR-supervised exercise sessions, education for patients, and training classes for citizens and health professionals. There are seven MedEx Club branches and 11 classes are being offered nationwide (Figure 3). The purpose of the MedEx club is to promote regular physical activity in CR patients and prevent cardiac disease and the recurrence of coronary events. Exercise training classes are held in various settings, some of which include hospitals, community centers, fitness facilities, and schools. The classes are typically held once or twice a week under the supervision of the MCRs. In the MedEx Club branch in Sendai, each session lasts 70 minutes and has a capacity of 12 people (Table 1).

![Graph showing the number of certified MCR from 2000 to 2008](Figure 1. The number of certified MCR from 2000-2008 (data from reference 7)).
Figure 2. The professional backgrounds of MCR (data from reference 7).

Figure 3. MedEx Club, the community-based CR programs in Japan (data from references 8 and 9).
Prior to and post-exercise session, participants measure their blood pressure and body weight and fill in the self-health check sheet. The exercise session starts with a 15 minute warm-up, either sitting or standing, followed by 15 minutes of aerobic exercise and 15 minutes of resistance training using elastic bands or their own body weight. The intensity of the aerobic exercise is determined by the cardiopulmonary exercise test measured upon entry to the club. Each session ends with cool down for 15 minutes which includes stretching of the major muscle groups. In addition to weekly exercise sessions, each patient keeps a log for blood pressure and body weight in the morning and night as well as step counts and exercise energy expenditure measured by an accelerometer. The log is submitted to the MCR program every 2 weeks. The MedEx club mainly offers exercise-based CR program, but patients also learn about physical activity, lifestyle modification, psychological management from the MCRs and other participants.

Cardiac rehabilitation is an integral component of the continuum of care for patients with CVD, the MedEx club can offer convenient, affordable, safe and enjoyable phase III programs and, in the near future, it may be recognized as a standard model of phase III CR service in Japan.

### References


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Cardiovascular disease especially coronary heart disease is a major problem in many countries. Cardiovascular diseases account for nearly 29% of all cause mortality and 10% of disease load in 2001. Post myocardial infarction survivors suffer a re-infarction 5 times the healthy population. Secondary prevention protocols can help the patients to live healthier with fewer morbidity and mortality. Cardiac rehabilitation decreases coronary heart disease mortality for nearly 26%.

The old population is expanding in most countries, including I.R. Iran, and 36.8% of Iranian elderly have cardiac diseases.

There are some specialized cardiac rehabilitation centers in large cities in Iran in which their program consist of:
1. in- patient programs with an early assessment for risk factor management and mobilization,
2. transition cares and discharge planning design for daily activities like driving, lifting, sexual activity and so on,
3. out-patient rehabilitation and secondary prevention, the patients are assessed for risk factors and they will be divided into different categories.

Necessary interventions for minimizing the effects of risk factors explained to patients such as non pharmacologic interventions or a healthier life style (quitting tobacco use, healthier diet, regular physical activity, weight management, stress reduction).

In this stage, the patients undergo medical evaluation and exercise testing and based on the results, exercise plan is prescribed and ECG monitoring and medical supervision applied when indicated.

Appropriate equipment, staffing and safety measures were utilized appropriately by the rehabilitation programs. In Iran, specialized physiatrists, nurses, physiotherapists, nutritionists, psychologists work as a group.

National health systems and Iranian health ministry together with insurance companies have started their supports of rehabilitation protocols, however they are only for secondary prevention strategies (post CABG, post angioplasty, post AMI,...).

Despite this, the current status in Iran is far from optimum in terms of facilities, knowledge, attitude and of course clinical practices.

Our future direction is making our efforts for changing life style habits in the population for primary prevention. On the other hand, we have to expand cardiac rehabilitation centers and enhance education of the staff; also we ought to try our best to get together the insurance companies to support primary prevention protocols in high risk individuals.

There is very limited researches in Iran. However, there are important results in the organization of secondary prevention strategies. The effectiveness of secondary prevention measures, the costs of disease and its consequences compared to the costs of prevention, the KAP analysis on the target population can help a fruitful organization.

In a study of 118 coronary artery disease patients in Shahid Rajaee Hospital, after the monitoring period, BMI, weight, waist circumference, and waist to hip ratio decreased (p<0.001) however, these indices returned to the pre rehabilitation period after 12 months (Masoumi 2005).

In another study of 8 weeks exercise rehabilitation on 100 patients (Farahani 2003), 10% increase in METs was observed compared to pre exercise situation (p=0.001). A 6% decrease in resting heart rate and 18% increase in maximal attainable heart rate were found. There is a slight decrease in systolic blood pressure and improvement in lipid profile.
Medicine and Spirituality: A New Task for Heart Friends Around the World

FLAVIO BURGARELLA and SARAH BURGARELLA
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Spirituality is a complex and interdisciplinary part of the human experience. It includes aspects both philosophical and inherent to emotional behaviour. Philosophical aspects include the search for the person's sense of the purpose and truth of life, and for beliefs and values in which he/she lives. Aspects of emotional behaviour include a sense of hope, love and belonging, of inner peace and consolation.

Many people reach their spiritual dimension by religion, through a personal relationship with the divine. Other people find this dimension through a connection with the nature, the arts and the music, or with values and moral principles, or also in the search for scientific truth. Every religion tries to give us a direction and assistance in our spiritual quest, developing a specific set of beliefs, teachings and practices. The relationship of the person with the religious organization is very variable, it can be extremely positive or negative.

The assessment of the spiritual dimension during the medical examination is a way to start the practice of incorporating spirituality into medical practice. The doctor must first learn his/her spiritual values and what he/she believes in, in order to give the necessary attention, without prejudice, when he/she talks to the patient about spiritual concerns. This is particularly true when the thought of the patient is different than the thought of the doctor.

Establishing a positive relationship between doctor and patient is crucial to discuss spiritual issues, and allocating the appropriate time to the matter is very important too. The evaluation of the spiritual resources of the patient may be manifested in the anamnestic debate and the initial conversation and may open the way for more in-depth interviews. During this evaluation of spirituality, issues like the fear of the unknown and the search for hope are important items with which the patient is compared to his/her spiritual dimension. With specific questions, more information can be obtained than by using only standardized tests for a formal assessment of spirituality. The evaluation of spirituality includes questions on issues that will be proposed during the anamnesis in order to determine which factors might play a spiritual role in the disease of the patient, as well as in therapy and healing process.

There are many systems used to conduct a formal assessment of spirituality. They have been especially prepared for religious or as means of investigation; they rarely have been used during a normal medical examination. Doctors have to take into consideration any factor that could affect the health of their patients, maintaining balance and professional ethics.

Doctors can begin to incorporate spirituality into medical practice in three ways: by studying the problem scientifically, applying the techniques for the assessment of spirituality, and by therapeutic intervention. Scientific studies include the evaluation of the connection between spirituality and health and the planning of further studies to clarify its effects. It is always important to keep the mind open to new ways of learning, considering that there will be always things that cannot be understood. Therapeutic interventions include considerations on the spirituality of the patient and recommendations on prevention, health education, treatment and anything that might help the healing
process. Although it is not easy to measure, the physician's ability to provide the necessary compassion and connection, so that the patient can feel the doctor truly present and participating, is an important therapeutic intervention.

Spirituality is an important and multidisciplinary aspect of human experience that is difficult to understand and to completely assess, using only the scientific method. The doctor who begins to integrate spirituality into medical practice should take into consideration the principle of "primum non nocere" and maintain absolute respect for the rights of the patient, in his/her autonomy and freedom of thought and belief. If practiced in a responsible manner, Medicine can make a significant contribution to the integration between Science and Spirituality.

Heart Friends Around The World is an international movement, born on previous experiences of the association, of which maintains the basic structure, including the existing affiliated groups, aiming to promote human health through a route that develops in the body, mind and spirit.

Heart Friends Around The World is affiliated to the International Federation of Cardiology, collaborates with the World Health Organization, and in 1994 had already laid the foundations of its existence by involving in its programs physicians, cardiologists and patients worldwide, predominantly coming from low- and middle-income countries, to promote prevention and rehabilitation of cardiovascular disease. The following paragraphs illustrate the Heart Friends Around The World Manifesto, whose vision is to promote the Good by the promotion of health and whose mission is a global health promotion, in its aspects of body, mind, spirit.

Heart Friends Around The World believes in the importance of everyday life, in the relationship between body and mind, in the development of interpersonal relationships. It also considers the education of women as a priority for her health and that of his family.

Heart Friends Around The World believes that old age is an asset in the search for spiritual life, and that young people are a resource of health and values, although nowadays are mortified by excesses both in consumerism and in deprivation.

Heart Friends Around The World believes that the body needs a balanced diet in its supply of water, sugars, proteins and fats, recommending the consumption of fruit and vegetables several times a day. As the hunger must be fought, so the excessive introduction of calories, leading to obesity, diabetes and development of chronic non-communicable diseases, must be avoided.

Heart Friends Around The World proposes the practice of a regular physical activity, with a medium muscle commitment. A slow and prolonged race practice is a good basis for maintaining the health and the associated state of mental and physical well-being.

Heart Friends Around The World believes that the proper use of drugs can help to maintain the state of health obtained by the treatment of the disease. It also believes that the pharmacological correction of potential risk factors is a practice to be fostered, according to the results of updated scientific publications. It also proposes to take action in order to produce new drugs at low cost, so that they can be used even in developing countries, protecting its right to health as an inalienable well for the human being.

Heart Friends Around The World considers that, in the relationship between doctor and patient, the positive attitude is a vital component to get that confidence, that mutual trust, which is so important for the recovery of health status.

Heart Friends Around The World finds its essence in the relationship between doctor and patient, striving to have a consistently positive attitude towards the patient and receiving in return what has been given in the form of Good for its professional and spiritual growth. The right man acts the Good for love of the Good, lives in the Good, in an independent manner by religion or no religion to which he belongs.

Heart Friends Around The World is in continuous search for figures of mystical expression such as religious, poets and philosophers who can indicate to us the most appropriate spiritual journey, namely that journey that opens us to a far greater reality and that helps us to expand our conscience. These figures will be proposed through their writings, so that everyone can have the freedom to create their own spiritual way.

Heart Friends Around The World is confident in the creativity of all the healthcare workers and citizens who recognize the Manifesto, so that they can be carriers of dissemination of this thought.
Ethnicity: The Other CV Risk Factor?

SANDEEP GUPTA
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People of south Asian background (namely Indians, Pakistanis, Bangladeshis and Sri Lankans) have a 40-50% greater mortality from coronary heart disease (CHD) than those of White-Caucasian, European origin. A statistic known for some 5 decades. Those of African-Caribbean and Chinese descent have tended to have lower rates of CHD mortality. Several lines of hypotheses attempt to unravel 'genetic versus environment' factors to explain the excess CHD risk amongst south Asians. A predisposition to insulin resistance, at an early age, with subsequent development of metabolic syndrome and diabetes mellitus remains the strongest line of evidence. Cigarette smoking, lack of physical activity and dietary issues may then exacerbate the genetic component.

The INTERHEART study revealed the importance of the same traditional risk factors in all populations and cultures. Perhaps the 'potency' of individual risk factors may impact on differing ethnic groups at different thresholds? For example, the concept of lower waist circumference targets in those of Chinese descent when diagnosing metabolic syndrome.

A strategy of increased awareness, altering the guidelines/targets to address the 'ethnicity' risk factor... in addition to a more aggressive approach on CV risk factor management remain the focus of attention. Whether lowering the threshold to treat lipids, blood pressure or blood sugar merits further debate.

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Towards Person-related Cardiac Care: Weighing the Evidence on Type D Personality

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The distressed or Type D personality refers to the combination of two personality traits, negative affectivity and social inhibition. Cardiac patients with this personality profile tend to experience negative emotions, but are not likely to express themselves towards other people. Type D personality can be easily assessed with the use of the 14-item DS14 self-report scale, and its prevalence ranges between 20%-35%. Clinical evidence indicates that Type D personality is an independent predictor of poor prognosis, including cardiac death and (recurrent) myocardial infarction, with the majority of odds ratios ranging between 2.5 and 6.8. Longitudinal research also indicates that Type D personality is a major determinant of depression, anxiety and poor perceived health status, with the majority of odds ratios ranging between 2.6 and 6.0. In addition, Type D personality has a modulating effect on the outcome of invasive interventions such as percutaneous coronary intervention, coronary bypass surgery, implantable cardioverter defibrillator treatment, and heart transplantation. Unlike depression, Type D is not confounded by disease severity, and Type D personality still predicted major adverse clinical events and cortisol dysregulation after adjustment for depressive symptoms. Apart from cortisol reactivity, other biological (cardiovascular reactivity, immune dysregulation) as well as behavioral (poor self-management, reluctance to consult clinical staff, unhealthy life style) mechanisms might mediate the relationship between Type D personality and prognosis. Overall, these findings indicate that the Type D construct has substantial predictive power, is associated with several pathways of disease, and may have important incremental value in clinical research and practice.
An Update on the Treatment of Stable Angina Pectoris

KATHY BERRA

From Stanford Prevention Research Center, Standford University School of Medicine, California, USA

Chronic stable angina (CSA) is one of the most common symptoms experienced by persons with coronary heart disease. It is estimated that over 140 million persons worldwide suffer from symptoms of angina. The incidence of angina increases with age and results in diminished quality of life, loss of productivity, and disability. Currently, in the US, one in 10 people over the age of 65 have chronic stable angina. By 2010, approximately 18 percent of the US population will be over the age of 65 — this will increase to 30 percent by 2025. These aging demographics are similar worldwide. Thus, angina will present as a chronic condition requiring significant health care resources.

Although angina affects both men and women, women have more symptoms of angina when compared to men. Medical costs associated with chronic stable angina exceed 15 billion dollars per year, with indirect costs being likely as high.

Medical therapies for relief of anginal symptoms date back to the 1880’s when nitrates were first used. Nitrates were followed nearly a century later with beta blockers. Soon, coronary artery bypass surgery became available and calcium channel blockers showed promise. In the late 1970’s, percutaneous coronary interventions (PCI) became widely used to improve symptoms. More recently, a new medication, ranolazine (Ranexa), a late sodium channel blocker, became available for treatment of anginal symptoms in patients who do not respond to traditional medical therapies.

Spinal cord stimulation, and enhanced external counterpulsation (EECP) are non-pharmacologic and non-surgical therapies also used to improves symptoms. Spinal cord stimulation is generally reserved for patients who have received maximal surgical and medical therapy and have refractory angina. EECP uses a series of cuffs wrapped around the legs that deliver compressed air synchronized to the cardiac cycle. It has been shown to be well tolerated, safe, and effective in reducing anginal symptoms. More research needs to be done with these therapies.

Treatment goals for patients with CSA should include improving longevity as well as quality of life (QOL). Strategies to improve longevity include reducing disease progression, preventing new events, readmission to the hospital, and reducing mortality. Treating anginal symptoms includes therapies to diminish symptoms, improve functional capacity, and improve quality of life through emotional support and education.

The mnemonic A, B, C, D and E is often used as a way to prompt the recollection of important therapies for persons with chronic stable angina.

<table>
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<tr>
<th>A</th>
<th>B</th>
<th>C</th>
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<tr>
<td>Aspirin (anti-thrombotic) &amp; Antianginal therapies</td>
<td>Beta blockers &amp; Blood pressure</td>
<td>Cigarette smoking &amp; Cholesterol</td>
<td>Diet &amp; Diabetes</td>
<td>Education &amp; Exercise</td>
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Education is a key component of care for patients with chronic illness such as coronary artery disease. The use of "integrative rehabilitation" for patients with angina has been studied. Integrative rehabilitation includes acupuncture, a self-care program, acupressure, Chinese health philosophy, stress management, and lifestyle adjustments. Integrated rehabilitation in patients with severe angina has been shown to add quality years to patient's lives and was cost effective.

*Get Tough on Angina (GTOA)* is a public health initiative designed to increase quality of life (QOL) in persons with angina and to increase the public's awareness of chronic stable angina and its impact on health and QOL. GTOA was developed by the Preventive Cardiovascular Nurses Association. It includes three main components:

- An educational brochure and handbook for patients and families available in both English and Spanish;
- A slide and script set for a four-part educational support group to be led by nurses or other health care providers;
- A slide and script set for a one hour community education forum. Both slide and script sets include detailed information about the educational content, class activities, and homework.

The GTOA program is available free of charge. All of the products can be ordered by emailing the Preventive Cardiovascular Nurses Association at www.pcna.net.

Chronic stable angina is a common symptom that is rising in incidence along with an aging population and an improved ability to prevent death from coronary atherosclerotic vascular disease. In spite of advanced medical and interventional therapies, anginal symptoms remain common and negatively affect quality of life for millions. Angina also contributes enormously to the personal, societal, and financial burdens attributed to poor health. Providing patients with medical, surgical and educational/support will reduce both morbidity and mortality and enhance Quality of Life.

* The *Get Tough on Angina* program was made possible through an unrestricted educational grant from Cardiovascular Therapeutics to the Preventive Cardiovascular Nurses Association.

**Further Readings**

Effect and Molecular Mechanism of Physiological Ischemia Training of Skeletal Muscle on Angiogenesis at Remote Sites with Pathological Ischemia in Rabbit Models of Coronary and Peripheral Artery Stenosis

JIANAN LI, MEI SHEN, JING GAO

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**Background**

This study was designed to test the hypothesis that physiological ischemia exercise training of normal limb can promote angiogenesis in pathological ischemic limb.

**Method**

The New Zealand white rabbits had left femoral artery ligated (FAL) and electrode implantation performed on the right sciatic nerve. They were randomly assigned to 4 groups. FAL-N was the group without electrical stimulation (ES). FAL-HE had its subjects with high intensity ES (2.5 mA, 40 Hz, 1 ms) on the right hindlimb. FAL-LE had its subjects with low intensity ES (0.3 mA, 40 Hz, 1 ms) on the right hindlimb. BFAO-HE had its subjects with FAL on both hindlimbs and high intensity ES (2.5 mA, 40 Hz, 1 ms) on the right hindlimb. The ES procedure was 5 minutes stimulation followed by 5 minutes rest, repeated 8 times daily for 4 weeks. Collateral circulation was grossly examined by angiography, relative blood flow was measured by microspheres technique. Collateralization was evaluated by immunohistochemistry. VEGF mRNA and protein detection were analyzed by western blot and real time RT-PCR.

**Results**

Collateral blood flow in all major muscles of the left hind limb in the FAO-HE was the highest among the 4 groups ($P<0.01$). Capillary supply ($P<0.001$), expression of VEGF mRNA ($P<0.001$) and protein ($P<0.01$) in gastrocnemius muscle remarkable increased in FAO-HE, there was no statistically significant difference among other groups.

**Conclusion**

Angiogenesis associated with up-regulation of VEGF expression in the pathological ischemic limb may be facilitated by the physiological ischemic exercise training with normal limb for 4 weeks.
Exercise Prescription in Cardiac Patients

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From 1Physiatrist & Electro Diagnostic Specialist, Milad Subspecialty Hospital; 2Internal Medicine Specialist, NIOC Central Hospital, Iran

Physical inactivity is an independent risk factor for coronary heart disease. The optimal amount of physical activity is controversial and is an area of challenge. Physical activity also has an impact on secondary prevention. Two meta analyses on RCTs (O’Connor et al, Berlin et al) showed a 20% to 25% reduction in mortality of post MI survivors with regular physical activities. And a more recent study (Jollife, 2001) showed a 31% reduction in mortality with regular physical activity.

Also Weight surveillance is very important. Those with BMI of 20-25 Kg/m² are at lower risk for coronary heart disease than those who are overweight or obese (Arch Internal Medicine 2000). The reduction in weight generally is achieved via decreasing energy intake and increasing physical activities (Douketis et al 1999). The primary goal is a 10% weight reduction.

The exercise prescription depends on when or whether a cardiac event has occurred before and also depends on the exercise capacity of the patient and should be individualized. A sub-maximal exercise stress test my help exercise capacity out patiently. Exercise tolerance test can help classifying the individuals into categories for special needs on medical supervisions or ECG monitoring during exercise. Also, the contraindications and special precautions have to be addressed in some conditions. Some situations such as silent angina, congestive heart failure, pacemakers and implantable cardiac defibrillators, cardiac transplant are aspects of cardiac patients that need special attention.

For each stage of prescription the FITT (Frequency, Intensity, Time, and Type) should be identified.

These special programming will be reviewed in the presentation.

Appropriate equipment, staffing and safety measures help minimize the rehabilitation programs.
Electrical Stimulation of Skeletal Muscles in Patients with Heart Failure: An Alternative to Aerobic Training?

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1 Department of Internal Medicine and Rehabilitation Science, Tohoku University Graduate School of Medicine, Sendai, Japan; 2 Department of Functional Diagnostics and Rehabilitation, St. Anna’s Faculty Hospital and Masaryk University, Brno, Czech Republic

KOHZUKI ET AL.: Electrical Stimulation of Skeletal Muscles in Patients with Heart Failure: An Alternative to Aerobic Training? The exercise training has been shown to improve the functional capacity, quality of life and also the patterns of strength muscles in patients with chronic heart failure (CHF). Most of actual training types, however, are based on the systemic exercises resulting in increased cardiac workload. This could lead to onset of life-threatening side effects such as fatal dysrhythmias. Moreover, most of patients with CHF have low exercise tolerance and poor motivation to exercise. Low-frequency electrical stimulation (ES) has been shown to increase oxidative capacity in the skeletal muscle fibers, to enhance muscular regeneration and to prevent atrophy. We aimed to evaluate the possible benefit of ES in patients with mild to severe CHF, and to compare the results with the conventional bicycle training. In our data, 6 weeks ES (60 min/day) of quadriceps and calf muscles of both legs significantly improved muscle strength and blood flow in patients with advanced CHF. Moreover, a similar improvement of exercise capacity in patients with CHF can be achieved either by aerobic bicycle training or by local ES of the strength muscles of the lower limbs in patients with mild to moderate CHF. Although the effectiveness of conventional exercise protocols in cardiovascular rehabilitation is beyond doubt, the safety and easy application of ES could be of great benefit in the rehabilitation of patients with CHF, especially those with a severe grade of the disease. Future studies should also address the possibility of combining ES with some type of classical exercise training. (J HK Coll Cardiol 2008;16 (Suppl 1):A38-A42)

Electrical stimulation, exercise, heart failure, skeletal muscle

摘要
運動被證明能夠增強身體的機能、生活品質，並且在慢性心衰竭病人中增強肌肉力量。然而，大多數的運動方式是基於系統訓練並導致心臟負荷加重。這將會引起威脅生命的副作用如致死性的心律失常。不僅如此，絕大多數的慢性心衰竭病人的運動耐受性差，且運動意願低下。低頻率的電刺激能夠增加骨骼肌纖維的氧耗能力，促進肌肉生長，防止肌肉萎縮。我們旨在評估在輕度至重度慢性心衰患者中使用電刺激的可能性，並且與傳統的自行車訓練加以比較。在我們的資料中，6周的電刺激（每天60分鐘）進展期的心衰竭患者雙下肢股四頭肌和腓腸肌的肌肉力量和血流狀況得以明顯改善。不僅如此，在輕度至中度慢性心衰竭病人中不論通過電動自行車運動或電刺激，運動能力的改善和下肢肌肉力量恢復狀況相似。儘管傳統運動的有效性在心血管病人的康復期中的作用毋庸置疑，但電刺激的安全性和易操作性對於慢性心衰竭病人的康復治療顯現出巨大的益處，尤其在那些疾病程度嚴重的患者中。我們需要進一步研究電刺激聯合一些經典運動訓練的可能性。

關鍵詞：電刺激 運動 心衰竭 骨骼肌

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Chronic Heart Failure and Exercise Training

Dyspnea and premature fatigue of skeletal muscles are common symptoms of reduced exercise capacity in subjects with chronic heart failure (CHF). CHF is a complex metabolic syndrome with impaired left ventricular function and poor prognosis. The exercise training has been shown to improve the functional capacity, quality of life and also the patterns of strength muscles, and therefore should be considered as an integral part of therapeutic standards in such patients. Most of actual training types, however, are based on the systemic exercises resulting in increased cardiac workload. This could lead to onset of life-threatening side effects such as fatal dysrhythmias, and for this reason classical rehabilitation programs need medical supervision and assistance. Other problems related to the choice of adequate exercise therapy for these patients are the grade of disease, low exercise tolerance and poor motivation to exercise.

Low-frequency electrical stimulation (ES) of strength muscles has been shown to increase oxidative capacity in the skeletal muscle fibers, to enhance muscular regeneration and to prevent atrophy. Nuhr et al. reported that ES increased functional capacity in patients with advanced CHF compared with sedentary controls. Recently, from the first randomized trial comparing home-based ES and classical exercise training have demonstrated that both methods could significantly influence functional capacity, muscle strength of patients with mild to moderate CHF. However, chronic effects of ES on systemic blood pressure, heart rate in mild to moderate CHF, or chronic effects of ES on systemic blood pressure, heart rate serum enzymes and functional capacity in severe CHF have not been elucidated. Regarding to the dramatic pathophysiologic changes which deteriorate the organism in conditions of chronic heart failure (including strength muscle mass) there is enough reasons to take the profit from ES also in conditions of CHF. We aimed to evaluate the possible benefit of ES in patients with mild to severe CHF, and to compare the results with the conventional bicycle training.

Electrical Stimulation: Animal Hindlimb Ischaemia Model Study

ES in skeletal muscle at a level far below the threshold of muscle contraction has been reported to promote local angiogenesis in a hindlimb ischaemia model of rats. We completely excised bilateral femoral arteries of male Sprague-Dawley rats. After the operation, electrodes were implanted onto the centre of the fascia of the bilateral tibialis anterior (TA) muscles, tunnelled subcutaneously and exteriorized at the level of the scapulae. The right TA muscles of rats were stimulated continuously at a stimulus frequency of 50 Hz, with a 0.1 V stimulus strength and no interval, for 5 days. The left TA muscles served as controls. We found that angiogenic factors, such as vascular endothelial growth factor (VEGF), and hepatocyte growth factor (HGF) were significantly increased by ES in stimulated muscles compared with control rats. It is concluded that both VEGF and HGF may contribute to the local angiogenesis produced by ES in a hindlimb ischaemia model of rats.

Electrical Stimulation in Patients with Severe CHF

We evaluated 15 patients with advanced grade of CHF (mean age 52±7 years; NYHA class III-IV; EF 19±3%) admitted at hospital for heart graft (Table 1). ES was performed 60 min/day, 7 days a week for 5 consecutive weeks, using dual-channel battery-powered stimulator. The stimulator delivered a biphasic current of 10 Hz frequency. The electrical stimulated muscles were quadriceps and calf muscles of both legs. Self-
adhesive surface electrodes were positioned on the thighs approx. 5 cm under inguinal fold and 3 cm over the upper patella border; in the calf muscles the electrodes position was the area approx. 2 cm under the knee joint and just over the proximal end of Achilles tendon. The current characteristics were set up as follows: "on-off" mode stimulus (20s stimulation, 20s rest), pulse width 200 msec, rise and fall time 1s, and maximal stimulation amplitude 60 mA. The stimulation was performed in supine position, at the same day period and under supervision of medical staff. The first session of stimulation was started with lower amplitudes (around 30 mA). In the following days this value was gradually increased (by 10-15 mA/day) until the final value of 60 mA was achieved and well tolerated by the patient (in 2-4 days).12

Effects of ES on the muscle strength and blood flow in patients with advanced CHF were examined before and after 6 weeks of 10 Hz ES of quadriceps and calf muscles of both legs (1 h/day, 7 days/week). Dynamometry was performed weekly to determine maximal muscle strength ($F_{\text{max}}$; N) and isokinetic peak torque ($PT_{\text{max}}$; Nm); blood flow velocity (BFV) was registered before and after 6 weeks of ES using pulsed-wave Doppler velocimetry of right femoral artery. Six weeks of ES increased significantly $F_{\text{max}}$ (p<0.001), and also $PT_{\text{max}}$ (p<0.01). Mean BFV in femoral artery increased after 6 weeks (p<0.05); BFV values at rest before and after 6 weeks of ES did not differ significantly.12

After 6 weeks of LFES, all patients had less dyspnea and a marked decrease in subjective feelings of fatigue during everyday activities, although this change was not statistically significant. Similar results were observed for NYHA classification: 4 patients moved from NYHA IV to NYHA III after 6 weeks of stimulation and the remainder were unchanged but not (e.g., from NYHA III to NYHA IV).12

ES did not cause any significant changes of systolic blood pressure and diastolic blood pressure, nor were there significant changes in the recorded values of heart rate. In order to evaluate the possible risk of damage to muscle fiber by stimulation, the activity of both CK and LDH was monitored at the beginning, after 1 week and after 6 weeks of stimulation and only insignificant increases after 1 week of stimulation was observed and after 6 weeks of stimulation, the serum levels of both enzymes returned to baseline.12 It is concluded that ES may improve the skeletal muscle strength and the blood supply. Thus, this method could be recommended in the treatment of patients with severe CHF.

**Electrical Stimulation and Aerobic Exercise Training in Patients with Mild to Moderate CHF**13

Thirty patients with stabilized form of CHF (mean age 56±6 years, NYHA class II-III, mean EF 35±5%) were randomly assigned to a rehabilitation program using either electrical stimulation of skeletal muscles or bicycle training (Table 2).13 Patients in the first group had 8 weeks of home-based ES applied simultaneously to the quadriceps and calf muscles of both legs (1 h/day for 7 days/week); patients in the second group underwent 8 weeks of 40 min aerobic exercise (3 times a week; 5 min warm-up without workload, 30 min of training alternating 1 min of work - 2 min of relaxation, and 5 min of cool down without workload), The realization of the exercise training was strongly individual, performed at the level of anaerobic threshold determined by spiroergometry, and under supervision of medical staff (doctor, physiotherapist and nurse).

After the 8-week period significant increases in several functional parameters were observed in both groups: maximal VO2 uptake (ES group: p<0.05; bicycle group: p<0.01), maximal workload (ES group: p<0.05; bicycle group: p<0.01), distance walked in 6 minutes (ES group: p<0.05; bicycle group: p<0.05), and exercise duration (ES group: p<0.05; bicycle group:

<table>
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<th>Table 2. Characteristics of patients included in the study13</th>
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<td>Women/men</td>
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<td>Age (years)</td>
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<tr>
<td>Heart failure aetiology</td>
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<tr>
<td>(ischaemic/nonischaemic)</td>
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<tr>
<td>NYHA class (II/III)</td>
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<td>Left-ventricular ejection fraction (%)</td>
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p<0.05) (Figure 1). The QoL score assessed using the Minnesota Living with Heart Failure Questionnaire was significantly improved in the bicycle group (from 41.4±5.3 to 27.3±6.3; p<0.03), whereas there was only a slight improvement in the ES group (from 39.6±2.9 to 31.4±4.8; NS). The present results demonstrated the good tolerance and significant improvement of functional capacity after 8 weeks of ES. The increases in VO2peak, Wpeak, and distance walked in 6 minutes, and also the exercise duration after 8 weeks of LFES were very similar to the increases in these parameters in the bicycle group. Other parameters (HRpeak, VO2AT and QoL) significantly increased in the bicycle group but not in the LFES group (only slight improvement was observed). Despite the differences between the 2 methods (myostimulation activity is local, whereas bicycle exercise training challenges the entire body), LFES could be regarded as an acceptable analogue of endurance training which can improve the physiological condition of CHF patients in a period of several weeks, and can be easily performed at home without medical supervision.13

**Future Perspectives of Electrical Stimulation in Patients with CHF**

Electrical stimulation of skeletal muscles in humans has been shown to be a useful therapeutic tool in neurology,14 postoperative treatment, and in cases of long-term immobilization.15 In a recent study, LFES was
reported to improve the functional capacity in claudicants. 16 Hamada, et al. 17 observed enhanced energy consumption, carbohydrate oxidation, and whole body glucose uptake after low-frequency electrical stimulation of the lower limbs, a finding that suggests the possibility of therapeutic application of LFES for diabetic subjects. However, the number of studies concerning the effects of LFES in cardiovascular rehabilitation is still very low. The effectiveness of conventional exercise training in cardiovascular rehabilitation has been sufficiently proven, 18 and LFES is not likely to replace it. But the safety and ease of application could be especially beneficial in patients with advanced CHF (III-IV).

ES should be considered as a valuable alternative to classical exercise training in patients with CHF. Recently, results from the first randomized trial comparing home-based ES and classical exercise training have demonstrated that both methods could significantly influence functional capacity, muscle strength of patients with CHF. 10 Similar results were shown by Nuhr et al in a group of patients with advanced CHF, and an increase of slow myosin heavy chain isoforms at the expense of the fast ones and increased intensity of oxidative enzymatic activity were also found after LFES. 9

Although the effectiveness of conventional exercise protocols in cardiovascular rehabilitation is beyond doubt, the safety and easy application of ES could be of great benefit in the rehabilitation of patients with CHF, especially those with a severe grade of the disease.

The effectiveness of conventional exercise protocols in cardiovascular rehabilitation is beyond doubt and the patients with mild heart failure would adopt exercise. But the patients with a severe grade of CHF who can not exercise would adopt ES for the safety and easy application. There are scarcely limitations except the allergies of the electrode. Further investigations should yield more detailed data, including information about possible interactions between the central and peripheral cardiovascular mechanisms during muscle stimulation. Future studies should also address the possibility of combining LFES with some type of classical exercise training.

References

Exercise and Hypertension

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KIM: Exercise and Hypertension. Even mild-to-moderate hypertension significantly increases the risk of left ventricular hypertrophy, renal disease, and stroke. Antihypertensive drugs are effective to lower blood pressure and decrease the risk of the target organ damage, but adverse side effects and cost have led to a search for non-pharmacological interventions. The USA Joint National Committee Guidelines on hypertension report strongly recommended lifestyle modification to prevent hypertension as definitive therapy for some and as adjunctive therapy for all hypertensive patients. Lack of physical fitness increases the risk of hypertension and is a strong predictor of cardiovascular mortality independent of blood pressure and other risk factors. Contrarily, physical activity can prevent hypertension and decrease systolic and diastolic blood pressure. The type of exercise should be primarily endurance physical activity (walking, jogging, or bicycling) regular basis supplemented by resistance exercise. The blood pressure is reduced early after the initiation of dynamic exercise training and no further reduction occurs after 3 months but disappears abruptly with detraining. Some antihypertensive drugs such as diuretics and beta blockers can interfere with exercise performance but alpha blockers, calcium channel blockers, and angiotensin converting enzyme inhibitors do not interfere with exercise performance and are well tolerated by active hypertensive individuals. If hypertension is poorly controlled, heavy physical exercise as well as maximal exercise testing should be discouraged or postponed until appropriate drug treatment has been instituted and blood pressure lowered. (J HK Coll Cardiol 2008;16(Suppl):A43-A47)

Exercise, hypertension, physical activity

摘要
即使是輕度到中度的高血壓就能夠顯著的增加左心室肥厚、腎臟疾病和中風的風險。抗高血壓藥物可以有效地降低血藥，減少靶器官受損的風險，但其藥物的副作用和費用使得人們尋求非藥物性的干預措施。美國聯合學會就高血壓的指導意見報告中強烈對於所有高血壓患者推薦改變生活方式作爲確定性的治療手段來預防高血壓，而藥物治療作爲輔助治療。缺乏身體良好的適應性不僅是高血壓病的風險因素，還是心血管性疾病致死的強烈徵兆，且獨立於血壓和其他風險因素。相反，體育活動能夠預防高血壓，並且降低收縮壓和舒張壓。運動的方式應是基礎的耐力性的運動（散步、慢跑或騎自行車），或常規運動輔以抵抗性運動。在起初的運動訓練後血壓在早期便能下降，但在3個月後這種下降便不再進一步了，而一旦停止運動血壓下降便會突然消失。有些抗高血壓藥物如利尿劑和β受體阻滯劑會影響運動表現，而α受體阻滯劑、鈣離子阻滯劑和血管緊張素轉化酶抑制劑不會干擾運動，它們適用於那些活動期的高血壓患者。如果高血壓控制不佳，不建議參與刺激運動和極限運動測試，必須在合適藥物治療確立和血壓下降後才考慮運動。

關鍵詞：運動 高血壓 體育活動

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**Introduction**

Physically inactive individuals have a 1.5 greater relative risk of developing hypertension than those with high levels of activity. A review of cross-sectional studies in children as well as longitudinal dynamic training studies in young adults below the age of 30 indicate that blood pressure (BP) is inversely related to leisure time physical activity. Adults up to 40 years old who engaged in regular physical activity had a 30% lower risk of developing hypertension than sedentary individuals. Regular physical activity has a protective effect against cardiovascular disease and all cause mortality. Contrarily, physical inactivity is an independent risk factor for hypertension and coronary artery disease, regardless of age, body mass index, and fasting plasma insulin levels.

**Dynamic Exercise and the BP Response**

I. Acute Dynamic (Aerobic) Exercise and the BP Response

BP rises during dynamic exercise and the rate of rise is related intensity and level of training. Systolic BP starts to rise at the beginning of exercise, continues rising in a linear relationship with higher workload, and reaches the peak at the end of the exercise or maximal workload. The exercise induced increase of systolic BP in borderline or definite hypertensive persons is roughly parallel to the changes in normotensive persons. However, the maximal BP at peak exercise in hypertensive subjects is higher than normotensive subjects due to the higher starting BP in both treadmill or bicycle exercise. These differences in BP between normotensive and hypertensive subjects are related to systemic vascular resistance rather than cardiac output. The increase in systolic BP of 50 to 70 mmHg at peak exercise shows no significant difference between treadmill and bicycle exercise whereas change of diastolic BP during exercise is different between those two exercise modes. Diastolic BP does not change or slightly decreases during treadmill exercise, but it tends to slightly increase during bicycle exercise. This is related to greater resistance to the exercising skeletal muscle than running.

An excessive or an exaggerated increase in BP during exercise testing may be a marker of future sustained hypertension. The cause of this abnormal response may be due to a failure to reduce total peripheral resistance adequately during exercise as a result of initial structural vascular change. Several studies showed that an exaggerated response to exercise (systolic BP ≥ 210 mmHg in men and ≥190 mmHg in women) increased the risk of hypertension 1.5-to fourfold. Subjects with exaggerated exercise blood pressure have a higher mean 24-h BP than subjects with normal exercise BP. An exaggerated exercise BP can be hazardous in the hypertensive subject who wants to continue strenuous exercise, since the repetitive BP peaks triggered by physical activity may impact chronic end-organ damage or cardiovascular events.

II. Training Effect of Dynamic Exercise on Hypertension

The reports from several meta-analysis studies (including total 155 studies) demonstrate that aerobic exercise training reduces resting systolic and diastolic pressure to 10 mmHg in mild to moderate essential hypertension. Age and gender seem to be not a limiting factor. Endurance training can lower BP also in patients taking antihypertensive drugs and may eliminate or reduce the need for medications. Although the BP reduction from exercise training is small, it may have significant effects to reduce the incidence of stroke and coronary heart diseases. Aerobic exercise can decrease the BP response to stressful conditions, blunt daytime BP peaks, reduce variability, and contribute subsequent target organ damage such as reduction of left ventricular wall mass.

Exercise capacity is 30% reduced in hypertensive subjects compared to age-matched controls. But physical exercise training can increase maximal oxygen consumption and maximal BP. Unlike the resting BP, the maximal BP during exercise is not reduced, but in fact is increased parallel to exercise tolerance and higher fitness levels. In sedentary hypertensive subjects, an increased total peripheral resistance is the most likely mechanism for the rise in BP with exercise. Whereas, the higher maximal BP after training in hypertensive subjects is probably due to an increase in cardiac output and improved ventricular function. High fitness groups shows lower systolic and diastolic pressure and slower
increase rate of the systolic pressure than sedentary group.\textsuperscript{11}

**Static Exercise and the BP Response**

Acute static exercise increases both systolic and diastolic BP in either normotensive or hypertensive subjects by reflex increases in cardiac output with minimal or no change in vascular resistance.\textsuperscript{12} According to the weightlifting subjects study by MacDougall et al.,\textsuperscript{13} the greatest peak pressure occurred during the double-leg press where the mean value for the group was 320/250 mmHg. Peak pressure with the single-arm curl exercise reached a mean group value of 255/190 mmHg. The magnitude of the BP rise is proportional to the intensity of muscle contraction, the size of muscle mass used in contraction, and the duration of exercise.\textsuperscript{14} During heavy weightlifting with a Valsalva maneuver, the BP response is extremely exaggerated but may be dramatically reduced with an open glottis or slow exhalation during exercise. Narloch and Brandstater demonstrated that the mean BP at 100% maximum double-leg press exercise with Valsalva was 311/284 mmHg compared to that of slow exhalation when the mean BP was 198/175 mmHg.\textsuperscript{15} So this breathing technique may help to prevent cardiovascular complications in hypertensive patients.

Several preliminary studies showed that supervised static exercise program, particularly circuit training, have acceptable hemodynamic responses and safe clinical limits and can reduce BP in hypertensive patients despite the inherent potential to acutely elevate BP. However, an abrupt elevation of BP induced by weightlifting increases myocardial oxygen demand, which may impact myocardial ischemia. So, heavy resistance training requiring high voluntary effort is generally not recommended in hypertensive patients and even moderate weight training should be delayed until resting BP is under control.

**Prescription of Exercise Training to Patients**

All controlled hypertensive patients should participate in exercise training. It can be used with other non-pharmacologic interventions and without medication in uncomplicated mild-to-moderate hypertensive patients. The patients with BP higher than 180/105 and patients with cardiovascular complications such as target organ damage, diabetes, or elderly should start exercise training only after BP is controlled by antihypertensive drugs. Obese patients need aggressive weight reduction combined with a walking program prior to more intense exercise training.

Initially, pre-training assessment is necessary to evaluate exercise risk stratification. The history including family history and physical examination on cardiovascular disease or conditions that might limit exercise capability should be taken. A resting ECG is recommended for all hypertensive patients and echocardiogram in selected patients. Although the American College of Sports Medicine does not recommend exercise test as a screening test to identify high risk subject for developing hypertension as a result of an exaggerated exercise BP response, it can provide information for risk stratification. A graded exercise test is often recommended for adults over the age of 40 who plan to begin an exercise training program and should be performed in moderate to severe hypertensive patients with evidence of left ventricular hypertrophy from an ECG or in diabetic hypertensive patients because of high incidence of silent myocardial infarction.

The BP response to dynamic exercise varies from sport to sport. Walking, running, cycling, or Tai chi do not cause a sustained increase in BP and possibly are the most suitable endurance exercises for hypertensive patients. Swimming can be an alternative exercise in patients with obesity, exercise induced asthma, or orthopedic problems but showed higher BP levels than running at comparable heart rates with smaller cardiopulmonary effects. Vigorous sprints, rowing, downhill skiing, and mountain sports are unsuitable for hypertensive patients.

Although there are no specific guidelines in exercise management of hypertension regarding intensity and frequency, low-to-moderate intensity endurance exercise training is recommended in general rather than high intensity in lowering BP in hypertensive
patients. Based on a consensus statement by the World Hypertension League, hypertensive patients should exercise at an intensity of 50 to 85% maximal oxygen consumption or 50 to 70% of maximal heart rate for 20 to 60 min, 3 to 5 days per week. The lower intensity requires longer duration.

In most studies, BP is reduced early (3 weeks to 3 months) after the initiation of moderate intensity dynamic exercise in both normotensive and hypertensive subjects, and no further reductions occurs after 3 months. The BP lowering effect of exercise training is evident only as long as a regular endurance exercise training program is maintained and BP rises gradually toward the baseline for 1 to 2 weeks after cessation of exercise. So, the maintenance of regular exercise is necessary and must be encouraged.

Antihypertensive Drugs for Active Hypertensive Patients

The choice of medication should be individualized and based on hypertension in association with other diseases. There are no absolute contraindications to use any drug classes in active hypertensive patients although certain classes of drugs are preferred, or are better tolerated.

Diuretics are effective to fall BP during exercise by decreasing peripheral resistance and plasma volume. The most trouble but manageable problem with diuretics for active persons is hypokalemia. Exercise with hypokalemia may interrupt skeletal muscle blood flow resulting in rhabdomyolysis and acute renal failure. To ensure against potassium loss, patients taking diuretics such as thiazide should receive potassium supplements. Diuretics and nonselective beta blockers can increase triglycerides and VLDL cholesterol by 10 to 30% and reduce HDL cholesterol by 6 to 25%.

Beta-adrenergic blocking agents especially nonselective beta blocker such as propranolol blunt exercise mediated increases in heart rate and cardiac output and may reduce exercise performance, and is greater with chronic administration than with acute dosing. However, in case of ischemic heart disease, beta blockers can be used without having a negative effect on exercise capacity. In patients with bronchospasm as a component of chronic obstructive lung disease, any beta blockers should be avoided.

Alpha-adrenergic blocking agents doxazosin, prazosin, and terazosin do not suppress cardiac output or exercise capacity and are excellent choices for use in active hypertensive patients. Calcium channel blockers verapamil, diltiazem, and nifedipine reduce systolic and diastolic BP during exercise possibly through reduction in systemic vascular resistance. So, calcium channel blockers are beneficial for patients who are not good candidates for beta blockers.

Conclusion

Antihypertensive drugs are effective to lower BP and decrease the risk of the target organ damage, but adverse side effects and cost have led to a search for non-pharmacological interventions in mild to moderate hypertension. Dynamic exercise or aerobic training such as walking, running, or bicycling exercise is the choice exercise for hypertensive patients. Low-to-moderate intensity exercise appears to lower systolic and diastolic blood pressure with an average of reduction of 10 mmHg. The blood pressure is reduced early after the initiation of dynamic exercise training and no further reductions occurs after 3 months but disappears abruptly with detraining.

Some antihypertensive drugs such as diuretics and beta blockers can interfere with exercise performance but alpha blockers, calcium channel blockers, and ACE-I do not interfere with exercise performance and are well tolerated by active hypertensive individuals. If hypertension is poorly controlled, heavy physical exercise as well as maximal exercise testing should be discouraged or postponed until appropriate drug treatment has been instituted and blood pressure lowered.

References


Is Cardiovascular Disease Preventable?

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Cardiovascular disease is the leading cause of death in developed and developing countries. In Asia, heart attacks and stroke are major causes of morbidity and mortality. The risk factors leading to cardiovascular disease are well known.1 Of these, smoking, blood pressure and cholesterol are the major modifiable risk factors. In highly developed countries such as the United States, we and others have shown that the prevalence of these risk factors is declining.2 This is not the case in developing countries.

Cardiovascular diseases form a continuum,3 in which cardiovascular risk factors lead to atherosclerosis, which is not clinically overt at first, but in middle age, may manifest itself as ischaemic heart disease, cerebrovascular and peripheral vascular disease. In old age, accumulated injuries to the myocardium lead to chronic heart failure whereas in the brain, vascular disease is an important cause of senile dementia. The question then arises — can we intervene earlier in the cardiovascular continuum?

Data from the Hong Kong Cardiovascular Risk Factor Prevalence Study showed that hypertension and diabetes are sequelae of obesity.4,5 They support the usefulness of the concept of the metabolic syndrome.6-8 Central obesity leads to elevated triglycerides and reduced high density lipoprotein cholesterol. Raised blood pressure and raised blood glucose follow later.9,10 This provides a window of opportunity to prevent cardiovascular disease by preventing the development of the leading risk factors. Numerous studies have shown that lifestyle measures to reduce central obesity will reduce blood pressure and the development of diabetes.11-13

As a result of economical development, physical activity is declining in Asia.14,15 HDL does not decrease with age in American women but it does so in Hong Kong Chinese women.16 At the same time, a diet that traditionally provides abundant calories for farming and manual labour may be inappropriate for a sedentary lifestyle.17-19 This may explain the high incidence of diabetes among Asians.

For those who already have cardiovascular disease, medications to modify blood pressure, cholesterol and platelet function have been shown in large clinical trials and meta-analyses to have favourable effects on outcome.20-23 The INTERHEART study has eloquently shown that 90% of heart attacks can be explained by nine risk factors, the majority of which are related to lifestyle and can be modified by changes in lifestyle.24 It is high time we put this knowledge into action.

References

Hypertension is one of the leading causes of cardiovascular disease worldwide. More than 1.5 billion individuals will suffer hypertension by the year 2025. This condition will account for up to 50% of heart disease risk and 75% of stroke risk. Moreover, hypertension presently accounts for direct global health costs estimated to be more than 400 billion dollars. High blood pressure defined as systolic pressure >140 and diastolic pressure >90 mmHg is a significant problem in both the United States and China. Over 73 million Americans or one in three adults have hypertension. In a national household survey conducted in China in 2002 the prevalence of hypertension in those 18 years and older was found to be 19%. This figure translates into more than 160 million hypertensive individuals. The growing rate of obesity and high intake of sodium in the diet both in the United States and China are likely reasons for the increase in hypertension rates.

Hypertension prevention and treatment includes both lifestyle interventions of weight loss, sodium restriction, adoption of the DASH diet, exercise and alcohol restriction. Studies such as the DASH and PREMIER trials suggest that weight loss and dietary changes can significantly lower systolic and diastolic blood pressure and should be more readily adopted in community settings. Increasing fruit and vegetable intake and decreasing saturated fats as well as improving exercise have the potential to not only effect hypertension but the associated CVD risk factors of dyslipidemia and diabetes.

Contemporary meta-analysis comparing various antihypertensive medications used in blood pressure trials of 168,593 individuals suggests that the majority of reduction in CVD endpoints is due to the lowering of blood pressure rather than the choice of agent used to manage hypertension. The majority of these trials resulted in the lowering of blood pressure to approximately 135/75 mmHg. Ensuring patient adherence to antihypertensive regimens is important to increasing better overall hypertension control. Data suggests that at least 50% of patients taking antihypertensive regimens may discontinue therapies by one year. Efforts must also be instituted to focus on the patient's acceptance of the medication regimen, how well it is executed and whether persistence continues beyond one year.

Home blood pressure monitoring (HBPM) has served as an effective method for improving the diagnosis of white coat and masked hypertension, and to improve medication adherence and control. Many organizations within the United States, Europe and Asia recommend the use of home blood pressure monitoring in the majority of individuals with hypertension. Ensuring the appropriate blood pressure technique, frequency and scheduling of measurement, and evaluating the need for ambulatory versus HBPM helps clinicians obtain important information to guide decisions about management. Moreover, HBPM offers the physiologic feedback needed for patients to observe their blood pressure values. This is especially important due to hypertension being an asymptomatic condition.

Managing resistant hypertension is also critical to better blood pressure control. Data from ALLHAT indicates that 27% of individuals were on three or more medications with blood pressures still not at goal.

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kidney disease (CR>1.5 mg.dL), diabetes, living in the southeast part of the U.S., African-Americans, and women. The causes of resistant hypertension include pseudoresistance, white coat effect, lifestyle factors, drug-related causes and secondary causes. A treatment algorithm should be followed to better manage this condition.

References

How to Achieve Regression of Atherosclerosis

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TOMLINSON ET AL.: How to Achieve Regression of Atherosclerosis. Coronary artery disease and stroke are the leading causes of death in most developed countries and the prevalence of these diseases is increasing rapidly in developing countries. Atherosclerosis is a dynamic process that in most patients shows a gradual progression with episodes of more rapid deterioration usually related to thrombotic episodes. Many of the early trials of lipid lowering agents showed only very small degrees of angiographic regression despite impressive reductions in cardiovascular events. The development of noninvasive imaging techniques to study atherosclerotic changes in the arterial wall, such as computed tomographic imaging of coronary calcium, intravascular ultrasound of the coronary arteries, multidetector computed tomographic angiography, B mode ultrasound of the carotid arteries, and magnetic resonance imaging of the carotid arteries has facilitated studies of lesion progression and provided evidence that aggressive pharmacological interventions, particularly those of lipid-altering therapies, can reduce the rate of progression or in some cases actually produce regression of atheromatous lesions. A multimodality approach to the management of all the risk factors in patients with coronary artery disease is likely to produce the best results, but the evidence for lowering low-density lipoprotein cholesterol with intensive statin therapy is currently the most convincing. The lipid responses to statins vary widely between individuals because of a combination of phenotypic and genotypic factors, which are also likely to affect outcomes measured by the various imaging techniques as well as cardiovascular events, so there may be considerable scope for the individualization of treatments to achieve greater benefits when more pharmacogenetic data are available. (J HK Coll Cardiol 2008;16(Suppl 1):A52-A61)

Atherosclerosis, coronary artery disease, imaging techniques, individualized therapy, statins

摘要
冠脈疾病和中風在大部分發達國家是主要死亡原因，其發病率在發展中國家也迅速增加。動脈粥樣硬化是一個動態過程，大部分患者中表現為逐漸進展期和與血栓形成有關的迅速惡化期。許多早期關於降血脂藥物的研究表明，其能降低心血管事件發生率但血管造影顯示的改善不明顯。諸如冠脈鈣化CT成像、冠脈血管內超聲、多控制器CT血管造影、頸動脈B超和磁共振成像等無創技術的進展促進了對粥樣硬化病變進程的研究，證明藥物干預，尤其是血脂調節能延緩疾病進展甚至修復粥樣硬化病變。針對冠脈疾病所有危險因素的多形式綜合防治可能效果最佳，但目前研究顯示加強新他汀類藥物從而降低低密度脂蛋白膽固醇含量的療法效果顯著。脂質對他汀類藥物的反應個體差異很大，這可能由於表現型與基因型的不同。此兩者也可能影響各種成像技術測量結果以及心血管事件發生率。因此在更多遺傳藥理學資料的基礎上，個體化治療能改善粥樣硬化的療效。

關鍵詞：動脈粥樣硬化 冠狀動脈疾病 成像技術 個體化治療 他汀類

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Introduction

It has only been in recent years that regression of atheromatous plaques in humans has been considered a real possibility. Earlier concepts of the pathology of advanced atheromatous lesions in humans and in animal models considered that they contain components that might not regress, such as necrosis, calcification and fibrosis. Many of the early trials of lipid lowering agents showed only very small degrees of angiographic regression, despite large reductions in clinical events giving rise to the so-called 'angiographic paradox' but meta-analysis of trials of statin therapy showed that the LDL-cholesterol level on therapy and the percentage reduction in LDL-cholesterol both were good predictors of angiographic benefit. The notion that lipid-rich, vulnerable plaques have a central role in acute coronary syndromes and the predominant benefit derived from statins in reduction of cardiovascular events was through stabilisation of lipid-laden plaques, rather than regression of atherosclerosis was also developed. This was shown in human carotid plaques removed during carotid endarterectomy where 3 months of pravastatin treatment had a plaque-stabilising effect decreasing lipids, lipid oxidation, and inflammation, and increasing collagen content compared to no lipid-lowering therapy.3

The increasing evidence from several large clinical outcome trials has clearly shown that aggressive LDL-cholesterol reduction with statins reduces hard end points of cardiovascular events. The development of new imaging techniques has also been able to show that aggressive lipid lowering slows the progression of atherosclerosis. Arterial lumen size may not be a very accurate measure of atheromatous plaque and lesion remodeling may confound the effects of therapeutic interventions. Autopsy studies had shown that atherosclerotic human coronary arteries enlarged in relation to plaque area and the cross-sectional area of the lumen was preserved until the lesion occupied at least 40% of the internal elastic lamina area. Furthermore, vulnerable plaques may be relatively small but may easily rupture and result in acute thrombotic events of unstable angina, acute myocardial infarction, and sudden cardiac death. The development of noninvasive imaging techniques to study atherosclerotic changes in the arterial wall, such as computed tomographic (CT) imaging of coronary calcium, intravascular ultrasound (IVUS), multidetector CT angiography, B mode ultrasound of the carotid arteries, and MRI of the carotid arteries has facilitated studies of lesion progression and provided extremely useful information for clinical trials.7, 8

Screening Guidelines

Some of these noninvasive imaging techniques have been included in guidelines for screening asymptomatic individuals who are considered high risk by the traditional risk factor-based approach. The Screening for Heart Attack Prevention and Education (SHAPE) Task Force proposed the First SHAPE Guideline to detect and treat individuals with subclinical atherosclerosis using 2 noninvasive imaging techniques: coronary artery calcium scoring using computed tomography and carotid intima media thickness and plaque using B-mode ultrasonography. The National Cholesterol Education Program and the American Heart Association also suggested that noninvasive screening tests may be an option for advanced risk assessment in appropriately selected individuals, specifically in those who are at intermediate or indeterminate risk.10, 11

Electron-Beam Tomography of Coronary Artery Calcium

A retrospective study showed that aggressive LDL-cholesterol lowering with statins correlated significantly with reduction in coronary calcium-volume score by electron-beam CT, indicating that even coronary artery calcifications can shrink with appropriate treatment. In the BELLES (Beyond Endorsed Lipid Lowering with EBT Scanning) study in 615 hypercholesterolaemic postmenopausal women randomized to intensive (atorvastatin 80 mg/day) and moderate (pravastatin 40 mg/day) lipid-lowering therapy using sequential electron-beam tomography (EBT) scanning to quantify changes in coronary artery calcium (CAC) as a measure of atherosclerosis burden...
only 475 completed the study and despite greater reductions in LDL-cholesterol in the intensive statin therapy it did not result in less progression of coronary calcification over 1 year.13

**Coronary Artery Intravascular Ultrasound**

The IVUS technique allows tomographic assessment of lumen area, plaque size, distribution, and composition and it was recognized that it was likely to be particularly useful in atherosclerosis regression-progression trials with lipid lowering or other therapies which might reduce atheroma burden.14, 15 Serial changes in plaque progression and lumen reduction as assessed with IVUS were compared with 3 established risk scores for primary prevention, PROCAM, SCORE, and Framingham, in 56 patients with established atherosclerosis and there was a positive linear relationship between the estimated risk of clinical events derived from all 3 established risk-score algorithms and the extent of plaque progression measured by serial IVUS.16 The main lipid-modifying studies using IVUS are summarised in Table 1.

The first large study to use this technique to examine the changes in coronary atheroma with statin treatments was the REVERSAL (Reversing Atherosclerosis with Aggressive Lipid Lowering) study,17 which was only able to demonstrate a lack of progression of coronary atheroma with high-dose (80 mg) atorvastatin, which reduced LDL-cholesterol to a mean of 79 mg/dL compared to a level of 110 mg/dL with pravastatin 40 mg. In the pravastatin treated group there was progression of coronary atherosclerosis (change in atheroma volume compared with baseline 2.7%; 95% confidence interval [CI], 0.2% to 4.7%; p =0.001). Analysis of the groups receiving atorvastatin and pravastatin combined, indicated that a reduction in LDL-cholesterol >50% was needed to obtain regression of coronary atheroma volume and changes in CRP also

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**Table 1. Summary of intravascular ultrasound trials in patients with coronary disease receiving lipid-altering treatment**

<table>
<thead>
<tr>
<th>Variables</th>
<th>REVERSAL17 (n=502)</th>
<th>ASTEROID21 (n=349)</th>
<th>ILLUSTRATE25 (n=910)</th>
<th>ACTIVATE28 (n=408)</th>
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<tr>
<td><strong>Study medications</strong></td>
<td>Atorvastatin 80 mg vs. Pravastatin 40 mg</td>
<td>Rosuvastatin 40 mg vs. Atorvastatin + torcetrapib</td>
<td>Pactimibe 100 mg vs. placebo**</td>
<td></td>
</tr>
<tr>
<td><strong>Duration of study, month</strong></td>
<td>18</td>
<td>24</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td><strong>Age, y</strong></td>
<td>55.8 vs. 56.6</td>
<td>58.5</td>
<td>57 vs. 56.9</td>
<td>58.8 vs. 59.6</td>
</tr>
<tr>
<td><strong>Male,</strong>%</td>
<td>71 vs. 73</td>
<td>70.2</td>
<td>70.5 vs. 70.4</td>
<td>65.8 vs. 71.6</td>
</tr>
<tr>
<td><strong>Body mass index, kg/m²</strong></td>
<td>30.5 vs. 30.5</td>
<td>29.1</td>
<td>30.3 vs. 30.6</td>
<td>30.9 vs. 31.0</td>
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<tr>
<td><strong>Mean baseline levels</strong></td>
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<tr>
<td><strong>Total cholesterol, mg/dL</strong></td>
<td>231.8 vs. 232.6</td>
<td>204</td>
<td>157.5 vs. 157.7</td>
<td>173.4 vs. 171.5</td>
</tr>
<tr>
<td><strong>LDL-cholesterol, mg/dL</strong></td>
<td>150.2 vs. 150.2</td>
<td>130.4</td>
<td>84.3 vs. 83.1</td>
<td>96.0 vs. 94.8</td>
</tr>
<tr>
<td><strong>Triglyceride, mg/dL</strong></td>
<td>197.2 vs. 197.7</td>
<td>135</td>
<td>123.9 vs. 122.0</td>
<td>144 vs. 150</td>
</tr>
<tr>
<td><strong>HDL-cholesterol, mg/dL</strong></td>
<td>42.3 vs. 42.9</td>
<td>43.1</td>
<td>45.2 vs. 46.0</td>
<td>44.6 vs. 42.4</td>
</tr>
<tr>
<td><strong>Percent atheroma volume, %</strong></td>
<td>38.4 vs. 39.5</td>
<td>39.6</td>
<td>37.1 vs. 37.0</td>
<td>39.8 vs. 39.3</td>
</tr>
<tr>
<td><strong>Total atheroma volume, mm³</strong></td>
<td>184.4 vs. 194.5</td>
<td>212.2</td>
<td>198.7 vs. 196.1</td>
<td>198.1 vs. 196.5</td>
</tr>
<tr>
<td><strong>Mean change from baseline</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total cholesterol, %</strong></td>
<td>-34.1 vs. -18.4</td>
<td>-33.8</td>
<td>1.9 vs. 7.2</td>
<td>NA</td>
</tr>
<tr>
<td><strong>LDL-cholesterol, %</strong></td>
<td>-6.3 vs. -25.2</td>
<td>-53.2</td>
<td>6.6 vs. -13.3</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Triglyceride, %</strong></td>
<td>-20.0 vs. -6.8</td>
<td>-14.5</td>
<td>-8.2 vs. -14.3</td>
<td>NA</td>
</tr>
<tr>
<td><strong>HDL-cholesterol, %</strong></td>
<td>2.9 vs. 5.6</td>
<td>14.7</td>
<td>-2.2 vs. 58.6</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Percent atheroma volume, %</strong></td>
<td>0.5 vs. 1.9</td>
<td>-0.98</td>
<td>0.19 vs. 0.12</td>
<td>0.69 vs. 0.59</td>
</tr>
<tr>
<td><strong>Total atheroma volume, mm³</strong></td>
<td>-0.4 vs. 5.1</td>
<td>-14.7</td>
<td>-6.3 vs. -9.4</td>
<td>-1.3 vs. -5.6</td>
</tr>
</tbody>
</table>

*Data was presented as median except for REVERSAL trial; **212 (79.1) and 204 (76.7) patients in placebo group and pactimibe group using statins respectively; †: p<0.001 between 2 treatment groups ; ‡: p<0.05 between 2 groups; NA: data not available
predicted regression in REVERSAL. In the clinical study of the same dosing strategy after acute coronary syndromes, the PROVE IT-TIMI 22 (Pravastatin or Atorvastatin Evaluation and Infection Therapy: Thrombolysis in Myocardial Infarction 22) trial, there was a marked reduction in adverse cardiovascular events with atorvastatin compared to pravastatin with a 16% (95% CI; 5 to 26%; p=0.005) reduction in the hazard ratio in favor of atorvastatin, supporting the theory of stabilisation of lipid-laden plaques without major regression of atherosclerosis with intensive statin therapy.

More recently in the ASTEROID (A Study To Evaluate the Effect of Rosuvastatin on Intravascular Ultrasound-Derived Coronary Atheroma Burden) trial of 2 years treatment with rosuvastatin 40 mg daily, mean LDL-cholesterol levels decreased by 53% (from 130 to 61 mg/dL) and mean high-density lipoprotein (HDL) cholesterol levels increased by 15% (from 43 to 49 mg/dL) and there was a decrease in mean percent atheroma volume (from 39.6% to 38.6%) and mean atheroma volume in the most diseased 10-mm subsegment (from 65 to 59 mm3). A post-hoc analysis of data from REVERSAL, ASTEROID and 2 other IVUS studies showed in univariate analysis that mean levels and treatment-mediated changes in LDL-cholesterol, total cholesterol, non-HDL cholesterol, apolipoprotein B, and ratio of apolipoprotein B to apolipoprotein A-I were significantly correlated with the rate of atherosclerotic progression, whereas treatment-mediated changes in HDL-cholesterol were inversely correlated with atheroma progression. Mean levels of LDL-cholesterol and increases in HDL-cholesterol remained independent predictors of atheroma regression in multivariate analysis. Substantial atheroma regression was seen in patients with on treatment levels of LDL-cholesterol less than the mean (87.5 mg/dL) and increases of HDL-cholesterol greater than the mean (7.5%).

Quantitative coronary angiography in the patients in the ASTEROID trial also showed evidence of lesion regression by decreasing percent diameter stenosis and improving minimum lumen diameter. It was concluded that aggressive lowering of LDL-cholesterol and a moderate increase in HDL-cholesterol with rosuvastatin 40 mg resulted in regression of coronary atherosclerosis. The ASTEROID trial did not have any control group and the ongoing SATURN (Study of Coronary Atheroma by Intravascular Ultrasound: Effect of Rosuvastatin versus Atorvastatin) study will remedy this by comparing the effects of rosuvastatin 40 mg or atorvastatin 80 mg treatment for 2 years on atherosclerotic disease as measured by IVUS in patients with coronary disease undergoing angiography.

The importance of increases in plasma HDL-cholesterol has been shown in some animal models of atherosclerosis in which infusion of native HDL-cholesterol or lipid-free apolipoprotein A-1 (apo A-1) reduced plaque size. Furthermore, weekly infusions of the recombinant mutant apolipoprotein apo A-1 Milano for 5 weeks resulted in modest plaque regression determined by IVUS in patients after an acute coronary event. The approach to increase HDL-cholesterol was pursued in the ILLUSTRATE trial with torcetrapib, an inhibitor of cholesteryl ester transfer protein (CETP) and in the IVUS study in patients with coronary disease, compared with atorvastatin monotherapy, torcetrapib-atorvastatin combination therapy resulted in an approximate 61% relative increase in HDL-cholesterol and a 20% relative decrease in LDL-cholesterol, but there was no significant difference in the change in atheroma volume for the most diseased vessel segment between the two treatment groups. This lack of benefit seems to be associated with an increase in systolic blood pressure of 4.6 mmHg and an increase in circulating aldosterone which could have negated the beneficial effects on lipids. Likewise, the clinical trial to investigate whether torcetrapib might reduce major cardiovascular events in patients at high cardiovascular risk (ILLUMINATE) was terminated prematurely because of an increased risk of death and cardiac events in patients receiving torcetrapib.

Another negative IVUS study was the ACTIVATE (Acy-CoA: Cholesterol Acyltransferase Intravascular Atherosclerosis Treatment Evaluation) Study with the ACAT inhibitor pactimibe, which has beneficial effects on foam cell formation and other antiatherosclerotic effects in animal models. Pactimibe (100 mg per day) in addition to usual care for secondary prevention, including statins, if indicated, did not improve the primary efficacy variable (percent atheroma volume)
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and adversely affected two major secondary IVUS efficacy measures and it was concluded that this treatment may actually promote atherogenesis in humans.28

Carotid Intima-Media Thickness

Carotid intima-media thickness (CIMT) is related to most of the conventional cardiovascular risk factors. In subjects in the Atherosclerosis Risk in Communities (ARIC) study and a group of patients with coronary heart disease (CHD), carotid thickness showed approximately linear positive associations with fasting plasma LDL-cholesterol and apolipoprotein B (apoB) and negative associations with HDL-cholesterol and apoA-I levels.29 CIMT was shown to predict not only stroke but also CHD events in studies such as the Rotterdam study,30 the Cholesterol Lowering Atherosclerosis Study,31 and the Cardiovascular Health Study.32 In the follow up from the ARIC study, greater CIMT was associated with increased risk of CHD and future ischaemic stroke incidence.33, 34

A number of studies have shown that the progression in CIMT can be influenced by modification of the cardiovascular risk factors. The main lipid-modifying studies using CIMT endpoints are summarised in Table 2. In the ASAP (aggressive versus conventional lipid lowering on atherosclerosis progression in familial hypercholesterolaemia) study, aggressive LDL-cholesterol reduction with atorvastatin 80 mg resulted in a decrease in CIMT of -0.031 mm (95% CI; -0.007 to -0.055; p=0.0017), whereas with conventional LDL-cholesterol lowering with simvastatin 40 mg it increased by 0.036 mm (95% CI: 0.014-0.058; p=0.0005).35 In the ARBITER (Arterial Biology for the Investigation of the Treatment Effects of Reducing Cholesterol) trial comparing the effects of atorvastatin 80 mg daily and pravastatin 40 mg daily on CIMT in patients that met National Cholesterol Education Program (NCEP) II criteria for lipid-lowering therapy, atorvastatin induced progressive CIMT regression over 12 months (change in CIMT, -0.034±0.021 mm), whereas CIMT was stable in the pravastatin group (change of 0.025±0.017 mm; p=0.03).36 A further study in patients with CHD and low levels of HDL-cholesterol (ARBITER 2) compared the addition of placebo or extended-release niacin to statin therapy. HDL-cholesterol increased by a mean of 21% in the niacin group and mean CIMT increased significantly in the placebo group (0.044±0.100 mm; p<0.001) and was unchanged in the niacin group (0.014±0.104 mm; p=0.23), but the overall difference in CIMT progression between the niacin and placebo groups was not statistically significant at 1 year (p=0.08).37 Some participants from the ARBITER 2 study were enrolled in ARBITER 3 and took extended-release niacin 1000 mg daily for another 12 months.38 The changes in CIMT suggested regression in atherosclerosis occurred over 24 months related to increases in HDL-cholesterol.

The study with torcetrapib on CIMT in patients with heterozygous familial hypercholesterolemia (RADIANCE 1 study) showed that the use of torcetrapib with atorvastatin, as compared with atorvastatin alone, produced a large increase in HDL-cholesterol levels and substantial decreases in LDL-cholesterol and triglyceride levels but failed to reduce progression of atherosclerosis, as assessed by a combined measure of CIMT, and was associated with progression of disease in the common carotid segment.39 Similar findings were reported in another study comparing the combination of torcetrapib with atorvastatin to atorvastatin alone in patients with mixed dyslipidaemia (RADIANCE 2 study).40 This lack of benefit of torcetrapib on CIMT appears to related to the increases in blood pressure and aldosterone as in the other studies with torcetrapib.

In the METEOR (Measuring Effects on Intima-Media Thickness: an Evaluation of Rosuvastatin) study in 984 middle-aged asymptomatic subjects with low CHD risk (Framingham risk score <10%), modest CIMT thickening (1.2 to <3.5 mm), and elevated LDL-cholesterol (mean, 154 mg/dL), rosuvastatin 40 mg daily resulted in statistically significant reductions in the rate of progression of maximum CIMT over 2 years vs. placebo.41 The change in maximum CIMT for the 12 carotid sites was -0.0014 mm/year (95% CI; -0.0041 to 0.0014) for the rosuvastatin group vs. 0.0131 mm/year (95% CI; 0.0087 to 0.0174) for the placebo group (p<0.001). In another small trial, the ACADIM (the Asymptomatic Carotid Atherosclerotic
Table 2. Summary of Carotid Intima-Media Thickness trials in patients with lipid-modifying treatments

<table>
<thead>
<tr>
<th>Variables</th>
<th>ASAP(^35) (n=325)</th>
<th>ARBITER(^36) (n=161)</th>
<th>ARBITER 2(^37) (n=167)</th>
<th>METEOR(^42) (n=984)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects</strong></td>
<td>FH Patients eligible for lipid lowering therapy</td>
<td>CHD patients on background statin therapy</td>
<td>Individuals with moderately elevated cholesterol and low risk of cardiovascular disease</td>
<td></td>
</tr>
<tr>
<td><strong>Study medications</strong></td>
<td>Atorvastatin 80 mg vs. simvastatin 40 mg</td>
<td>Atorvastatin 80 mg vs. pravastatin 40 mg</td>
<td>Niacin 1000 mg vs. placebo</td>
<td>Rosuvastatin 40 mg vs. placebo</td>
</tr>
<tr>
<td><strong>Duration of study, month</strong></td>
<td>24</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td><strong>Age, y</strong></td>
<td>48</td>
<td>58 vs. 61</td>
<td>67 vs. 68</td>
<td>57 vs. 57</td>
</tr>
<tr>
<td><strong>Male, %</strong></td>
<td>NA</td>
<td>68.4 vs. 74.4</td>
<td>89.7 vs. 92.5</td>
<td>60 vs. 59</td>
</tr>
<tr>
<td><strong>Body mass index, kg/m(^2)</strong></td>
<td>26</td>
<td>NA</td>
<td>NA</td>
<td>27.1 vs. 27.5</td>
</tr>
<tr>
<td><strong>Mean baseline levels</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol, mg/dL</td>
<td>386 vs. 397</td>
<td>229 vs. 234</td>
<td>154 vs. 161</td>
<td>229 vs. 230</td>
</tr>
<tr>
<td>LDL-cholesterol, mg/dL</td>
<td>309 vs. 322</td>
<td>148 vs. 155</td>
<td>87 vs. 91</td>
<td>155 vs. 154</td>
</tr>
<tr>
<td>Triglyceride, mg/dL</td>
<td>166 vs. 164</td>
<td>203 vs. 211</td>
<td>154 vs. 172</td>
<td>126 vs. 134</td>
</tr>
<tr>
<td>HDL-cholesterol, mg/dL</td>
<td>46 vs. 45</td>
<td>49 vs. 49</td>
<td>39 vs. 40</td>
<td>50 vs. 49</td>
</tr>
<tr>
<td>Carotid intima-media thickness, mm</td>
<td>0.93 vs. 0.92</td>
<td>0.625 vs. 0.615</td>
<td>0.893 vs. 0.868</td>
<td>0.76 vs. 0.76</td>
</tr>
<tr>
<td><strong>Mean change from baseline</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol, %</td>
<td>-41.8 vs. -33.6(^\dagger)</td>
<td>NA</td>
<td>NA</td>
<td>-33.7 vs. 0.3(^\dagger)</td>
</tr>
<tr>
<td>LDL-cholesterol, %</td>
<td>50.5 vs. -41.2(^\dagger)</td>
<td>-48.5 vs. -27.2(^\dagger)</td>
<td>NA</td>
<td>-48.8 vs. -0.3(^\dagger)</td>
</tr>
<tr>
<td>Triglyceride, %</td>
<td>-29.2 vs. -17.7(^\dagger)</td>
<td>NA</td>
<td>NA</td>
<td>-15.7 vs. 10.1(^\dagger)</td>
</tr>
<tr>
<td>HDL-cholesterol, %</td>
<td>13.2 vs. 13.4</td>
<td>NA</td>
<td>+21% vs. no change</td>
<td>8.0 vs. 2.8(^\dagger)</td>
</tr>
<tr>
<td>Carotid intima-media thickness, mm</td>
<td>-0.031 vs. 0.036(^\dagger)</td>
<td>-0.034 vs. 0.025(^\dagger)</td>
<td>0.014 vs. 0.044</td>
<td>0.0004 vs. 0.088(^\dagger)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables</th>
<th>RADIANCE 1(^39) (n=850)</th>
<th>RADIANCE 2(^40) (n=752)</th>
<th>ENHANCE(^43) (n=720)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects</strong></td>
<td>FH Mixed dyslipidaemia FH</td>
<td>FH</td>
<td></td>
</tr>
<tr>
<td><strong>Study medications</strong></td>
<td>Atorvastatin vs. Atorvastatin + torcetrapib 60 mg</td>
<td>Atorvastatin + placebo vs. Atorvastatin + torcetrapib 60 mg</td>
<td>Simvastatin 80 mg + placebo vs. Simvastatin + ezetimibe 10 mg</td>
</tr>
<tr>
<td><strong>Duration of study, month</strong></td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td><strong>Age, y</strong></td>
<td>45.2 vs. 46.8</td>
<td>56.5 vs. 57.9</td>
<td>45.7 vs. 46.1</td>
</tr>
<tr>
<td><strong>Male, %</strong></td>
<td>51.1 vs. 47.6</td>
<td>65 vs. 63</td>
<td>49.3 vs. 53.5</td>
</tr>
<tr>
<td><strong>Body mass index, kg/m(^2)</strong></td>
<td>26.7 vs. 26.7</td>
<td>30.0 vs. 30.0</td>
<td>26.7 vs. 27.4(^\dagger)</td>
</tr>
<tr>
<td><strong>Mean baseline levels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol, mg/dL</td>
<td>213.5 vs. 213.0</td>
<td>184 vs. 185</td>
<td>400.0 vs. 400.0</td>
</tr>
<tr>
<td>LDL-cholesterol, mg/dL</td>
<td>138.9 vs. 138.4</td>
<td>101 vs. 101</td>
<td>317.8 vs. 319.0</td>
</tr>
<tr>
<td>Triglyceride, mg/dL</td>
<td>97.4 vs. 97.4(^*)</td>
<td>166 vs. 167</td>
<td>160 vs. 157(^*)</td>
</tr>
<tr>
<td>HDL-cholesterol, mg/dL</td>
<td>51.8 vs. 52.9</td>
<td>48 vs. 48</td>
<td>47.4 vs. 46.7</td>
</tr>
<tr>
<td>Carotid intima-media thickness, mm</td>
<td>0.72 vs. 0.71</td>
<td>0.83 vs. 0.83</td>
<td>0.65 vs. 0.67</td>
</tr>
<tr>
<td><strong>Mean change from baseline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol, %</td>
<td>5.1 vs. 3.8</td>
<td>2.3 vs. 5.9(^\dagger)</td>
<td>-31.9 vs. -45.3(^\dagger)</td>
</tr>
<tr>
<td>LDL-cholesterol, %</td>
<td>6.3 vs. -14.4(^\dagger)</td>
<td>4.4 vs. -13.3(^\dagger)</td>
<td>-39.1 vs. -55.6(^\dagger)</td>
</tr>
<tr>
<td>Triglyceride, %</td>
<td>2.1 vs. -7.7(^*)</td>
<td>1.5 vs. -12.6(^\dagger)</td>
<td>-23.2 vs. -29.8(^*)</td>
</tr>
<tr>
<td>HDL-cholesterol, %</td>
<td>2.5 vs. 54.4(^\dagger)</td>
<td>-1.8 vs. 61.6(^\dagger)</td>
<td>7.8 vs. 10.2</td>
</tr>
<tr>
<td>Carotid intima-media thickness, mm</td>
<td>-0.0014 vs. 0.038 (per year)(^\dagger)</td>
<td>0.008 vs. 0.0013 (per year)(^\dagger)</td>
<td>0.0024 vs. 0.0019 (per year)(^\dagger)</td>
</tr>
</tbody>
</table>

\(^\dagger\): p<0.01 between 2 groups; \(^\ddagger\): p<0.05 between 2 groups; \(^*\): Data was presented as Median; NA: data not available.
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Disease in Manfredonia) Study, treatment with rosvastatin (10 mg/day) for only 16 weeks in 66 subjects with hypercholesterolemia and carotid atherosclerosis at baseline significantly reduced the CIMT of both common carotid arteries as well as improving lipid and lipoprotein levels.42

Thus, aggressive reduction of LDL-cholesterol with statins appears effective in reducing CIMT over a relatively short period of time. However, in the ENHANCE (Ezetimibe and Simvastatin in Hypercholesterolemia Enhances Atherosclerosis Regression) study in 720 patients with familial hypercholesterolemia treated with 80 mg of simvastatin either with placebo or with 10 mg of ezetimibe for 24 months, there was no significant difference in changes in CIMT between the two treatments despite additional reductions with the combination treatment of 16.5%, 6.6% and 25.7% for LDL-cholesterol, triglycerides and C-reactive protein, respectively.43 Whilst at first sight this may not appear to support the concept that lower levels of LDL-cholesterol will result in greater benefits, it should be noted that the patients in this study had smaller baseline values for CIMT than in most previous studies and they had been treated aggressively with statins for some years previously and many of them had taken part in the earlier aggressive versus conventional lipid lowering on atherosclerosis progression in familial hypercholesterolaemia (ASAP).35

High-Resolution Magnetic Resonance Imaging

The role of magnetic resonance imaging (MRI) for detection and monitoring of the development and progression of atherothrombosis responsible for ischemic events has been reviewed recently.7,44 It appears particularly useful to characterize carotid atherosclerotic plaque and identify vulnerable lesions.45 In hypercholesterolemic patients with moderate carotid stenosis, noninvasive MRI was able to determine the distribution of lesions and lesion types reproducibly and showed a wide range of lesion types, including advanced lesions.46

The ORION (Outcome of Rosuvastatin treatment on carotid artery atheroma: a magnetic resonance Imaging ObservatioN) trial used high-resolution magnetic resonance imaging (MRI) to evaluate the effect of low-dose (5 mg) and high-dose (40/80 mg) rosvastatin for 2 years on carotid artery atherosclerosis in 43 patients with fasting LDL-cholesterol ≥100 and <250 mg/dL and 16% to 79% carotid stenosis by duplex ultrasound.47 LDL-cholesterol was significantly reduced by 59.9±3.3% in the high-dose group and by 38.2±2.4% in the low-dose group (both p<0.001) and HDL-cholesterol increased by 10.1±2.0% in the high-dose group (p<0.001) with no significant change from baseline in the low-dose group (2.2±3.2%; p=0.05). At 24 months, the overall plaque burden remained unchanged for both dosage groups, but in all patients with a lipid-rich necrotic core (LRNC) at baseline, the mean proportion of the vessel wall composed of LRNC (%LRNC) decreased by 41.4% (p=0.005).

Statin Pharmacogenetics

It is worth noting that the clinical efficacy, in terms of LDL-cholesterol lowering, and the safety of statin treatment varies considerably from person to person because of a combination of phenotypic and genotypic factors.48-50 These factors are also likely to effect outcomes measured by the various imaging techniques as well as cardiovascular events so there may be considerable scope for the individualization of treatments when more pharmacogenetic and pharmacogenomic data are available to predict these responses. A recent study using the genome-wide scan for genetic markers of simvastatin-related myopathy found that a common variant in the hepatocyte uptake transporter organic anion-transporting polypeptide 1B1 (OATP1B1), encoded by the gene SLC01B1, was associated with increased risk of myopathy, and this polymorphisms may be useful in the future for the choice of drug and dosage to achieve maximum efficacy and safety.51 Rosuvastatin shows increased systemic exposure in Asians compared with Caucasians and regulatory authorities including the FDA have
recommended starting with lower doses (5 mg) in 'Asian' patients. The OATP1B1 uptake transporter does influence hepatic uptake of rosuvastatin but the higher systemic exposure did not appear to be related to the common polymorphisms and haplotypes in SLCO1B1 in a study examining the ethnic differences in disposition of rosuvastatin in Singapore. In that study there was considerable overlap in the measures of rosuvastatin systemic exposure between different ethnic groups so a number of other genotypic or phenotypic factors are likely to be involved in determining efficacy and safety.

In the DISCOVERY Asia study conducted at 70 centers in China, Hong Kong, Korea, Malaysia, Taiwan, and Thailand, the starting dose of 10 mg rosuvastatin produced no adverse effects and the reduction in LDL-cholesterol was similar to that seen in other studies with rosuvastatin 10 mg mainly in Caucasians reviewed by Schuster or in the STELLAR trial.

Conclusions

The development of these new imaging technologies has allowed the visualisation of arterial wall thicknesses, areas, and volumes and plaque composition and burden and enables the early detection of atherosclerosis, refinement of risk assessments, and monitoring of atherosclerosis progression/regression. A multimodality approach to the management of lipid risk factors in patients with coronary artery disease is likely to produce the best results, but the evidence for potent statins is still the most compelling at present. The results of several ongoing trials should help to clarify whether combinations of pharmacologic agents may be even more efficacious in the long-term management of patients at risk for atherosclerosis events. A pharmacogenetic approach may eventually allow the individualisation of treatments for even greater benefits.

Acknowledgment

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References

HOW TO ACHIEVE REGRESSION OF ATHEROSCLEROSIS


Update in Medical Treatment

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Majority of patients referred for cardiac rehabilitation have severe coronary artery diseases (e.g. post myocardial infarction, percutaneous coronary intervention or coronary artery bypass grafting). Medications prescribed during cardiac rehabilitation for these patients include specific therapies and drugs to modify cardiovascular risk factors. The following table summarizes the commonly used drugs:

### Specific treatment for coronary artery diseases

<table>
<thead>
<tr>
<th>Category</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-platelets</td>
<td>Aspirin, Clopidogrel</td>
</tr>
<tr>
<td>Symptoms control</td>
<td>Nitrates (po, sublingual, patch)</td>
</tr>
<tr>
<td>Anti-heart failure medications</td>
<td>Beta-blockers (Metoprolol XL, Bisoprolol, Carvedilol)</td>
</tr>
<tr>
<td></td>
<td>ACEI (Captopril, Ramipril) or ARB (Valsartan)</td>
</tr>
<tr>
<td></td>
<td>Aldosterone antagonists (Eplerenone)</td>
</tr>
</tbody>
</table>

### Drugs for secondary prevention

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Medications</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Varenicline tartrate</td>
<td>Smoking cessation</td>
</tr>
<tr>
<td></td>
<td>Bupropion SR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transdermal nicotine patch</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>Various anti-hypertensives</td>
<td>BP &lt;140/90 mmHg or &lt;130/80 mmHg if DM or renal impairment</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>Statins</td>
<td>LDL-C &lt;2.6 mmol/L (if TG ≥2.3 mmol/L, non-HDL-C &lt;3.4 mmol/L), &lt;1.8 mmol/L in very high risk patients</td>
</tr>
<tr>
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<td>Depression</td>
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Update in Interventional Treatment and Rehabilitation

ALBERT WAI-SUEN LEUNG

From Specialist in Cardiology, Hong Kong

The progress of cardiology intervention has been rapid and spectacular in the past twenty to thirty years. The term 'intervention' is aimed to describe an invasive treatment modality as separated from non-invasive treatment method, which usually means drug treatment. Initially, invasive treatment means surgery, which involves making open wounds to work out a treatment. Nowadays, this term is singled out to describe invasive treatment that involves no or very small surgical wounds. Common examples are making access to central vascular structures such as the heart through the use of peripheral arteries or veins. A better term for this approach is 'endovascular intervention'. Intervention can now be broadened to include treatment modules that can facilitate rehabilitation. A good example is the use of cardiac re-synchronization therapy to treat and to rehabilitate patients with certain types of congestive heart failure.

The most popular endovascular intervention nowadays is coronary revascularization, which means repairing a diseased (usually narrowed) coronary artery. It was first named percutaneous transluminal balloon angioplasty (PTCA), by using an inflatable (and deflatable) balloon device to expand the coronary lumen. The first human case was performed in 1977. After 3 decades, in the year 2007, we have seen exponential increase in the worldwide use of percutaneous coronary intervention (PCI), a broader term that includes all kinds of endovascular devices that can be used to modify the lumen size of coronary artery. It is estimated that just in the USA, 1,000,000 PCI procedures were performed annually.

Steady improvements in the equipment used for PCI have been and will certainly be on-going. Reductions in device profile, improvements in catheter flexibility and introduction of stents have extended the scope and breadth of clinical practice. The type of lesions amenable to PCI has become progressively more complex, and the outcomes have progressively improved. Special attention has to be drawn to the use of drug-eluting stents (DES) which had developed in the early 2000s. Randomized trials and registries have demonstrated the benefit of DES in patients with focal de-novo lesions as well as in patients with long and small vessels, chronic total occlusions, bypass graft diseases, in-stent restenosis, and in patients with STEMI. Other currently available devices are rotational atherectomy, thrombectomy and aspiration devices, and embolic protection devices. Technical improvements worth mentioning comprise the use of intra-vascular ultrasound (enable operators to visualize directly the artery lumen and artery wall characteristics), the access through radial artery (smaller wound and better haemostasis as compared to femoral approach), and the designs of vascular closure devices for femoral approach. Finally, the adjunctive drug therapies have added values in the outcome of PCI. Examples are dual oral anti-platelet therapies (aspirin plus clopidogrel) and intravenous glycoprotein 2b3a inhibitors.

Endovascular interventions have already been successfully applied in other fields of cardiology. Percutaneous mitral valvuloplasty was first performed in 1984 as an alternative to surgical mitral valve commissurotomy in patients with rheumatic mitral stenosis. The most commonly used approach now is to

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perform a transseptal puncture to gain access to the left atrium, followed by a pressure-distensible dumbbell-shaped balloon dilatation of the stenotic mitral valve. Other valvular interventions include percutaneous mitral valve repair, aortic valvuloplasty, and percutaneous aortic valve replacement.

Another kind of endovascular interventions is aimed for non-coronary obstructive vascular disease. This category consists of atherosclerotic disease of the abdominal aorta and the arteries below (renal, mesenteric, aortoiliac and femoropopliteal), or disease of the supraaortic extracranial arteries (subclavian, vertebral, common carotid and internal carotid), or even the disease of intracranial arteries (e.g. proximal mid cerebral). The most common technology involved is still endovascular ballooning and stenting. Newer techniques have been used in some particular areas, such as cryo-balloon for femoropopliteal disease. Sometimes atherosclerotic disease of the abdominal aorta will present in the form of aneurysm rather than obstruction, then endovascular deployment of aortic stent graft can be considered.

Endovascular interventions have also been practiced in certain kinds of congenital heart diseases and congenital vascular diseases. The procedures can be performed in neonatal, childhood, adolescent or adult stage, depending on the symptom manifestation and urgency of intervention. An example of intervention in adulthood is alcohol ablation in the treatment of hypertrophic obstructive cardiomyopathy (HOCM), in which the septal branches of coronary artery that supply the hypertrophic septal muscles are ablated with alcohol (to make a confined myocardial infarction of the septal muscles). Another example is the closing of atrial septal defect or patent ductus arteriosus with endovascular occlusive devices. Embolization of cerebral artery aneurysm by embolization coils is a method to prevent or to treat rupture aneurysm.

The practice of non-drug therapy for cardiac arrhythmias has created a different category of intervention, another name for it being electrotherapy. It involves a totally different concept by aiming to stop the generation and propagation of abnormal electrical impulse in the heart, or to trigger an impulse when necessary. It can be subdivided into 2 parts, catheter ablation therapy and implantable device therapy.

The purpose of catheter ablation is to destroy myocardial tissue by delivering electrical energy through electrodes on a catheter placed next to an area of the myocardium integrally related to the onset or maintenance of the arrhythmia. The first catheter ablation procedures were performed using direct-current shocks, but this energy source has been supplanted by radiofrequency (RF) energy, hence the term radiofrequency ablation (RFA). Usually the target tissue has been identified by a preceding procedure called electro-physiology stimulation (EPS), which involves the placement of several diagnostic electrode catheters in strategic positions inside the heart (such as right atrium, right ventricle, next to His bundle, and coronary sinus) and programmed stimulation of the heart through different electrodes to trigger the suspected arrhythmia. The target tissue can usually be the slow pathway in AV node, an accessory pathway or the right ventricular outflow tract. The ablation is claimed successful when the initially triggered arrhythmia is not reproduced by subsequent programmed stimulation. Advances in this field include the use of newer energy source such as cryothermal energy, specially designed ablation catheters, and new mapping techniques such as electroanatomical mapping. The ablation therapy for atrial fibrillation is gaining popularity as well.

The advances in implantable devices are rapidly growing. The first kind of implantable device is permanent pacemaker, designed to treat brady-arrhythmia, such as AV block or sick sinus syndrome. It consists of an impulse generator box usually inserted subcutaneously in the infra-clavicular region. One or 2 pacing leads (single or dual chamber type) are placed transvenously into the right ventricle apex and/or right atrial appendage, and then connected to the generator. Impulse is generated whenever a delay in atrial and/or ventricular rhythm is detected. Advances in pacemaker technology have been tremendous. The leads, the generator, the pacing mode, the pacing algorithm and the site of pacing
have all been modified according to the need, the safety and the comfort of patients. The most important advance, however, is the incorporation of anti-tachycardia and defibrillation function in the implantable device, hence the name implantable cardioverter-defibrillator (ICD). ICD is now indicated in patients with ventricular tachycardia and ventricular fibrillation, or to prevent sudden cardiac death in severe heart disease cases.

The ever growing complexity of implantable devices has allowed more disease entities to be treated. The concept of cardiac resynchronization therapy (CRT) is another product. It is designed to treat patients with refractory heart failure as a result of severe structural heart disease that is not amenable to other modes of treatment. It is especially suitable for patients with dys-synchronized left and right heart contraction, reflected by the presence of left or right bundle branch block. Usually a third pacing lead is inserted via the coronary sinus into a cardiac vein in order to trigger the left ventricle. Thus, synchronized atrio-ventricular and ventriculo-ventricular contraction can be maintained. Better designs in leads and anchoring methods are now available, and new indications are forthcoming. The combination of CRT and ICD has created the device known as CRT-D.

New advance in intervention techniques and creation of new concepts is a non-stop process. The yield of today is the effort of the past, not to mention the compulsory elimination of those outdated. Be it cardiac or non-cardiac, catheter-based or device-based, new toys are bound to come and replace the old. It is our role to keep abreast of the updated knowledge in order to make our patients benefit.
Update in the Rehabilitation of Heart Failure

KEI-PUI LEUNG

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Heart failure is the final path of various heart diseases. The cardinal symptoms are exercise intolerance, breathlessness and fatigue. Preventive measures that stop heart failure development along its track are most important. Rehabilitation in heart failure patients includes the following components: i) maintain a normal salt and fluid status and remove the multiple adverse effects of organ congestion, ii) maximize anti-heart failure medications to slow down or to reverse the cardiac remodeling process, iii) empower patients with knowledge and skills for self management, and iv) improve functional capacity and quality of life through exercise training. Exercise training can improve the morphological and biochemical changes in skeletal muscles related to chronic heart failure. Other beneficial effects include autonomic adaptation, decrease in inflammatory markers, and possibly, central adaptation.
Healthful Eating for a Healthy Heart

SELINA KHOR

From State Registered Dietitian, United Kingdom; Accredited Dietitian, Hong Kong Dietitians' Association, Hong Kong

The main aim of the workshop is to translate the updated evidence-based dietetic message into down-to-earth information according to clients' ability to comprehend and accept; most of all to enjoy foods as healthy persons. The workshop conducted in Cantonese, will be started off with a brief presentation of the latest dietary guidelines for dyslipidaemia and "healthful eating for a healthy heart". It will be followed by group discussion on the application of the guidelines such as healthy food choices, shopping tips, menu planning, cooking and eating out tips etc. Other aspects such as the common food beliefs and food fads will also be discussed. At the end of the workshop, the audiences are expected to be able to adopt a healthful diet suitable for dyslipidaemia and "healthy heart".

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In Hong Kong, the health care system is mainly organized under a Western medicine framework, yet the concepts of Chinese medicine are widely held in people's health belief systems. In view of the advantages of the health concepts derived from Western medicine and traditional Chinese beliefs on health among Hong Kong Chinese, Chan and colleagues developed a cultural relevant model, the eastern Body-Mind-Spirit (BMS) model, for understanding health and illness. Integrating the fundamental concepts of traditional Chinese medicine and eastern philosophical concepts of Buddhism and Taoism, the BMS model promotes the idea of holistic health by emphasizing the interconnectedness and balance between the body, mind, and spirit: "Body" refers to the individual's physical health. "Mind" means one's mental health and psychological wellbeing within the individual as well as in the context of society. "Spirit" is the meaning of life and a peace of mind. Within the BMS model, disease is considered a disturbance of the equilibrium between the body, the mind and the spirit; therefore, treatment should lie on restoring and maintaining a balance rather than being allopathic. Systemic thinking and prevention are thus fundamental.

Intervention programs derived from the BMS model are constituted of five primary principles: (1) Normalization of traumatic experience; (2) Letting go of the need for absolute attachments, and acceptance of the unpredictability of life; (3) Forgiveness and self-love as the keys to joy and peace of mind; (4) Expression of emotions; and (5) Reinforcement and stabilization of long-term efforts to change through social support and commitment to help others. Eastern health practices that involve both physical movements and meditation at the same time, such as acupressure and Tai Chi exercise, are often employed techniques. With these techniques being integrated with Western group psychotherapeutic techniques including emotional expression and enhancement of social support, BMS intervention aims to foster a sense of control and independence, and to promote a positive and empowering spirit among clients. The BMS model has been applied to divorced women, infertile couples undergoing in-vitro fertilization, and most extensively, cancer patients. Efficacy of the BMS intervention has been established.

This workshop will focus on a holistic approach of chronic illness management. Holistic health involves the interconnection of body, mind and spirit. Based on the concepts of Traditional Chinese Medicine and Chinese philosophies, the model adopts an integrated and reflective approach that postulates physical, psychosocial and spiritual well-being as an integrated whole. Bridging together Eastern and Western health philosophies and practices in developing a holistic and culturally sensitive Body-Mind-Spirit model for pain management as well as the intervention for patients with heart diseases. The aim of the workshop is to facilitate the self-awareness on the association between the body and the mind, as well as learning techniques in relaxation, with the ultimate aim of achieving a harmonious dynamic equilibrium within the person and between the person and the environment.
References


Behavorial Skills Training

NANCY HOUSTON MILLER

From Stanford Cardiac Rehabilitation Program, Stanford University School of Medicine, USA

Introduction

Patients' adherence with many lifestyle changes and medications hovers at only 50% per year.1,2 Improving patient-provider communication and education and behavioral skills enhances patient adherence. Moreover, multi-component strategies appear to be more effective than single interventions in helping individuals change behavior. While maintenance of behavior change is difficult, it is encouraging that more than two-thirds of the U.S. population is attempting to make lifestyle changes such as limiting salt, fat, and cholesterol and getting regular exercise.3

Meta-analysis of controlled trials of cardiac education show the success of interventions related to diet, exercise, smoking, blood pressure, medication adherence and stress. The most successful programs incorporated close to 10 hours of contact time extending over 10 or more visits. More than 50% of successful programs used at least two interventions, including self-monitoring and some form of social support. More than 75% of the successful trials included behavioral skills rather than an exclusive focus on imparting knowledge.4

Various theories and models of health behavior change underlie cardiovascular risk reduction. These include social learning theory5 the most widely used theory known to help individuals change health behaviors; the trans-theoretical model (stages of change) to assess readiness;6 relapse prevention training for the addictive behaviors of smoking, alcohol and obesity;7 and motivational interviewing that enables the counselor to be guided on appropriate communication skills.8 However, these theories explain only about 30% of the variance in predicting change in patient’s behavior.9 Two additional factors are key: the elements of applied behavioral therapy and the continuous quality improvement process.

For many years behavioral scientists have used a combination of 11 strategies to support the change process. These strategies include setting positive expectations about results, precisely defining behaviors, setting realistic goals, using contracts or written agreements, training around relapse prevention to help individuals with lapses in behaviors, modeling the desired behavior, feedback about progress, problem-solving, finding cues and prompts for helping to remember medications, self-monitoring, rewards, and encouraging social support.9 The choice of these elements varies from one behavior to another. For example, cues and prompts are most important for enhancing medication-taking behavior as the most common reason for non-adherence is due to patients forgetting their medicines. Relapse prevention is the most critical element of behavioral therapy for smokers who lapse and smoke a cigarette or entirely relapse in the early days following a quit attempt. For weight control the self-monitoring of foods and weight are especially salient. Social support from a buddy in a weight loss program or from a family member or friend provides additional benefit. Problem-solving and self-monitoring are applicable to most behaviors and should be applied in the early stages of helping individuals to adopt lifestyle changes. A combination of two or more of these elements fosters success in the adoption and maintenance phases of health behavior change.4

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Continuous quality improvement (CQI) fosters health behavior change. Why is this so important? Adherence is increased when health care professionals provide feedback to patients on progress toward their goals. An evidence-based practice incorporating adherence monitoring at every visit, and flagging of the electronic medical record, enhances clinician's capability to facilitate the change process. The CQI process is facilitated by multi-disciplinary teams with champions, provider training, feedback offered to staff, and guidelines and protocols. Quality improvement programs such as the American Heart Association's Get with the Guidelines utilize a continuous quality improvement process to ensure that patients receive the appropriate lifestyle interventions and medications prior to hospital discharge.

Skills for the Individual Practitioner

Helping individuals change their behavior requires health care professionals to become communicators, educators and coaches - not just one but all three. These important skills of communication, education, and coaching are more fully described below.

Communication

Four communication skills, active listening, warmth and empathy, open-ended questions, and interactive communication provide the basis of motivational interviewing and a patient-centered approach. These four skills facilitate data gathering (through active listening and open-ended questioning), relationship-building (through warmth and empathy) and partnering (interactive communication).

On average, physicians redirect a discussion as soon as 23 seconds into the patient's opening statement of concerns within an office visit. Once redirected, patients rarely come back to important information that remains uncovered. In a study of active listening where patients were not interrupted, patients took an average of 92 seconds to express their concerns at the beginning of a visit. Active listening involves (1) refraining from asking questions immediately while individuals are sharing concerns or information, (2) responding by checking your understanding of what is being said by patients and (3) being attentive to patients' verbal and non-verbal behavior. According to the World Health Organization, warmth and empathy from health care professionals are central determinants of patients' adherence. Warmth and empathy convey concern and interest, ease anxiety and build trust and satisfaction. These skills are conveyed through asking patients to share their concerns about changing health behaviors, acknowledging emotions and providing non-verbal cues. Suggestions for undertaking these skills and those noted below are shown in Table 1.

Open-ended questioning facilitates communication about adherence to medications and other lifestyle behaviors. This is especially important when patients' physicians spend on average 3.94 minutes (20-25% of office visit time) discussing medications, asking on average 9 yes/no questions. The use of yes/no questions is especially ineffective for low-literate patients. They nod "yes" even when they don't understand. In contrast, two key words that facilitate change are "what" and "how." As shown below, open-ended questions that can help to detect and prevent medication problems and improve adherence include the following:

- "What types of problems have you had with your medicines?"
- "How do you remember to take your medicines?"
- "Many people forget to take their medicines at one time or another. How many times have you missed a dose of your medicine (s) over the past week?"

The fourth communication skill, interactive communication, involves improving your understanding of what a patient is saying. More than half of the American adult population has difficulty in understanding health care instructions. All too often individuals leave an office setting or hospital with an inadequate understanding of their diagnoses and treatments. Misunderstandings are also compounded by health care professional's use of unfamiliar medical terms, and the social, cultural and educational differences between patients and providers. As shown
Table 1. Examples of communications skills for health behavior change

ACTIVE LISTENING

MD: Hello, Mr. Jones. It's been two months since your surgery. How are things going?
Mr. J: Pretty well, except that I feel tired a lot. This has occurred since I've gone back to work. (Goal: Encourage pt to continue rather than address first concern.)

MD: Go on

Mr. J.: In the evening I fall asleep in front of the television right after dinner. I don't feel I have the energy I did before surgery. And, I'm not exercising like you told me.

MD: (Nods silently) (Goal: Affirm with nod; use silence to elicit more information)

MD: I see. (pause) What else. (Goal: Continue to affirm and prompt more)

Mr. J: I think I may be getting depressed again.

WARMTH AND EMPATHY

RN: You'll be going home from the hospital tomorrow. How are you feeling about that? (Goal: Draw out emotions)

Mrs. J.: Well, I'm really not sure how I'm going to manage. I'm pretty overwhelmed and nervous that I'll start smoking again.

RN: Yes, I understand that you have a lot to remember and to do. What's your greatest concern about slipping and having a cigarette? (Goal: Acknowledge the emotion and ask pt to elaborate.)

Mrs. J.: You know I'm going to go home with my son and I don't want to be a burden on him. He also smokes and I really worry that I will pick up one of his cigarettes.

RN: It sounds like you have some anxiety here. I have spoken to your son as well about making sure that he supports you in your effort to quit smoking by not leaving cigarettes around or smoking in front of you. He seems very supportive. Is this helpful to you? (Goal: Offer reassurance and problem-solving to ease fears.)

OPEN-ENDED QUESTIONS

Q: Tell me what you are doing to help you lose weight?
A: I've been biking 3 times per week and eating more fish than beef

Q: What do you think is preventing you from exercising regularly?
A: I really get bored easily and can't find the time to walk.

Q: I understand. What exercise do you think you might enjoy?
A: Well, I used to ride my stationary bike all the time and think that might be better for me.

INTERACTIVE COMMUNICATION

1. Ask pts to repeat by important information and instructions in their own words:

MD: Mr. Jones, can you tell me in your own words why it is important to control your high blood pressure.
Pt.: Well, I understand that if my blood pressure is not controlled I can get heart disease or have a stroke.

MD: That's correct. And we also talked about the fact that high blood pressure can cause kidney disease and damage to your eyes.

2. Ensure you summarize at the end of a visit to improve patient recall

MD: So you don't have problems undertaking an exercise program can you tell me in your own words what you need to do to carry out your exercise sessions? Or

MD: To make sure my explanation was correct, can you tell me what you should do to safely undertake your exercise sessions?
in Table 1, interactive communication involves checking a patients’ understanding of information and providing clarification or reinforcement as needed. Two skills contribute to interactive communication including the repeat back/clarify/repeat back method to check understanding, and asking a patient to summarize the discussion at the end of a visit to check the patients understanding.

**Education**

Sydney J. Harris once said, "The whole purpose of education is to turn mirrors into windows." Physicians, nurses, cardiac rehabilitation specialists, nutritionists and other allied health individuals need to be educators. Patients' ratings of how well their physicians provided information about their illness and treatment were very important as predictors of the success in diabetes self-management. Effective messages around health behavior change can often be provided in 1-3 minutes. The impact of these messages is enhanced by limiting content to one or two key facts, tailoring the message for a given patient, and being clear and directive. An example of such a message around smoking is provided in Table 2. Educating also involves capitalizing on teachable moments such as at the end of an office visit in which new information was conveyed, when a lifestyle change is recommended, or when starting a new therapy or treatment. Finally, education around health behavior change includes ensuring that all members of the office staff provide up-to-date educational information for family members and friends, use visual aides in exam rooms, write down important instructions, and cover walls with posters and materials that promote healthy practices.

**Coaching**

Fewer than 25% of American adults eat the recommended servings of fruits and vegetable; only 31% engage in regular physical activity; 21% smoke cigarettes, and 65% are overweight or obese. Coaching is an interactive process that involves give and take between the healthcare professional (coach) and the patient. As shown in Figure 1 the Stanford Cardiac Rehabilitation Program developed programs to assist individuals to change behavior and have identified three steps in the coaching process. The first step involves a brief, personalized message involving persuasion, one of the elements of building self-efficacy, an important component of social learning theory. Examples of critical statements to help individuals are shown in Table 3. Part of the process of step one also includes assessment of patients' readiness or willingness to change. Research indicates that using a simple yes/no question can accomplish this task which is also to encourage patients to think and talk about behavior change. The transtheoretical model or what is known as stages of change may also facilitate the steps of assessing readiness.

Step 2 in the process of coaching involves setting incremental goals and assessing patients’ confidence to

**Table 2. Education around smoking cessation**

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<th>A 1-3 minute message</th>
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<td>Giving up cigarettes is the single most important thing you can do for your health. <strong>(clear and directive)</strong></td>
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<tr>
<td>Smoking decreases the amount of oxygen that is carried in the blood to your heart and other parts of your body. <strong>(key information)</strong></td>
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<tr>
<td>Your chest discomfort (angina) is caused by a lack of blood flow to your heart muscle. Continuing to smoke is likely to cause you more chest discomfort. <strong>(tailored to the pt.)</strong></td>
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<tr>
<td>I would like to help you remain off cigarettes for good. Are you willing to attempt to quit smoking now? <strong>(supportive)</strong></td>
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Table 3. Critical opening statements

Losing 10 pounds over the next 3 months will help to lower your cholesterol and blood pressure and will better control your blood sugar. This weight loss may also lessen your need for medication.

Walking at least 15 minutes every day at a moderate pace can reduce your risk of heart disease by as much as 30-40%.

Limiting your daily alcohol to one glass of wine will help to lower your blood pressure and make it easier for you to lose weight. Wine has over 100 calories per glass.

Keeping your portion sizes to the size of your fist is one way to help you control how much you eat. You can look at your plate to see if you have the right portion sizes.

make a change. Goals must be specific, measurable and within a time-frame. Examples of measureable goals include "Can you…

"Walk at least 10 minutes on level ground at 2 miles per hour every day for the next seven days."
"Eat at least 3 different fruits and 3 different vegetables every day this week."

Assessing patient's confidence to achieve these goals is accomplished by using a self-efficacy scale measured on a scale of 0-100 or 0 to 10 as shown below. Responses of 70 or greater on a scale of 0-100 or 0-7 (scale 0-7) indicate a good chance of success in undertaking the behavior. Ratings invite exploration if lower. It is useful to explore barriers by asking the question: "Why is your confidence a 3 instead of a 5?"

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Figure 1.
As people adopt new behaviors one of the most important keys in helping them achieve their goals is to ask them to self-monitor their behaviors. Self-monitoring tools include diaries, logs, calendars, placed in plain view such as on a refrigerator, next to the bed, or on a kitchen table. Daily self-monitoring is useful during the first three months of adopting new behaviors. During maintenance the frequency may be reduced to weekly for a period of 3-6 months. Self-monitoring should be reinstituted if individuals lapse into old behaviors.

Step 3 in the process of coaching for health behavior change involves follow-up by telephone, mail or through visits. This gives individuals the impetus and motivation to continue change. Goals for patients should be recorded, patients asked about their progress, and a problem-solving approach reinstituted when goals are unmet. Unmet goals may require assisting patients to develop new goals.

As shown in Figure 1, at any step in the process of change, patients may need to deal with barriers. This involves a problem-solving approach. Coaching questions to uncover barriers when patients are reluctant to change include queries such as:

“What's standing in your way” or “Your confidence seems low. Can you tell me why?”

Three of the most common barriers include misinformation or lack of information, previous experiences that have been negative for patients, and lack of support. Providing key educational messages to individuals needing more information, supporting individuals to move beyond negative experiences, and helping them to find support resources in the health care system, within their community or existing circle of family and friends all promote success. A problem-solving approach is important in addressing when difficulties of health behavior change occur. Key steps in this process include: identifying the problem and possible reasons for it, selecting the main reason and listing solutions, weighing the pro’s and con’s of each solution and selecting one or two solutions to try, attempting the solution, and repeating the solution if the initial solution is not successful.

In summary, helping individuals to change their behaviors requires that health care professionals improve their skills in communicating, educating and coaching. These lessons will not only help us to help our patients but may better serve our skills in facilitating the change process.

References

Updates on Smoking Cessation

RONALD LAM and CINDY LAI

From Department of Health, Hong Kong

Context

Smoking is associated with an increased risk of total and cause-specific death, and ample evidence is available which showed quitting smoking could reduce such risk at any age. Cardiologists are encouraged to provide smoking cessation treatment or suitable referrals for smoking clients.

Objective

To provide an overview of updates in treatment strategies for smokers.

Methods

Drawing references from evidence-based practices of Mayo Clinic Nicotine Dependence Centre, and Clinical Practice Guidelines: Treating Tobacco Use and Dependence 2008 update from the USA Department of Health and Human Services, the key management strategies for treating tobacco dependence are reviewed.

Results

Physician advice, however brief, is effective in motivating patients to quit. The 4 "A"s (ask, advise, assess, assist and arrange) model are suitable for use at outpatient setting. Management strategies comprise addiction therapy, cognitive behavioral intervention, pharmacological treatment and relapse prevention. In addition to nicotine replacement therapy, other first line medications include benzodiazepine and varenicline, and combination therapies produce better abstinence than single therapy.

There is also a dose-response effect between intensity of intervention and abstinence rates. If very limited time is available, cardiologists can adopt an "Elicit-Provide-Elicit" model to help current smokers to quit.

Conclusions

Smoking is now treated as a disease entity, and no longer a mere personal habit. All healthcare professionals therefore have the ethical and moral responsibility to document smoking history and make appropriate interventions or timely referrals.
Motivational Interviewing and Smoking Cessation: What Is It and Is It Effective?

DOUGLAS TAT-CHAU LAI

From Department of Health, Hong Kong

Background

Motivational Interviewing is a relatively new counseling technique commonly used in the field of addiction treatment like smoking cessation. It is also recommended by international smoking cessation guidelines for poorly motivated smokers.

Objectives

To study the efficacy of Motivational Interviewing on Smoking Cessation and to identify potential effect modifiers.

Methods

A comprehensive literature search was done on studies about the use of "motivational interviewing" on "smoking cessation". This study was limited to randomized controlled trial and those trials with explicit reference to the counseling method "motivational interviewing" as innovated by Miller & Rollnick. The following indicators were noted: credentials of the treatment providers, the specific training procedures (for performing motivational interviewing e.g. focused workshops), the exact nature of motivational interviewing (different aspects of the counseling e.g. the use of decision balance technique, problem feedback, or just "general spirit" etc.), the total duration of treatment, the nature of follow-up support, the use of supplementary technique (e.g. the use of self help booklet, computer program) and whether the treatment provider were administering the treatment as directed (e.g. was there supervision of the counseling process, videotaping or guided by a manual).

Results

Preliminary analysis indicates that the motivational interviewing is efficacious for smoking cessation with pooled odds ratio 1.5 (95% CI 1.32-1.7). The duration of the study period (6, 12 months or longer abstinence), the duration of the counseling sessions and the number of follow-up sessions are potential effect modifiers. However, the trainings that were given to the treatment provider were not mentioned in about half of the studies. Methods to ensure fidelity of counseling were either not described or inadequately described in most papers.

Conclusions

Motivational interviewing seems to be a promising technique for smoking cessation. The potential effect modifiers identified may help to guide the formulation of an effective counseling program. But as there were large variations in the integrity of the interventions used, the results should be interpreted with caution.
The Influence of Nutrition on Cardiovascular Health

VANESSA LAI-FAN AU

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Cardiovascular disease remains the leading cause of mortality in industrialized countries and is rapidly becoming a primary cause of death worldwide. Therefore, identification of the nutritional factors that most effectively decrease cardiovascular disease's risk is essential. The relationship between diet and cardiovascular disease has been studied intensively for nearly a century. The following dietary strategies have been proven to be effective in preventing cardiovascular disease. (1) Balance calorie intake and physical activity to achieve and maintain healthy body weight. (2) Consume diets rich in fruits, vegetables and whole grains. (3) Substitute polyunsaturated fat and monounsaturated fat for saturated fat and trans fat. (4) Increase consumption of Omega-3 fatty acids from fish, fish oil supplement or plant source. (5) Include adequate dietary fiber, especially soluble fiber. (6) Minimize the intake of beverages and foods with added sugar. (7) Choose and prepare foods with little or no salt. (8) Consume alcohol in moderation. (9) Phytostanols, nuts and soys are suggested to be included as part of a cardioprotective diet. Also, other functional ingredients/nutrients with possible effect on cardiovascular disease risk are antioxidants, prebiotics, dairy bioactives, Folate, B vitamins, vitamin D, vitamin K2. Studies have suggested that nutrition play an important role on the prevention of cardiovascular disease. The presentation will discuss the dietary factors effect on cardiovascular health and how to apply these recommendations to practice.

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Facilitating Self-management Behaviors in Cardiac Patients

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With the ageing of our population and the increased rates of chronic conditions such as Cardiac Conditions, our Health Services have a growing need to better manage chronic disease. Effective support for self-management is an important component of such change.

Aims of the Workshop

To introduce to the health care professionals with the knowledge, skills in applying self-management strategies in care of cardiac patients.

Objectives of the Workshop

By the end of the workshop, the participants will be able to:

1. Identify the key principles and strategies in facilitating patient's self-managing health behaviour
2. Identify the core self-management skills in the patient educational and rehabilitation programs.
3. Acquire the steps in conducting an important self-management strategy – Action Planning and Problem Solving.

Program Approach and Format

It consists of presentation, interactive and participatory discussion, demonstration and practice.

Content

1. Key health theories in relating to self-management and behavioural change
2. Self-management support provided by the health care professionals
3. Acquiring some of the practical skills in facilitating self-managing health behavior

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Exercise in Practice for Cardiac Patients

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Cardiac Rehabilitation is imperative for cardiac patients. It aims at improving cardiovascular and respiratory function, returning to premorbid functional status and activity level; developing a safe and effective home exercise program and developing a long-term exercise habit; and educating for secondary prevention. There are 4 phases in a comprehensive cardiac rehabilitation, i.e. Phase I: In-patient physical training; Phase II: Supervised institutional physical training with education following hospital discharge; and Phase III & Phase IV: Exercise in community without ECG monitoring or under supervision.

Before exercise training starts, physical assessments should be proceeded for exercise prescription. These include current exercise habit; physical status; cardiorespiratory endurance (exercise testing, 6-minute walk test); body composition (fat & fat-free tissue, height, weight, Body Mass Index, Waist-Hip Ratio); muscular strength, endurance and flexibility.

Patient’s maximum cardiorespiratory endurance (maximum aerobic capacity) is measured in terms of Maximum Oxygen Uptake ($\text{VO}_2\text{max}$):

\[
\text{VO}_2\text{max} = \text{Maximum cardiac output (L/min)} \times \text{Arterial-venous O}_2\text{ difference (mL O}_2\text{/L)}
\]

It reflects the ability of the heart to deliver $O_2$ to the working muscles and the muscle's ability to generate energy with $O_2$. The change of $\text{VO}_2\text{max}$ is related to mode, frequency, duration, intensity and progression of the exercise training.

Each exercise session should include 10 minute warm up, 20-30 minutes endurance training (3-5 days per week), 10-15 repetitions x 1 set x 8-10 exercises for resistance training (2-3 days per week), and 10 minutes cool down. The training effect depends on the overloading and specificity principles. For the intensity of exercise, ACSM recommends 40%/50% to 85% $\text{VO}_2$ Reserve or Heart Rate Reserve. The common method for intensity calculation is the Karvonen Method (Heart Rate Reserve Method): 

\[
\text{Training Heart Rate} = \{(\text{Maximum Heart Rate} - \text{Resting Heart Rate}) \times 40-85\% \text{ of Training zone}\} + \text{Resting Heart Rate}
\]

Monitoring during Phase II cardiac exercise training should contain ECG monitoring (for initial session or high risk patient), Blood Pressure, Heart Rate, Rate of Perceived Exertion (RPE), and Oxygen concentration ($\text{SaO}_2$) (if indicated).

The art of exercise prescription is the successful integration of exercise science with behavioral techniques that results in long-term program compliance and attainment of the individual’s training goals. Maintaining exercise compliance after Phase II cardiac rehabilitation is challenging. It can be improved by setting individual short- and long-term, realistic and measurable goals; improving confidence level, signing
contract; giving feedback; revising training plan; recording diary; seeking social support system; and regular follow up.3

References

Return to Work after Acute Myocardial Infarction

TONY KA-KEUNG WONG

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Cardiovascular diseases represent the second leading cause of death in Hong Kong. According to the recent statistic published in Statistical Report Hospital Authority 2006/2007 of Hong Kong,1 5619 deaths (15% of all deaths) in 2006 were accounted for cardiovascular disease.

Ischaemic heart disease, being the major component of cardiovascular disease, is therefore an important cause of both mortality and morbidity. The objective of cardiac rehabilitation is to restore an optimal physical, mental and social condition in patients with ischaemic heart disease; allowing them to resume an active role in the community as soon as possible after the heart attack. The cardiac rehabilitation program is a multidisciplinary practice involving not only the patient and the physician but also the patient's relatives, the occupational therapist, physiotherapist, nursing specialist, dietician, and clinical psychologist.

The incidence of myocardial infarction rises with increasing age but the age of onset is in turn decreasing. The onset of myocardial infarction even happened as young as at early 30. These patients are at working age and most of them are expected to return to work.2 Thus, to assist the patient to return work is one of the important goals of cardiac rehabilitation and also the responsibility of occupational therapist.3

During the process of recovery from a heart attack, the occupational therapist provides unique intervention to both the physical and psychological dysfunctions of the patients. In order to facilitate the patients return to work, work evaluation and training are offered. The process starts in the in-patient phase. Early intervention will anticipate, identify and modify barriers to return to work and alleviate the anxiety of patients.4 The return to work process usually includes clinical evaluation, work evaluation, work simplification & modification, simulated work training and vocational counseling.

**Clinical Evaluation**

For cardiac patients, cardiac function is the primary consideration. They include the disease nature, functional capacity, exercise testing result (MET), ejection fraction and the existing cardiac related sign & symptom. In general, the objective data of exercise testing result gives a guideline in advising patients to safe activity level and daily engagement.

**Work Evaluation**

Work evaluation includes the identification of various demands of a specific job. The barriers that exist and the potential hazards at the workplace are explored before resumption of work. Job analysis provides step-by-step breakdown of job task to find out critical job demands.5 In addition, the information of working environment, and related work stress allow us to give more appropriate recommendation to our patients in return to work.

**Work Simplification & Modification**

In order to decrease cardiac workload and energy consumption, several methods are employed in activity
modification. For instance, avoiding extreme hot and cold environment, and increasing awareness to the ventilation in working environment. Optimal structuring of the daily schedule can eliminate the emotional stress due to time pressure. The use of pacing control and frequent rest increase the activity tolerance throughout work process. Besides, work simplification will also be used to educate patients in analyzing new tasks so as to accomplish the work tasks in a more efficient way.

**Simulated Work Training**

Work simulation for cardiac patient in the occupational therapy is important. A simulated work situation can evaluate the readiness of patient to return to previous work type, so that we can determine the need for any adapted method and its effectiveness. Throughout the training process, it provides more objective data of the physiological changes and also enhances the sign & symptom monitoring by patient. The intensity and the duration of the activity can gradually increased up to a level comparative to the patient's work demands.

**Vocational Counseling**

Psychological and social factors play an important role to work resumption. Thus patients' perception on return to work is a crucial factor of a successful intervention. In addition to patient's physical state, we also have to focus on the motivation to return to work, financial situation, work stress and future career planning. Therefore, counseling to patients' value, satisfaction, expectation must be included in a comprehensive rehabilitation program.

Return to work is an important marker of the success of cardiac rehabilitation. It enables patient to maintain economic independence. Therefore, a comprehensive cardiac rehabilitation program should include the above components in order to help patients to resume a productive life roles, hence improve their quality of life.

**References**

Driver Assessment for Cardiac Patients

JOCELYN AU

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A comprehensive evaluation is required to determine the ability to drive for patients with cardiac problems. It involves off-road assessment which includes evaluation of different components involved in driving, i.e. visual, physical, cognitive deficits as well as reaction time. It then follows with an on-road assessment which actually involves the patients to drive a vehicle in different traffic situations to determine their safety and competency on the road. Most cardiac patients may not exhibit major physical disabilities which may interfere with safe driving, but the concern is whether they are medically fit to drive. A set of guidelines, which is referenced from similar guidelines adopted in various overseas countries, has been formulated to enable medical practitioners to determine such medical fitness, both for driving private cars and commercial vehicles.

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