

表1 全国実態調査におけるAMI受け入れ病院のプロフィール

	AMI受け入れ全施設	循環器専門医研修
平均病床数(床)	400±250	473±256
循環器内科病床数(床)	35±21	40±19
循環器内科常勤医師数(人)	5.1±6.2	6.4±6.7
循環器内科非常勤医師数(人)	1.7±3.8	2.1±4.5
日本循環器学会循環器専門医 研修施設認定あり(%)	511/741(69.0%)	511/511(100.0%)
CCUあり	423/741(57.1%)	359/511(70.3%)
冠動脈造影実施あり	644/741(86.9%)	497/511(97.3%)
冠動脈インターベンション(PCI) 実施あり	616/741(83.1%)	489/511(95.7%)
緊急PCI実施あり	606/741(81.8%)	485/511(94.9%)
年間AMI患者数平均値(例)	48±47	61±49
年間AMI患者数メディアン値(例)	35	50
心臓外科あり	324/741(43.7%)	300/511(58.7%)
	43±78	
年間開心術施行件数(件)	(ただし開心術実施施設のみにお ける件数は103±93件)	61±88
年間開心術施行件数メディアン値(件)	0	30

(文献13より引用)

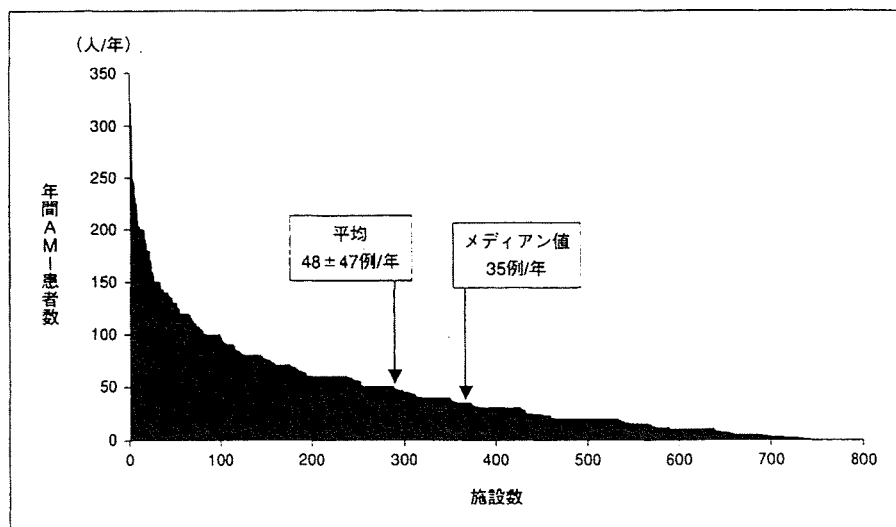


図2

急性心筋梗塞受け入れ741病院
における年間患者数の分布

全国実態調査に回答した1,059施設
のうちのAMI受け入れ741施設にお
ける年間AMI患者数は、平均値で
年48例、メディアン値は年35例、
70%の施設をカバーする値(70パー
センタイル値)は年20例であった。
全体のうち、平均値の年48例以上
を収容する施設は741施設中289施
設(39.0%)しかなく、いわゆるLong
Tail distribution(恐竜の尾)分布が
認められた。(文献13より引用)

であった。Long Tail distributionという用語は当初Anderson¹⁵⁾により、「需要の高い少数の品目と需要の低い多数の品目」からなる分布を指す用語として商業戦略の分野において用いられたが、わが国のAMI受

け入れ施設の分布はまさにこの分布を示している。この知見は、AMI受け入れ患者数が平均値(年間48例)を想定した施設基準や採算ラインを設定してもそれを満たすことができない施設が61%も存在するこ

表 2 全国実態調査でのAMI受け入れ741病院における施設規模と心リハ参加様式に基づく1日当たり心リハ参加患者数の推計

		モデル 1 (初期参加率60%, 全例退院後継続)	モデル 2 (初期参加率60%, 半数退院後継続)	モデル 3 (モデル 2 に 術後症例を追加)
AMI受け入れ全741病院における推計(人/日)				
AMI患者数が メディアン値(35人/年) の施設	心リハセッション数 5回/週の場合	4.0	2.4	-
	心リハセッション数 3回/週の場合	6.7	3.9	-
AMI患者数が 平均値(48人/年) の施設	心リハセッション数 5回/週の場合	5.5	3.2	6.1
	心リハセッション数 3回/週の場合	9.2	5.4	10.2
循環器専門医研修施設認定511病院における推計(人/日)				
AMI患者数が メディアン値(35人/年) の施設	心リハセッション数 5回/週の場合	5.8	3.4	5.7
	心リハセッション数 3回/週の場合	9.6	5.6	9.5
AMI患者数が 平均値(48人/年) の施設	心リハセッション数 5回/週の場合	7.0	4.1	8.4
	心リハセッション数 3回/週の場合	11.7	6.8	13.7

(文献13より引用)

とを意味しており、「心リハ施設基準策定」と「心リハ運営の採算性」に際して留意すべき点である。

2. 1日当たり心リハ参加患者数推計

表 2 にAMI受け入れ全施設741病院における心リハの参加様式と患者数・セッション数の条件設定に基づく1日当たり(1セッション当たり)参加患者数の推計を示す¹³⁾。条件設定として、参加様式については初期参加率を60%とし、モデル1(AMI退院後全例継続モデル)、モデル2(AMI退院後半数継続モデル)、モデル3(AMI退院後半数継続+開心術後上乘せモデル)の3種類、年間AMI患者数についてはメディアン値(年間35例)、平均値(年間48例)の2条件、1週間の心リハ実施日数(セッション数)については週5セッション(1日1セッション、年間250

セッション)、週3セッション(年間150セッション)の2条件を設定した。

これによると、たとえばモデル1で年間AMI入院患者数が平均値(48例)の場合、心リハ運動療法セッションを週5セッション実施すると1セッション当たり参加患者数は5.5例であるが、週3セッションに減らすと9.2例に増加する。しかしモデル2で年間AMI入院患者数がメディアン値(35例)の場合は、週3セッションでも3.9例にとどまる。一方、モデル3で開心術後症例が加わる場合、平均値施設では週3セッションなら10.2例まで増加する。しかしAMI患者数がメディアン値の施設では、通常心臓外科がないためモデル3でも心リハ参加患者は増えない。

循環器専門医研修病院511施設における心リハ1セッション当たり参加患者数は、全741施設での数

表 3 心臓リハビリテーションの採算性に関する多施設調査結果(対象51施設)

	品目	内容	金額
設備費	トレーニング機器	トレッドミル(平均 1.8 ± 1.5 台), エルゴメータ(平均 4.0 ± 4.9 台)など	4,905,000円
	必須備品	心電計(平均 1.1 ± 0.5 台), モニター(平均 1.2 ± 0.7 台), DC(平均 1.2 ± 0.4 台)など	8,024,000円
	設備費合計		12,968,000円
人件費	医師人件費	47.6時間/月	277,759円/月
	コメディカル人件費	看護師, PT, 検査技師, 健康運動指導士	401,473円/月
	人件費合計	641,109 \pm 837,425円/月	7,693,308円/年
支出	10年減価償却の場合	設備費 + 人件費	8,990,108円/年
	5年減価償却の場合	設備費 + 人件費	10,286,908円/年
収入	心リハ料(病棟リハ平均 59 ± 73 件/月, リハ室平均 115 ± 147 件/月, 合計 173 ± 179 件/月)	953,527円 \pm 987,179/月	11,442,324円/年
収支	設備費なしの場合	312,418 \pm 634,501円/月	3,749,016円/年
	10年減価償却の場合		2,027,116円/年
	5年減価償却の場合		1,155,416円/年

(文献14より引用)


値に比べると、いずれの条件においても心リハ参加患者数の増加が見られる(表2)。特にモデル3のメデアン値で開心術後患者が加わった場合の患者数増加(6~14人)が目立つ。ただし研修施設でも、モデル2のように心臓外科がなく退院後継続患者が半減する条件下では、1セッション当たりの参加患者数は3~7人と少ない。

以上の結果から、心リハ1セッション当たり参加患者数は年間AMI入院患者数、心臓外科の有無、退院後継続率、1週間のセッション数に大きく影響されることが明らかになった。すなわち、心臓外科のある大規模病院では1日10人以上の心リハ参加患者を確保することは比較的容易であるが、年間AMI入院患者数がメデアン値(35例)で退院後心リハ継続率が全AMIの30%程度の平均的な中規模施設では、1日5人以上の心リハ参加患者を確保することは容易ではないと言える。

◎ 心リハの採算性

わが国における心リハ普及の遅れの要因として、心リハの社会的認知度が低いことのほか、施設基準の厳しさ、採算性が不明であること、わが国におけるエビデンスが不十分であることなどがあげられている¹⁶⁾。しかし心リハの採算性については、これまで基礎データさえ全く存在しない状態であった。そこで循環器病研究委託費(15指-2)後藤班では、2005年12月に郵送アンケート方式で心リハの採算性に関する多施設調査を実施し、51施設から回答を得た(表3)¹⁴⁾。

その結果、心リハ室の必須機器である心電計、心電図モニター、除細動装置などの設置数については施設間の変動が少なかったが、トレーニング機器については、施設によりトレッドミル0~5台、エルゴメータ0~24台と施設間の変動が大きかった。また心リハ件数についても、平均値は心リハ室と病棟の



合計件数で173±179件/月であったが、個々の施設で見ると心リハ実施は0～730件/月、病棟実施は0～276件/月、合計件数は5～930件/月と施設間の変動が著しく大きかった。

収支については、設備費なしで人件費と心リハ料の単純差引として算出すると、平均値は312,418±634,501円/月の黒字であった。しかしこれも、個々の施設では1,800,480円/月の黒字から-1,413,000円/月の赤字まで施設間の変動が大きかった。運動機器・モニター機器に対する初期設備投資費用については、単年度で返済しようとする赤字になるが、5年以上の減価償却期間を見込むと黒字であった。

この結果は、各施設における工夫次第で心臓リハビリを収益部門にできることを示している。ただし今回の対象施設は、1日平均の心リハ件数が7.9件(1カ月の稼働日数を22日として計算)の中規模以上の病院で、さらに黒字の上位5施設は1日心リハ件数24.3件(534±215件/月)という大規模病院であることから、収入を確保するためにはある程度の実施件数が必要であると考えられる。さらに現行の施設基準(I)では少なくとも合計2名以上の看護師・理学療法士の配置が要求されているため、配置スタッフ1人当たりの参加患者数を最大限まで増やすことが重要であり、そのためには心リハへの初期参加率を向上させる、退院後の外来心リハ継続率を向上させる、AMI以外の心リハ適応患者を組み込む、などの方策が必要である。また患者数確保が困難な中小規模病院では、自施設単独で心リハを開設・運営するよりも既存の心リハ認定施設と連携する方が効率的である可能性がある。

○ 心リハを組み込んだAMI地域連携パス

1. 疾病管理プログラムとしての外来心リハ

AMIの退院後マネジメントに関する新しい潮流として、疾病管理プログラム(disease management program)の考え方が台頭しつつある。疾病管理プログラム¹⁷⁾¹⁸⁾とは元来、慢性心不全や糖尿病などの慢性疾患患者に対して、医師・看護師・薬剤師・栄養

士・理学療法士・訪問看護師などの多職種チームが退院前から退院後にわたり医学的評価・患者教育・生活指導を包括的計画的に実施することにより、再入院抑制を含む予後改善をめざす中～長期プログラムである。Squiresら¹⁹⁾はこれを虚血性心疾患患者に適用し、Mayoクリニックの外来心リハプログラムに参加したAMI・CABG・PCI後患者503名を対象として、心リハスタッフが“disease manager”として3カ月ごとに個別面接を行い2次予防ガイドライン目標達成状況を評価・指導した結果、3年後のガイドライン目標達成率は平均収縮期血圧126mmHg, LDL-C 90mg/dL, 中性脂肪145mg/dL, 運動時間139分/週というようにきわめて良好であったと報告している。この成績は、外来心リハプログラムが虚血性心疾患患者において2次予防目標を達成・維持する「疾病管理プログラム」、すなわちAMI後患者の包括的マネジメントシステムの役割を果たすことができることを示している。

2. 退院後外来心リハを組み込んだAMI地域連携パスの必要性

近年各地でAMIの地域連携パスの試みが始まっている²⁰⁾。しかし、それらの多くはPCI施行後の抗血小板薬の副作用チェックのスケジュールを中心としたもので、退院後の外来心リハを組み込んだ地域連携パスに関する報告はほとんど見当たらない。一方、AMI診療ガイドライン^{5)~7)}においてAMI回復期心リハ(すなわち退院後の外来心リハ)がclass Iとして推奨されていることを承知していても、前述のとおり現在のわが国の中小病院では採算を維持できるだけの心リハ参加患者数の確保が困難であるというジレンマがある。このジレンマに対する解決策の1つとして、心リハ設備のない中小病院では地域連携パスで外来心リハ実施施設と連携することにより、既存の心リハ施設を地域全体の資産として活用するという方策が考えられる。これにより、AMI受け入れ病院の経営上の負担を増すことなく、AMI患者が回復期心リハの効果を享受できることになる。したがっ

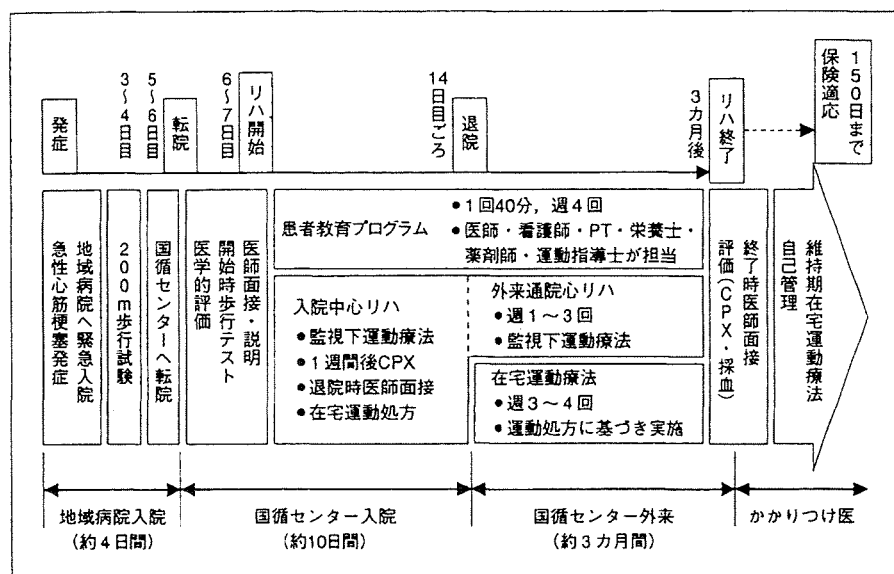


図3 地域連携バスによるAMI回復期心臓リハビリプログラム

て今後わが国においてAMIの地域連携バスを作成する際に、退院後の外来心リハを組み込む工夫が必要である。

3. AMI回復期心リハ地域連携バスの試み

大阪府吹田市ではPCI実施施設は5～6施設存在するが、外来心リハ実施施設は国立循環器病センターのみである。そこでわれわれは2006年以降、当地区においてAMI患者に対する回復期心リハ導入を目的とした病院間連携バスを試みている。具体的には、発症後当センターに直接入院したAMI症例に使用しているAMIクリティカルパス(14日間パス)を、地域のPCI実施(心リハ非実施)病院に入院したAMIに対して準用するものである(図3)。すなわち、心リハ設備を持たない地域病院に入院し急性期治療を受けたAMI症例が200m歩行試験に合格した時点で、当センター医療連携室へ規定の書式(図4)により情報を送付することにより、当センター一般病棟で転入院を受け入れ、心リハ室での回復期心リハプログラムを開始し、当センター退院後は、引き続き3カ月間の外来通院心リハプログラムを継続する。退院後の薬物治療は、地域のかかりつけ医または当セン

ター外来にて行われる。なお、合併症(虚血、心不全、不整脈など)により地域病院での歩行開始が遅れた症例については、200m歩行試験に合格した時点で当センターへの転院可としている。

① 症例

この地域連携バスを適用した82歳男性のAMI症例を提示する。広範前壁AMIを発症し、地域病院(心リハ非実施施設)にて#6:100%に緊急PCI(金属ステント留置)を施行されたがSlow flowあり、peak CK 6410 U/L, CK-MB 510 U/Lと高値で、左室駆出率は39%と低値を示した。一時夜間せん妄あり、第10病日に当センターへ転院となった。転入時の問題点として、①広範前壁梗塞で低心機能、BNP 927pg/mLと高値、②転院後夜間に非持続性心室頻拍(non-sustained ventricular tachycardia; NSVT)11連発出現、③空咳(前医からエナラプリル処方中)、④運動耐容能低下、が認められた。入院後経過:入院時心エコーで左室血栓がないことを確認し、翌日心リハ室での回復期心リハプログラムにエントリー、低強度運動(歩行10分+自転車エルゴメータ20W, 10分)から開始。空咳につきエナラプリルを中止し、カルベジロールを2.5mgから漸増した。一時、脳性ナ

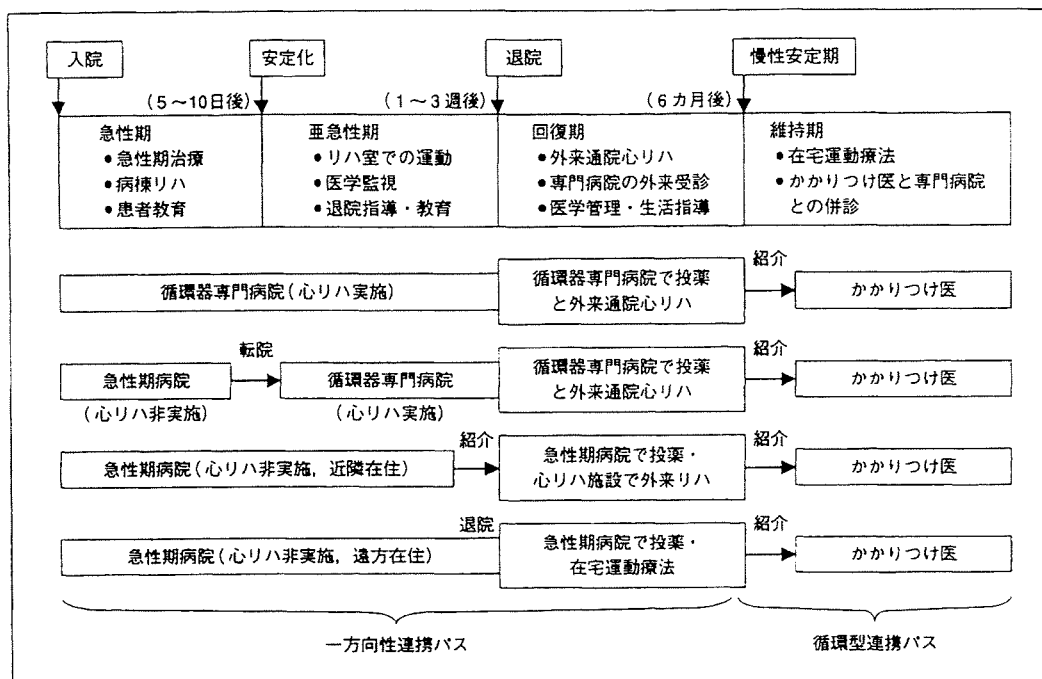


図5 心臓リハビリテーションを組み込んだAMI地域連携バスのモデル

回復期心リハへのスムーズな移行を可能とし、心リハ非実施施設へ入院したAMI症例に対しても心リハの効果を与えるものである。なお本連携バスの実施上の課題として、発症数日後のAMI症例の心リハ実施病院への搬送方法(救急車かタクシーか)と業務量増大に対する経済的インセンティブ(紹介元施設への報酬)があげられる。経済的インセンティブは将来診療報酬で連携バスが認められれば解決するであろうが、亜急性期の患者の搬送方法については今後の課題である。

4. 大阪府豊能医療圏域におけるAMI地域連携バスの試み

前述の心リハ連携バスは、急性期から回復期までの連携バスであり、維持期の連携を想定していなかった。そこで心リハを組み込み、かつ急性期から維持期までをカバーするAMI地域連携バスを作成するために、大阪府北部豊能二次医療圏域の4市(吹田・豊中・箕面・池田)医師会と協力してAMI地域連携バス作成のワーキンググループを立ち上げた。これまでに数回の会合を持ち、連携バスの運用方式、掲載す

る情報項目、具体的な書式などについて検討作業を進めている。これまでの会合において、①連携バスの方式として、AMIの場合は患者の生活習慣改善活動への支援という目的も期待できることから、紙ベースのノート型バスとすること、②急性期から回復期までの一方向型バスの部分と、維持期以降の循環型バスの部分からなる形態とすること、③急性期以後のAMI患者に対する診療施設と心リハ実施施設の組み合わせとして、急性期専門病院、回復期心リハ実施施設、かかりつけ医、在宅運動療法など複数のパターン(図5)があるため、それらに対応できる形態とすること、④連携バスの中に可能な限り外来通院型心リハを組み込むが、それが困難な場合は在宅運動療法を組み込むこと、などが合意された。今後早急にプロトタイプを試作し、各医師会の承認を得たうえ、参加施設を募り、本年度中に現場で試行の予定である。

○ まとめ

全国実態調査の結果から、①わが国のAMI受け入

れ病院は多数例を受け入れる少数の施設と少数例を受け入れる多数の施設とからなるいわゆるLong Tail distributionと呼ばれる分布を示すこと, ②心リハ1日(1セッション)当たり参加患者数は年間AMI入院患者数・心臓外科の有無・退院後心リハ継続率・1週間のセッション数に大きく影響されること, ③AMI入院患者数がメデアン値に近い中規模施設では1日5人以上の心リハ参加患者を確保することは容易ではないこと, ④心リハの採算性は平均値としては黒字であるが施設間のばらつきが大きく, 配置スタッフ1人当たりの参加患者数を最大化する努力が必要であること, が示された。これらの結果と, 心リハをAMI患者の疾病管理システムと捉える新しい潮流を踏まえて, 既存の外来心リハ実施施設を地域で活用する「外来心臓リハビリを組み込んだAMI地域連携パス」の試みを紹介した。AMI患者のQOLと長期予後を改善することが示されている退院後外来心リハを組み込んだAMI地域連携パスが普及することにより, わが国のすべてのAMI患者が心リハの効果を享受できるようになることが望まれる。

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Effects of Phase II Cardiac Rehabilitation on Job Stress and Health-Related Quality of Life After Return to Work in Middle-Aged Patients With Acute Myocardial Infarction

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SUMMARY

The aim of the present study was to clarify the effects of phase II cardiac rehabilitation (CR) on job stress and health-related quality of life (HRQOL) after return to work in middle-aged patients with acute myocardial infarction (AMI). A total of 109 middle-aged outpatients (57 ± 7 years) who completed a phase I CR program after AMI were enrolled, 72 of whom participated in a phase II CR program for 5 months after hospital discharge (CR group) and 37 who discontinued the phase II CR program after the discharge (non-CR group). Job stress was assessed at 6 months after the AMI using a brief job stress questionnaire containing questions related to job stressors, worksite support, level of satisfaction with work or daily life, and psychological distress. HRQOL was assessed using the short-form 36-item health survey (SF-36) at hospital discharge and at 3 and 6 months after the AMI. There were no significant differences in clinical and occupational characteristics between the CR and non-CR groups. The CR group patients exhibited significantly better results for job stressors and psychological distress and higher SF-36 scores at 6 months after the AMI, as compared with those in the non-CR group. These findings suggest that discontinuing a phase II CR program induced chronic psychosocial stress after return to work in these middle-aged post-AMI patients. (*Int Heart J* 2009; 50: 279-290)

Key words: Myocardial infarction, Rehabilitation, Middle-aged, Stress, Quality of life

PATIENT-PERCEIVED health-related quality of life (HRQOL) is one of the most important and fundamental parameters in the evaluation of the health

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condition in patients recovering from coronary artery disease (CAD).¹¹ Although physical activity, psychological status, socioeconomic status, and social role are known to influence the HRQOL in patients with acute myocardial infarction (AMI),¹⁻³⁾ this influence appears to differ widely between middle-aged and more aged patients. Retired and aged patients with CAD have been reported to readily develop depression because of physical inactivity, living alone, and low socioeconomic status.⁴⁾ On the other hand, middle-aged patients with CAD may often experience anxiety and depressed mood due to loss of social position and economic instability.⁴⁾ Most patients who were working before AMI desire to return to work soon after hospital discharge, because they hope to regain their social position, or need to support their family.^{4,5)} It has been reported that post-AMI patients who could successfully return to work exhibited greater emotional well-being after hospital discharge than those who could not.^{3,5)} Return to work is thus one of the most important goals of the phase II CR program after an AMI for middle-aged patients.

On the other hand, job stress by itself has recently been shown to be a risk factor for AMI and for other cardiovascular events such as life-threatening arrhythmias, recurrence of AMI, and sudden death.⁶⁾ Although an appropriate level of job stress is required for fruitful work, excessive stress induced by a highly demanding occupation, low job latitude, or low work-related social support can exaggerate psychosomatic symptoms, including anxiety, depression, and fatigue.⁷⁾ Healthcare managers thus need to recognize that in addition to being a risk factor for coronary events, job stress can also produce deterioration of the HRQOL in AMI patients after return to work.

Some studies have suggested that education of patients about their disease, behavioral counseling, and the use of a psychosocial approach as part of a comprehensive CR program may decrease stress related to work and daily life in post-AMI patients.⁷⁻⁹⁾ In addition, some studies have examined the effects of comprehensive CR on the success rate of return to work in middle-aged patients.⁹⁾ However, few reports have documented the beneficial effects of CR programs on the job stress perceived by AMI patients who returned to their work. The purpose of the present study was to clarify the beneficial effects of a phase II CR program on the job stress level, psychosocial aspects of life, including the status of depression and anxiety, and HRQOL in middle-aged AMI patients returning to work after hospital discharge.

METHODS

Patients: The study protocol was approved by the Ethics Committee of Kitasato University on Human Research. Patients who were admitted to the Cardiovas-

cular Center of Kitasato University Hospital from September 2003 to July 2006 with AMI and who underwent phase I CR during hospitalization were enrolled as eligible candidates for the present study. Patients were excluded if they had limitation of activities of daily living caused by central neurologic disease or orthopedic disorder or were 65 years of age or older. A total of 266 patients who met the eligibility criteria were given information about the purpose and method of the study and provided consent for participation in the questionnaire surveys to evaluate the job stress level, HRQOL, and the severity of anxiety and depression. Of the 266 middle-aged post-AMI patients, 109 (90 men and 19 women; mean age, 56 ± 7 years; range, 35 to 64 years) who had undergone percutaneous coronary intervention ($n = 78$) or coronary artery bypass grafting ($n = 31$) during the hospitalization and returned to their previous jobs after hospital discharge participated. The patients decided of their own will whether they participated in a phase II CR or not after completion of a phase I CR program. The patients were divided into the following two groups: a CR group, consisting of 72 patients who underwent phase II CR as outpatients for 5 months after hospital discharge, and a non-CR group comprised of 37 patients who discontinued CR and did not attend the phase II CR program for outpatients after hospital discharge. The patients were also interviewed to determine the job stress level at 6 months after the AMI, and given questionnaires for determining the HRQOL and status of anxiety and depression at the time of hospital discharge, and at 3 and 6 months after AMI.

Measurements of the clinical and occupational characteristics: Age, sex, number of stenotic coronary arteries, and left ventricular ejection fraction (LVEF) were assessed on admission, and the body mass index, exercise capacity, muscle strength of the lower limbs, duration of hospital stay, and score for type A behavior pattern were evaluated at hospital discharge. LVEF, exercise capacity, and muscle strength of the lower limbs were reevaluated at 6 months after the AMI in the CR and non-CR groups. The duration from hospital discharge to return to work, job description, and working conditions after return to work were assessed 6 months after the AMI as occupational characteristics. Exercise capacity was calculated from the exercise time on treadmill exercise testing using the Bruce protocol. Muscle strength of the lower limbs was measured using a hand-held dynamometer (μ Tas MT-1, Anima, Tokyo) while patients performed isometric knee extension in a sitting position. The mean peak muscle strength (kg) in the right and left legs was normalized to the body weight and expressed as a percentage of the body weight (%BW) for statistical analysis. The type A behavior pattern score was measured by the discrimination test for the type A behavior pattern, which was developed for Japanese subjects.¹⁰⁾

Assessment of job stress: Job stress was assessed using a brief job stress ques-

tionnaire¹¹⁾ containing questions related to four main categories: job stressors (quantitative job overload, qualitative job overload, physical demand, interpersonal conflict, poor physical environment, job control, skill underutilization, suitable job and rewarding job), worksite support (supervisor support, coworker support and family support), level of satisfaction with work or daily life and psychological distress (lack of vigor, irritability, fatigue, anxiety, depressed mood, and somatic symptoms), while the quantitative job overload and qualitative job overload represented the psychological job demand. Each of the topic subscales was graded from 1 to 5 and adjusted for age and sex. A score of 3 represented the mean score for age-matched healthy workers, and lower scores indicated greater stress in AMI patients after return to work.

Assessment of psychosocial aspects: HRQOL was assessed using the medical outcome study short-form 36-item health survey (SF-36) Japanese version 1.20.¹²⁾ The SF-36 includes eight subscales: physical functioning (PF), role-physical (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). Norm-based scale scores were adjusted for age and sex to enable comparison between the CR and non-CR groups, with higher scores in each subscale indicating a better HRQOL. Anxiety and depression were assessed using the hospital anxiety and depression scale (HADS).¹³⁾ Scores on the HADS were graded from 0 to 16, with scores of 8 or higher indicating anxiety or depression. In addition, patients were instructed to fill out a self-reported questionnaire freely and concretely if they had any anxiety or problem related to working or daily life after hospital discharge.

CR program: At the Cardiovascular Center of Kitasato University Hospital, all patients are individually offered a comprehensive CR program, including exercise prescription, exercise training, dietary advice, instruction on medications and smoking cessation, referred to as phase I CR, during hospitalization. Before hospital discharge, the patients were briefed about the need to continue with CR and encouraged to participate in the comprehensive CR program, the phase II CR program for outpatients. The patients who participated in the phase II CR program received supervised exercise training and counseling as comprehensive CR for an hour once a week. The exercise session in the CR program included stretching, resistance training, aerobic exercise, and cool-down periods. After sufficient stretching of the quadriceps and triceps surae, the patients performed knee extensions with weights and calf raises for resistance training at a perceived exertion grade of 11-13. The exercise intensity in aerobic training was maintained at 65% of the peak heart rate determined during the treadmill exercise test. In the counseling session, a physical therapist confirmed the patients' physical condition, including the blood pressure, heart rate, arrhythmias, and leg

fatigue during the exercise training, and offered consultation for fitness conditioning for working and daily life.

Statistical analysis: The unpaired *t*-test and χ^2 test were used to examine the differences between the CR and non-CR groups in terms of the clinical and occupational characteristics, scores on the brief job stress questionnaire, and self-reported anxiety or problems in working or daily life. The paired *t*-test was used to compare the LVEF, exercise capacity, and muscle strength of the lower limbs measured at hospital discharge and 6 months after the AMI in the CR and non-CR groups. Two-way analysis of variance for repeated measures was used to examine the differences in the scores on the SF-36 and HADS between the two groups. All values are expressed as the mean \pm standard deviation (SD), with *P* values of less than 0.05 considered to represent significant differences. All analyses were performed using SPSS 11.0J for Windows (SPSS Japan Inc., Tokyo).

Table I. Clinical and Occupational Characteristics of Patients

Groups	CR		Non-CR	
	Hospital discharge	6 months	Hospital discharge	6 months
Number	72		37	
Age (years)	57 \pm 6		57 \pm 7	
Sex (Man/Woman)	59/13		31/6	
Body mass index (kg/m ²)	23.4 \pm 2.6		22.6 \pm 4.0	
Multiple vessel disease (%)	46		55	
Treatment (%)				
Percutaneous coronary intervention	68		78	
Coronary artery bypass grafting	32		22	
Type A behavior pattern score (points)	15.7 \pm 5.2		15.4 \pm 3.8	
Duration of hospital stay (days)	23 \pm 7		22 \pm 9	
Left ventricular ejection fraction (%)	48.9 \pm 10.7	53.1 \pm 9.1*	47.2 \pm 13.7	53.9 \pm 6.8
Exercise capacity (METs)	9.2 \pm 1.9	11.4 \pm 2.0**	9.1 \pm 2.4	10.4 \pm 3.0
Muscle strength of the lower limbs (%BW)	56.3 \pm 13.8	68.9 \pm 16.3**	52.8 \pm 11.6	60.1 \pm 8.0
Duration to return to work (days)		29 \pm 33		24 \pm 23
Job description (%)				
Managerial posts		31		20
Independent business		32		13
Part-time job		4		38
White-collar work		25		13
Blue-collar work		21		13
Working condition after return to work (%)				
Decreased workload and work hours		13		18
Change of job		3		0
No change		83		82

Mean \pm SD. CR indicates cardiac rehabilitation; 6 months, 6 months after acute myocardial infarction; MET, metabolic equivalent; BW, body weight; *, *P* < 0.05 and **, *P* < 0.01 versus hospital discharge in the CR group.

RESULTS

Clinical and occupational characteristics: The clinical and occupational characteristics of the patients in the CR and non-CR groups are shown in Table I. There were no significant differences in the clinical or occupational characteristics between the two groups at hospital discharge and 6 months after AMI. LVEF, exercise capacity, and muscle strength of the lower limbs were significantly improved at 6 months after the AMI as compared with the respective values measured at hospital discharge in the CR group ($P < 0.05$, $P < 0.01$ and $P < 0.01$, respectively), while no significant changes were observed during the study period in the non-CR group. No significant difference was found between the two groups in regard to the duration from hospital discharge to return to work. Sixty patients (83%) in the CR group and 30 patients (82%) in the non-CR group could return to their previous workplace under the same working conditions, and 31% in the CR group and 20% in the non-CR group were engaged in managerial work. There were no significant differences between the two groups in the job description or working conditions after return to work.

Brief job stress questionnaire: The scores on the brief job stress questionnaire are shown in Table II. Although no significant differences were found between

Table II. Scores on the Brief Job Stress Questionnaire

Groups	CR	Non-CR
Job stressors		
Quantitative job overload	3.5 ± 1.1	2.8 ± 1.5
Qualitative job overload	2.8 ± 1.1	2.4 ± 1.3
Physical demand	2.9 ± 0.9	2.5 ± 1.0
Interpersonal conflict	3.6 ± 1.1	3.4 ± 1.0
Poor physical environment	4.2 ± 0.9	3.7 ± 1.1
Job control	4.0 ± 0.9	4.3 ± 1.0
Skill underutilization	4.1 ± 1.0	3.7 ± 0.6
Suitable job	3.6 ± 1.2	3.1 ± 1.0
Rewarding job	3.9 ± 1.1*	2.8 ± 1.3
Worksite support		
Supervisor support	3.9 ± 0.7	3.9 ± 0.6
Coworker support	3.5 ± 0.9	3.3 ± 0.9
Family support	4.2 ± 1.1	4.3 ± 0.9
Level of satisfaction with work or daily life	3.6 ± 1.0	3.5 ± 1.1
Psychological distress		
Lack of vigor	4.2 ± 0.7**	3.1 ± 0.8
Irritability	4.0 ± 1.0*	3.3 ± 1.1
Fatigue	3.9 ± 0.7**	3.0 ± 0.4
Anxiety	3.5 ± 0.8	3.1 ± 0.7
Depressed mood	4.0 ± 1.0**	2.7 ± 0.5
Somatic symptoms	3.6 ± 1.0*	2.5 ± 1.0

Mean ± SD. CR indicates cardiac rehabilitation; *, $P < 0.05$ and **, $P < 0.01$ versus non-CR group.

the two groups' in regard to worksite support or level of satisfaction with work or daily life, the score for 'rewarding job' in job stressors was significantly higher in the CR group than in the non-CR group ($P < 0.01$). The scores for lack of vigor, irritability, fatigue, depressed mood, and somatic symptoms in psychological distress were significantly higher in the CR group than in the non-CR group ($P < 0.01$, $P < 0.05$, $P < 0.01$, $P < 0.01$ and $P < 0.05$, respectively).

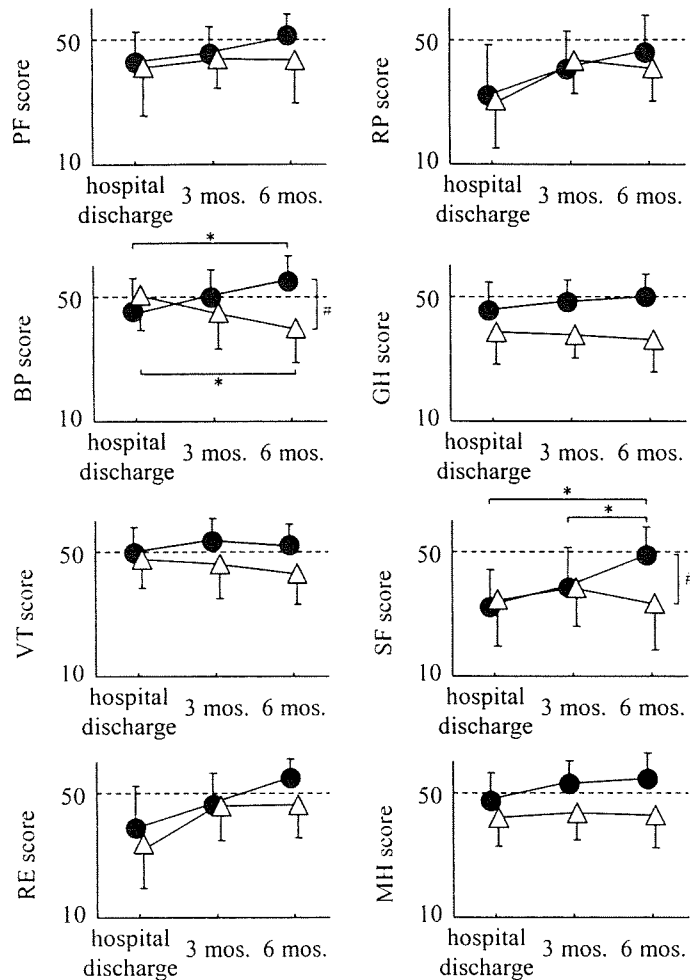


Figure 1. Changes in the norm-based scale scores for the subscales of SF-36. ● indicates CR group; △, non-CR group; CR, cardiac rehabilitation: 3 mos., 3 months after acute myocardial infarction; 6 mos., 6 months after acute myocardial infarction; PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health perceptions; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health; *, $P < 0.05$ versus 6 months after acute myocardial infarction and #, $P < 0.05$ between the CR and non-CR groups.

SF-36 and HADS: The changes in the norm-based scale scores of the SF-36 in the CR and non-CR groups are shown in Figure 1. There were significant interactions in the changes of the BP and SF scores between the CR and non-CR groups ($F = 5.17$, $P < 0.05$ and $F = 3.32$, $P < 0.05$, respectively). The BP score was significantly improved at 6 months after the AMI as compared with that at hospital discharge in the CR group ($P < 0.05$), whereas it was significantly decreased in the non-CR group ($P < 0.05$). The SF score was significantly improved at 6 months after the AMI as compared with those at hospital discharge and at 3 months after the AMI in the CR group ($P < 0.05$ and $P < 0.05$, respectively), while no significant changes were observed during the study period in the non-CR group. The BP and SF scores at 6 months after the AMI were significantly higher in the CR group than in the non-CR group ($P < 0.05$ and $P < 0.05$, respectively).

The changes in the anxiety and depression scores in the CR and non-CR groups are shown in Figure 2. There were no significant differences in the anxiety or depression scores between the CR and non-CR groups throughout the study period.

Self-reported anxieties or problems on the job or in daily living: The self-reported anxieties or problems on the job or in daily living are shown in Table III. The percentage of patients who had anxieties or problems related to work or daily living was significantly higher in the non-CR group than in the CR group ($P < 0.01$). Nine patients had anxieties or problems related to work or daily living in the CR group (13%), including those related to recurrence of AMI (89%), self-management of medication or diet (22%), smoking cessation (22%), and physical activity (22%). On the other hand, 17 patients had anxieties or problems in

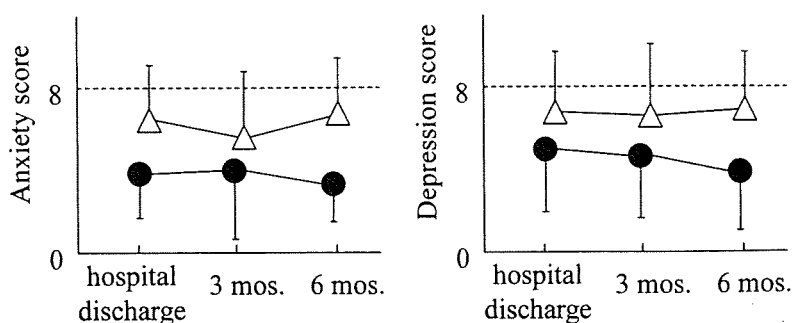


Figure 2. Changes in the anxiety and depression scores in HADS.

● indicates CR group; △, non-CR group; CR, cardiac rehabilitation; 3 mos., 3 months after acute myocardial infarction and 6 mos., 6 months after acute myocardial infarction.

Table III. Self-Reported Anxieties or Problems on the Job or in Daily Living

	CR	Non-CR
Do you have any anxieties or problems related to work or daily living?		
No (%)	87	54
Yes (%)	13	46*
Breakdown of anxieties or problems		
Recurrence of AMI (%)	89	18
Self-management of medication usage or diet (%)	22	35
Smoking secession (%)	22	6
Physical activities (%)	22	53

CR indicates cardiac rehabilitation; AMI, acute myocardial infarction and *, $P < 0.01$ analyzed by the chi-square test.

the non-CR group (46%), including those related to recurrence of AMI (18%), self-management of medication or diet (35%), smoking cessation (6%), and physical activity (53%).

In the non-CR group, the reasons for discontinuation of CR into the phase II CR were patient refusal in 29 patients and the long time needed to come to the hospital in 8 patients.

DISCUSSION

It was recently reported that 50% of AMI patients returned to work as early as within a month after the occurrence of AMI,¹⁴⁾ and that 75% begin to work again under the same conditions as those before the admission.¹⁵⁾ In the present study, the mean duration from hospital discharge to return to work was 29 days in the CR group and 24 days in the non-CR group, and more than 80% of the patients in both groups returned to their previous work and working conditions within 6 months after the AMI. These findings suggest that in Japan many middle-aged post-AMI patients return to work early after hospital discharge and continue to work with few disadvantages arising out of the absence from work, findings which are similar to those for other countries.^{14,15)}

In the brief job stress questionnaire survey conducted at 6 months after the AMI in the present study, no significant differences were found between the CR and non-CR groups in most of the subscales of job stressors, worksite supports, and level of satisfaction with work or daily life, although many subscales of psychological distress showed that the patients in the CR group felt less stressed than those in the non-CR group. It is believed that the main reason for the absence of any influence of the phase II CR on the scores of job stressors and worksite support is that the CR program provided did not include active intervention in the patients' work environment. The European Commission, Directorate-General for Employment and Social Affairs, recommended redesigning

of the job surroundings, ie, avoiding overload, improving worksite support, and adjusting occupational settings to suit a worker's abilities, in order to prevent recurrence of health hazards such as depression, psychosomatic disorders, and CAD.¹⁶⁾ It thus appears important for healthcare managers to collaborate with industrial specialists to improve the working conditions to accommodate the changes in the patients' cardiac and physical functions.

In regard to job stress, it has been reported that higher job demand, lower job control or lower worksite support represent greater risk in terms of psychological distress and cardiovascular disease.¹⁷⁾ However, the present study revealed scores of above 3 for many subscales of job stressors and worksite support in both the CR and non-CR groups, suggesting that middle-aged post-AMI patients had less job stress than expected after return to work. Such patients appear to be able to build up close personal relationships in their social lives soon after hospital discharge or return to work, with sufficient support from the supervisors, coworkers, and family. Additional stressors such as limitation of physical activity or social isolation should also be considered in the assessment of the psychological distress in AMI patients.

It was reported that workers who exercised regularly during the previous 6 months showed greater job satisfaction than those who did not.¹⁸⁾ The phase II CR program provides an opportunity for patients to engage in exercise and to consult with healthcare managers about their fears and problems related to physical activities or daily living. We speculated that such a supportive environment would enhance exercise capacity and physical activity levels in patients after return to work, to produce high motivation and job satisfaction levels at work. Furthermore, it has been reported that workers who felt that their job was rewarding, even if the job was excessively demanding, showed lower psychological distress than those who did not feel that way.¹⁹⁾ The present study results also suggested that a low score for 'rewarding job', observed in the non-CR group, resulted in high psychological distress or decreased HRQOL.

The present study showed no significant changes in the subscales of SF-36 in the non-CR group, and in particular, the BP score decreased significantly during the study period. It has been reported that the BP score in patients who feel fatigue is lower than that in healthy persons.²⁰⁾ The decreased BP score in the non-CR group suggested that the patients continued to work while experiencing fatigue and somatic symptoms for 6 months after AMI, because they showed no improvement in their physical functions. Furthermore, the anxiety and depression manifested by patients with AMI have been reported to be strong indicators of poor HRQOL on long-term follow-up after hospital discharge.²¹⁾ Anxieties and depressive mood may be induced by the prospect of the disadvantages in life, health, social roles, and employment in patients with AMI, because of the

sudden and unexpected turn of events.²²⁾ As the patients in the non-CR group had fewer opportunities to receive advice from healthcare managers after return to work, it was considered that chronic anxieties derived from working or daily life induced higher psychological distress and lower HRQOL in middle-aged post-AMI patients after return to work.

We recommend that middle-aged post-AMI patients undergo frequent evaluation of their physical and psychosocial conditions by experienced healthcare managers, not only during the period of hospitalization, but also after discharge, and that when possible, they should participate in a phase II CR program to maintain a better physical and psychological status after returning to work.

Study limitations: It was ethically unacceptable to randomize the patients in the present study, because it is well known that a comprehensive CR program reduces mortality and prevents recurrence of AMI.²³⁻²⁵⁾ Although the patients decided of their own will whether or not they would participate in a phase II CR, there were no significant differences in the clinical and occupational characteristics of the patients, subscale scores of SF-36, or anxiety and depression scores of HADS at hospital discharge between the CR and non-CR groups. In addition, it was reported that the psychological problems including depression or anxiety disorder observed during hospitalization did not prevent cardiac patients from participating in a phase II CR program.²⁶⁾ Therefore, we believe that the psychological problems and HRQOL could be compared between the CR and non-CR groups in spite of the nonrandomized design of the study.

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