Checklist for Heart Failure Treatments Improves Adherence to Guideline-Directed Treatment and Outcomes in Patients with Chronic Heart Failure with Reduced Ejection Fraction

Doungporn Ruthirago MD*, Nattawut Wongpraparut MD*, Saowanee Naowapanich RN*,
Akarin Nimmannit MD**, Suthipol Udompunturak MSc***, Rungtiwa Pongakasira BSc****

* Division of Cardiology, Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand
** Office for Research and Development, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand
*** Clinical Epidemiology Unit, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand
**** Her Majesty's Cardiac Center, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Background: *Chronic heart failure (HF) with reduced ejection fraction is a common cause of hospital admission. Patients who do not take medications for secondary prevention as described in the guidelines have significantly poorer long-term outcomes. Physicians may forget to prescribe these medications when contraindications to taking them no longer exist. Safety checklists have been found to decrease morbidity and mortality in a number of conditions and procedures.*

Objective: *To investigate whether implementation of a HF checklist can improve physician adherence to the American College of Cardiology/American Heart Association (ACC/AHA) 2009 treatment guidelines in patients with chronic HF with reduced ejection fraction and the treatment outcomes.*

Material and Method: *This prospective cohort with historical controlled cohort study compared a control group and an intervention group of patients recently diagnosed with HF with reduced ejection fraction within six months by an echocardiography that were treated at Siriraj Hospital's outpatient cardiology clinic. Patients in the control group were diagnosed between January and October 2011, and patients in the intervention group were diagnosed between January and October 2012. The control group received normal care without use of the HF checklist. The medical records of control group were retrospectively reviewed to collect the data at the first visit and the two follow-up visits at 3- and 6-month. HF checklist was attached inside the outpatient medical record of patients in the intervention group at the first visit and the two follow-up visits. The physicians completed the HF checklists before prescribing medications. The medical records of intervention group were reviewed at the end of the study.*

Results: *Ninety-three patients were included. Rate of adherence to medications, such as beta-blockers, angiotensin-converting enzyme inhibitors, and aldosterone antagonists was significantly improved in the intervention group at first visit after enrollment and at the 3- and 6-month follow-up visits. Mean blood pressure was significantly lower in the intervention group at six months. The 6-month readmission rate was lower in the intervention group than in the control group (4.7% vs. 20.8%, p = 0.027). There was a trend toward lower 6-month mortality rate in the intervention group.*

Conclusion: *Implementation of a HF checklist in patients with chronic HF with reduced ejection fraction improved both physician adherence to ACC/AHA 2009 guidelines and clinical outcomes, resulting in fewer cardiovascular hospitalizations and a trend toward lower mortality rate.*

Keywords: *Chronic systolic heart failure, Heart failure checklist, Medication, Guideline adherence*

J Med Assoc Thai 2017; 100 (9): 935-43
Website: http://www.jmatonline.com

Chronic systolic heart failure (heart failure with reduced ejection fraction) resulted in more than 1,000,000 hospital admissions in the United States in 2005, which was more than the total number of admissions for cancer during that same year[1]. A trial conducted in Thailand reported 2,041 admissions for chronic systolic heart failure in 1,612 patients aged 64±14 years between March 2006 and November 2007, of which 67% were associated with prior heart failure[2]. The incidence of systolic heart failure is directly associated with age, with one study reporting an exponential correlation between systolic heart failure and age[3]. The increasing incidence of this condition may be due to advances in the treatment of coronary artery disease, valvular heart disease, and arrhythmias,

Correspondence to:

Wongpraparut N; Division of Cardiology, Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Wang Lang Road, Bangkoknoi, Bangkok 10700, Thailand.
Phone: +66-2-4196104; Fax: +66-2-4197412
E-mail: wongpraparut@yahoo.com

with all of these advances prolonging survival in cardiac patients.

Medical treatment has reduced mortality in patients with chronic systolic heart failure and secondary prevention has a significant impact on outcome in patients with stage B or C heart failure[4,5]. Several randomized controlled trials demonstrated the benefit of using beta blocker, angiotensin-converting enzyme inhibitor (ACEI), and angiotensin receptor blocker (ARB) for mortality reduction in patients with chronic systolic heart failure[6-8]. The use of spironolactone in addition to standard therapy in patients with severe heart failure reduced both morbidity and mortality[9]. According to guidelines[4,5], patients with chronic systolic heart failure should be treated using diuretics, beta-blockers, ACEIs/ARBs, aldosterone receptor antagonists, digitalis, and hydralazine plus nitrates. Patients should also take digitalis if they have atrial fibrillation or New York Heart Association (NYHA) functional class II to IV. Hydralazine plus nitrates should be given if patients have contraindications to ACEIs/ARBs or they are unable to tolerate the adverse effects associated with ACEIs/ARBs[10]. Patients that do not take medications for secondary prevention as described in the guidelines have significantly poorer long-term mortality. Physicians may forget to prescribe these medications when contraindications to taking them are no longer present.

The Thai Acute Decompensated Heart Failure Registry (ADHERE) study revealed underutilization of ACEI, ARB, and beta-blocker among Thai patients. The rate of use for ACEI, ARB, beta-blocker, and aldosterone receptor antagonist was only 25.7%, 11.8%, 26.1%, and 12.5%, respectively[2]. The percentage of use for ACEI, ARB, and beta-blocker from Thai ADHERE are much lower when compared to US ADHERE and the Euro Heart Failure Survey I, both of which were conducted during the same period.

The implementation and use of a surgical safety checklist reduced morbidity and mortality among surgical patients worldwide[11]. Use of a surgical safety checklist resulted in changes in surgery-related systems and changes in surgeon behavior. Another previous study found that the use of a guideline-derived medication checklist for patients with coronary artery disease who underwent percutaneous coronary intervention (PCI) improved both physician guideline adherence and clinical outcomes in Thai patients[12].

This study set forth to investigate whether use of a heart failure checklist for patients with chronic systolic heart failure would increase physician guideline adherence and improve patient outcomes. Medications on the checklist included diuretics, beta-blockers, ACEIs/ARBs, aldosterone antagonists, digitalis, and hydralazine plus nitrates. The health education factors on the checklist included advice regarding smoking cessation, diet and physical activity, weight monitoring and reduction, and avoidance of non-steroidal anti-inflammatory drugs (NSAIDS) and negative inotropic agents - all as recommended by current guidelines. The checklist was used in patients treated at the outpatient cardiology clinic of Siriraj Hospital in Bangkok, Thailand.

Material and Method

Patient population

This prospective cohort with historical controlled cohort study was conducted in cardiac patients who received care and treatment at our center's outpatient cardiology clinic. Siriraj Hospital is Thailand's largest national tertiary referral center. This study compared a prospective intervention group to retrospectively treated controls. Patients in the intervention group were recently diagnosed with chronic systolic heart failure between January and October 2012. There were 43 patients that met the inclusion criteria. All of them were included in this study. Patients in the control group were recently diagnosed with chronic systolic heart failure between January and October 2011. Fifty patients met the inclusion criteria and were included in the study. Patients were included if they were diagnosed with stage B or C heart failure according to the ACC/AHA 2009 guidelines; had an ejection fraction of <40% recorded on transthoracic or transesophageal echocardiography during the 6-month period prior to their first visit to the cardiology clinic, and were followed-up for at least 6 months. Retrospectively reviewed control group patients continued to receive normal care.

The protocol for this study was approved by the Siriraj Institutional Review Board (SIRB), Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand. Written informed consent was provided by each patient of intervention group prior to his/her inclusion in the study.

The study protocol was described in detail to all residents and fellows of the Division of Cardiology, Department of Medicine, Faculty of Medicine Siriraj Hospital during the month of January 2012. Participating physicians were reminded that strict adherence to guidelines would likely yield reductions in patient

mortality. They were encouraged to prescribe diuretics if patients had volume overload; beta-blockers and ACEIs or ARBs if there were no contraindications to these agents, and aldosterone antagonists if patients were experiencing severe heart failure and were already taking diuretics, digitalis, beta-blockers, and ACEIs/ARBs. Hydralazine plus nitrates were recommended if patients had contraindications to ACEIs/ARBs. The investigation team was notified from the echocardiography lab when there was a new patient diagnosed with heart failure with reduced ejection fraction. The informed consent was obtained from the patient before he/she was enrolled to the study. The outpatient cardiology clinic appointment dates and time were tracked for each patient in the intervention group. The heart failure checklist was attached inside the outpatient medical record of intervention group patients by the investigation team at the first visit after enrollment, and at the 3- and 6-month follow-up visits. The heart failure checklist used in this study is a simple, one-page list of health education and medication factors (Appendix). Health education points on the checklist include smoking cessation, dietary sodium restriction, weight monitoring, and abstinence from NSAIDS. Medications on the checklist include angiotensin converting enzyme inhibitors or angiotensin receptor blocker, beta-blocker, aldosterone antagonist, digitalis, diuretic, and nitrate-hydralazine. Participating physicians were instructed to complete the heart failure checklist before prescribing medications at the first visit and the two subsequent follow-up visits.

Data were collected from inpatient and outpatient medical records at each of the three time points. Patient records were specifically reviewed for use of all of the previously described medications and for contraindications to the use of these medications. Health education counseling provided to patients was also reviewed and recorded.

The main results, the proportions of patients who received each type of medication were compared between control and intervention groups at first visit after enrollment and at the 3- and 6-month follow-up visits. Three-month and 6-month clinical outcomes were also compared between groups.

Statistical analysis

Data describing the demographic and clinical characteristics of the study population are presented as frequency (%) or mean ± standard deviation. The proportions of patients who received each type of medication and the quality of care indicators (blood pressure, heart rate, body mass index, and functional class) were compared between groups. Continuous data and categorical data were compared using Student's t-test and Chi-square test, respectively. A p-value <0.05 was considered to be statistically significant. All statistical analyzes were performed using SPSS Statistics version 22 (SPSS Inc., Chicago, IL, USA).

Results

Ninety-three patients were included in this study, with 50 allocated to the control group and 43 to the intervention group. Baseline demographic and clinical characteristics are shown in Table 1. Baseline demographic characteristics and ejection fractions were similar between the intervention and control groups except for the baseline functional class (Table 1). The baseline laboratory data were also similar between groups (Table 2).

At the first outpatient visit after enrollment, the intervention group had higher proportions of patients taking diuretics (97.6% vs. 72%, p<0.001), beta-blockers (95.1% vs. 48%, p<0.001), ACEIs/ARBs (87.8% vs. 66%, p = 0.016), aldosterone receptor antagonists (63.4% vs. 30%, p = 0.001), and hydralazine plus nitrates (75.6% vs. 54%, p = 0.033) than the control group. At the 3-month follow-up visit, the intervention group also had higher proportions of patients taking diuretics (100% vs. 68%, p<0.001), beta-blockers (95.1% vs. 54%, p<0.001), aldosterone receptor antagonists (67.5% vs. 35.4%, p = 0.003), and hydralazine plus nitrates (87.5% vs. 54%, p = 0.001). At the 6-month follow-up visit, the intervention group had higher rate of use of diuretics (100% vs. 81.8%, p = 0.003), beta-blockers (95.3% vs. 68.2%, p<0.001), ACEIs/ARBs (93% vs. 70.5%, p = 0.007), aldosterone antagonists (72.1% vs. 34.1%, p<0.001), and hydralazine plus nitrates (90.7% vs. 72.7%, p = 0.031). At the 6-month follow-up visit, the intervention group had a higher proportion of patients with optimized blood pressure control according to the guidelines than the control group (100% vs. 86%, p = 0.264), with significantly lower mean systolic blood pressure (118.5±17.4 mmHg vs. 131.3±10.8 mmHg, p = 0.021) and diastolic blood pressure (71.1±10.6 mmHg vs. 81.1±8.1 mmHg, p = 0.004). At 6-month, patients in the intervention group also had a lower mean heart rate (74.2±12.6 beats/minute vs. 83.3±9 beats/minute, p = 0.062) and body mass index (23.9±6.1 kg/m^2 vs. 24.1±6.1 kg/m^2, p = 0.798) than patients in the control group; however, these differences did not achieve statistical significance (Table 3). Functional

Table 1. Comparison of baseline demographic and clinical characteristics between the case and control groups

Characteristics	Case group (n = 43)	Control group (n = 50)	*p*-value
Male, n (%)	29 (70.7)	33 (66.0)	0.63
Age (years), mean ± SD	60.6±13.2	69.9±9.6	0.19
Weight (kg), mean ± SD	63.0±11.6	60.2±17.1	0.43
Body mass index (kg/m^2), mean ± SD	23.9±3.7	24.9±6.4	0.73
Systolic blood pressure (mmHg), mean ± SD	118.9±23.2	127.9±18.5	0.09
Diastolic blood pressure (mmHg), mean ± SD	71.5±13.3	73.2±13.7	0.61
Heart rate (beats/minute), mean ± SD	77.9±13.9	81.9±14.3	0.27
Comorbidities, n (%)			
Diabetes mellitus	17 (41.4)	21 (42.0)	0.48
Hypertension	22 (53.7)	30 (60.0)	0.54
Dyslipidemia	22 (53.7)	26 (52.0)	0.88
CAD	33 (80.5)	33 (66.0)	0.12
Stroke	4 (9.7)	7 (14.0)	0.34
Smoker	26 (63.4)	24 (48.0)	0.34
Functional class, n (%)			0.01
Class I	5 (12.2)	1 (2.0)	
Class II	31 (75.6)	34 (68.0)	
Class III	5 (12.2)	15 (30.0)	
Class IV	-	-	
Ejection fraction (%), mean ± SD	28.4±5.8	31.0±6.5	0.051

SD = standard deviation; CAD = coronary artery disease
p-value <0.05 indicates statistical significance

Table 2. Comparison of laboratory values between the case and control groups

Laboratory investigations	Case group (n = 43)	Control group (n = 50)	*p*-value
Serum potassium (mEq/L)			
First visit	4.0±0.5	3.6±0.3	0.07
3-month follow-up	4.1±0.5	3.7±0.2	0.16
6-month follow-up	4.1±0.5	3.6±0.2	0.04
Blood urea nitrogen (mg/dL)			
First visit	20.1±11.2	26.1±14.2	0.10
3-month follow-up	25.9±12.2	31.9±22.6	0.54
6-month follow-up	22.8±13.9	29.7±14.9	0.15
Serum creatinine (mg/dL)			
First visit	1.3±1.1	1.7±1.2	0.26
3-month follow-up	1.6±1.2	1.9±1.4	0.45
6-month follow-up	1.4±1.0	2.2±1.8	0.05

Data presented as mean ± standard deviation, *p*-value <0.05 indicates statistical significance

classification (class I to IV) of patients was slightly better in the intervention group than in the control group at 6-month (Table 3). The 6-month readmission rate was higher in the control group than in the intervention group (20.8% vs. 4.7%, $p = 0.027$). The 6-month mortality rate was also higher in the control group than in the intervention group, but this difference was not statistically significant (12% vs. 0%, $p = 0.053$) (Table 4). There was no loss to follow-up. All 93 patients completed the study.

Use of a heart failure checklist in patients with chronic heart failure with reduced ejection fraction helped to improve both clinical outcomes and physician adherence to the practice guidelines.

Discussion

This study found that the use of a heart failure checklist for secondary prevention of chronic heart failure with reduced ejection fraction resulted in greater physician adherence to treatment guidelines at the first visit, 3- and 6-month follow-up visits to our outpatient cardiology clinic. Diuretics, beta-blockers, ACEIs/ARBs, aldosterone antagonists, and hydralazine plus nitrates were used less frequently in the control group

Table 3. Comparison of quality of care indicators between the case and control groups

Indicators	Case group (n = 43)	Control group (n = 50)	*p*-value
BP <140/90 mmHg, n (%)	41 (95.3)	43 (86.0)	0.26
Systolic blood pressure (mmHg), mean ± SD			
First visit	118.9±23.2	127.9±18.5	0.09
3-month follow-up	114.1±19.9	137.6±14.8	0.01
6-month follow-up	118.5±17.4	131.3±10.8	0.02
Diastolic blood pressure (mmHg), mean ± SD			
First visit	71.5±13.3	73.2±13.7	0.61
3-month follow-up	70.6±12.8	84.8±8.4	0.02
6-month follow-up	71.1±10.6	81.1±8.1	0.01
Heart rate (beats/min), mean ± SD			
First visit	77.9±13.9	81.9±14.3	0.27
3-month follow-up	76.1±15.6	83.0±8.8	0.39
6-month follow-up	74.2±12.6	83.3±9.0	0.06
Body mass index (kg/m^2), mean ± SD			
First visit	23.9±3.7	24.9±6.4	0.73
3-month follow-up	23.1±4.7	25.1±6.3	0.66
6-month follow-up	23.9±6.1	24.1±6.1	0.80
NYHA functional class, mean ± SD			
First visit	2.7±0.6	2.5±0.5	0.09
3-month follow-up	1.8±0.5	2.1±0.6	0.01
6-month follow-up	1.7±0.5	2.8±0.4	0.01

BP = blood pressure; SD = standard deviation; NYHA = New York Heart Association
p-value <0.05 indicates statistical significance

Table 4. Comparison of 6-month clinical outcomes between the case and control groups

Clinical outcomes	Case group (n = 43)	Control group (n = 50)	*p*-value
Unplanned readmission, n (%)	2 (4.7)	10 (20.0)	0.03
Congestive heart failure	1 (2.3)	8 (16.0)	
Acute coronary syndrome	1 (2.3)	1 (2.0)	
Other	-	1 (2.0)	
Mortality, n (%)	0 (0.0)	6 (12.0)	0.05

p-value <0.05 indicates statistical significance

than in the intervention group, resulting in poorer control of blood pressure and volume overload, and a higher rate of unplanned readmissions due to recurrent heart failure or acute coronary syndrome among control group patients.

In this study, physician adherence to treatment guidelines in chronic heart failure patients was different for each medication. ACEIs/ARBs were used more frequently than beta-blockers and spironolactone[13]. Several interventions to improve physician and patient adherence have been described. Tamblyn et al reported on the use of an automated alert intervention that was linked to the electronic medical record to alert the primary care physician to a need for medical reconciliation[14]. However, that intervention had no impact on increase in drug dose or drug adherence. Similar findings were reported in hypertensive patients, in which automated reminders linked to the patient's electronic medical record did not result in better blood pressure control or improved medical adherence[15]. Several landmark trials showed the benefit of beta-blockers, ACEIs/ARBs, aldosterone antagonists, and hydralazine plus nitrates in reducing mortality[6-10]. The challenges associated with implementing an adherence guideline into clinical practice depends on geographic factors, cultural factors, and patterns of practice. As described at the 27th Bethesda Conference, multiple factors may play a role in reducing the implementation of appropriate therapy, such as physicians being focused on acute problems, time limitations, lack of training, and inadequate communication between the specialist and the primary care physician[16].

In our setting, residents rotated out every 4 to 6 weeks. Resident knowledge and the quality of care he/she would have been able to provide to a heart failure patient was limited at the beginning of the

rotation and then the continuation of patient care was disrupted. Use of the heart failure checklist would help to bridge any gaps in case awareness among physicians. This method can be expected to improve physician guideline adherence and improve rates of morbidity and mortality in chronic systolic heart failure patients.

Use of appropriate cardiovascular medications at appropriate dosages will improve the clinical outcome[17-20]. In an observational study, Corbelli et al[21] found that the use of a guideline-based critical care pathway in patients with acute coronary syndrome significantly increased the use of appropriate medications and significantly decreased 1-year adjusted mortality. The Mahler survey demonstrated that physician adherence to treatment guideline in heart failure patients resulted in fewer cardiovascular hospitalizations[13]. Use of the heart failure checklist in patients with chronic systolic heart failure creates a continuation of care among participating physicians and increases their awareness to focus on adherence to medication regimens that reduce the long-term risk of readmission for heart failure and other adverse cardiac events.

Limitation

This study has some mentionable limitations. First, the study design involves a comparison of pre-intervention and post-intervention data and the consecutive enrollment of two groups of patients from the same outpatient cardiology clinic. This design was chosen because it was not possible to assign the use of the heart failure checklist to specific clinic or house staff (resident, fellow) without risking significant cross contamination. Second, we selected the same months in two consecutive years in order to minimize the potential of readmission rate variations that are due to seasonal change becoming a confounding factor. However, there may have been variations in the knowledge and competence of residents and fellows from one year to the next. Third, there was also a trend toward a difference in baseline functional class between the two groups. Fourth, the proportions of medication use were collected from medical records. Therefore, they actually reflected only the physician prescriptions. This study did not confirm whether the patients took the medications or not.

Conclusion

Implementation of a heart failure checklist in patients with chronic heart failure with reduced ejection fraction improved both physician adherence to guidelines and clinical outcomes, resulting in fewer cardiovascular hospitalizations and a trend toward lower mortality rate.

What is already known on this topic?

Adherence to clinical guideline-recommended medications reduces morbidity and mortality in patients with chronic systolic heart failure. However, the utilization rate of ACEI, ARB, beta-blockers, and aldosterone receptor antagonists was found to be low among Thai patients according to the Thai ADHERE study.

What this study adds?

Implementation and use of a heart failure checklist in patients with chronic heart failure with reduced ejection fraction improved both clinical outcomes and physician adherence to clinical guidelines, resulting in fewer cardiovascular hospitalizations and a trend toward lower mortality rate in this patient population.

Acknowledgement

The authors gratefully acknowledge the support and cooperation of the residents, fellows, and staff of the outpatient cardiology clinic at Siriraj Hospital. This study was supported by a grant from the Routine to Research (R2R) Project, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand.

Potential conflicts of interest

None.

References

1. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, et al. Heart disease and stroke statistics--2010 update: a report from the American Heart Association. Circulation 2010; 121: e46-215.
2. Laothavorn P, Hengrassamee K, Kanjanavanit R, Moleerergpoom W, Laorakpongse D, Pachirat O, et al. Thai acute decompensated heart failure registry (Thai ADHERE). CVD Prevention and Control 2010; 5: 89- 95.
3. McMurray JJ, Petrie MC, Murdoch DR, Davie AP. Clinical epidemiology of heart failure: public and private health burden. Eur Heart J 1998; 19 (Suppl P): 9-16.
4. McMurray JJ, Adamopoulos S, Anker SD, Auricchio A, Bohm M, Dickstein K, et al. ESC

Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. Eur Heart J 2012; 33: 1787-847.
5. Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. Circulation 2013; 128: e240-e327.
6. CONSENSUS Trial Study Group. Effects of enalapril on mortality in severe congestive heart failure. Results of the Cooperative North Scandinavian Enalapril Survival Study (CONSENSUS). N Engl J Med 1987; 316: 1429-35.
7. Hjalmarson A, Goldstein S, Fagerberg B, Wedel H, Waagstein F, Kjekshus J, et al. Effects of controlled-release metoprolol on total mortality, hospitalizations, and well-being in patients with heart failure: the Metoprolol CR/XL Randomized Intervention Trial in congestive heart failure (MERIT-HF). MERIT-HF Study Group. JAMA 2000; 283: 1295-302.
8. Granger CB, McMurray JJ, Yusuf S, Held P, Michelson EL, Olofsson B, et al. Effects of candesartan in patients with chronic heart failure and reduced left-ventricular systolic function intolerant to angiotensin-converting-enzyme inhibitors: the CHARM-Alternative trial. Lancet 2003; 362: 772-6.
9. Pitt B, Zannad F, Remme WJ, Cody R, Castaigne A, Perez A, et al. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators. N Engl J Med 1999; 341: 709-17.
10. Cohn JN, Johnson G, Ziesche S, Cobb F, Francis G, Tristani F, et al. A comparison of enalapril with hydralazine-isosorbide dinitrate in the treatment of chronic congestive heart failure. N Engl J Med 1991; 325: 303-10.
11. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, Dellinger EP, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med 2009; 360: 491-9.
12. Phed-on U, Naowapanich S, Poolsawat U, Nimmannit A, Wongpraparut N. Benefit of post PCI medical checklist to improve adhering with best practice guidelines in the patients with coronary artery disease undergoing percutaneous coronary intervention (PCI). J Med Assoc Thai 2011; 94 (Suppl 1): S1-10.
13. Komajda M, Lapuerta P, Hermans N, Gonzalez-Juanatey JR, van Veldhuisen DJ, Erdmann E, et al. Adherence to guidelines is a predictor of outcome in chronic heart failure: the MAHLER survey. Eur Heart J 2005; 26: 1653-9.
14. Tamblyn R, Reidel K, Huang A, Taylor L, Winslade N, Bartlett G, et al. Increasing the detection and response to adherence problems with cardiovascular medication in primary care through computerized drug management systems: a randomized controlled trial. Med Decis Making 2010; 30: 176-88.
15. Christensen A, Christrup LL, Fabricius PE, Chrostowska M, Wronka M, Narkiewicz K, et al. The impact of an electronic monitoring and reminder device on patient compliance with antihypertensive therapy: a randomized controlled trial. J Hypertens 2010; 28: 194-200.
16. 27th Bethesda conference. Matching the intensity of risk factor management with the hazard for coronary disease events. September 14-15, 1995. J Am Coll Cardiol 1996; 27: 957-1047.
17. Tu J, Donovan L, Austin PK, Newman A, Wang J, Fang J. Quality of Cardiac Care in Ontario: Phase 1. Report 2. Toronto: Institute for Clinical Evaluative Sciences; 2005.
18. McVeigh GE, Flack J, Grimm R. Goals of antihypertensive therapy. Drugs 1995; 49: 161-75.
19. Riggio JM, Sorokin R, Moxey ED, Mather P, Gould S, Kane GC. Effectiveness of a clinical-decision-support system in improving compliance with cardiac-care quality measures and supporting resident training. Acad Med 2009; 84: 1719-26.
20. Bhatt DL, Steg PG, Ohman EM, Hirsch AT, Ikeda Y, Mas JL, et al. International prevalence, recognition, and treatment of cardiovascular risk factors in outpatients with atherothrombosis. JAMA 2006; 295: 180-9.
21. Corbelli JC, Janicke DM, Cziraky MJ, Hoy TA, Corbelli JA. Acute coronary syndrome emergency treatment strategies: Improved treatment and reduced mortality in patients with acute coronary syndrome using guideline-based critical care pathways. Am Heart J 2009; 157: 61-8.

Appendix. Heart failure checklist

Heart Failure Checklist

☐ First visit Date_____
☐ Follow-up at 3 months Date_____
☐ Follow-up at 6 months Date_____

Health education			
Smoking cessation		☐ Given	☐ Not given
Dietary control (Na restriction)		☐ Given	☐ Not given
Physical activity		☐ Given	☐ Not given
Weight monitoring and reduction		☐ Given	☐ Not given
Avoid NSAIDs, negative inotropic drugs		☐ Given	☐ Not given
Medication	☐ Yes		
Diuretics	☐ No, because	○ Volume depletion	○ Other.....
ACEI or ARB	☐ Yes		
	☐ No, because	○ Cr >3	○ K >5.5
		○ Hx. of angioedema	○ Pregnancy
		○ Bilat RAS	○ Other.....
Beta blocker	☐ Yes		
	☐ No, because	○ COPD/asthma	○ Hypotension/shock
		○ Deterioration of HF	○ HR<60
		○ Other.....	
Aldosterone antagonist	☐ Yes		
	☐ No, because	○ Cr >3	○ K >5.5
		○ Gynecomastia	○ Others.....
Digitalis	☐ Yes		
	☐ No, because	○ Post-MI, ongoing myocardial ischemia	○ HR <60
		○ Heart block	○ Other.....
Hydralazine+nitrates	☐ Yes		
	☐ No, because	○ Hypotension	○ Other.....

If there is no contraindication, please give medications according to ACC/AHA guideline 2009

Physician _____ Date _____
(Last name, first name)

ผลของการใช้แบบติดตามการได้รับยาและการให้คำแนะนำด้านสุขภาพตามมาตรฐานการรักษาผู้ป่วยภาวะหัวใจวายที่มีค่าการบีบตัวของหัวใจต่ำ

ดวงพร รุธิรโก, ณัฐวุฒิ วงษ์ประภารัตน์, เสาวนีย์ เนาวพาณิช, อัครินทร์ นิมมานนิตย์, สุทธิพล อุดมพันธุ์รัก, รุ่งทิวา พงษ์อัคคศิรา

ภูมิหลัง: *ในปัจจุบันการเพิ่มขึ้นของอัตราการเจ็บป่วยด้วยภาวะหัวใจวายที่มีค่าการบีบตัวของหัวใจต่ำและอัตราการเข้ารักษาในโรงพยาบาลด้วยภาวะดังกล่าวถือเป็นปัญหาสำคัญของประเทศไทย สาเหตุส่วนหนึ่งเนื่องมาจากการที่แพทย์ผู้รักษาไม่ได้สั่งการรักษาด้วยยาที่มีประโยชน์ในการลดอัตราตายหรือบรรเทาอาการของภาวะหัวใจวายอย่างเหมาะสม รวมทั้งไม่มีเวลาในการให้คำแนะนำด้านสุขภาพกับผู้ป่วยอย่างเพียงพอ*

วัตถุประสงค์: *เพื่อศึกษาผลของการใช้แบบติดตามการได้รับยาและการให้คำแนะนำด้านสุขภาพตามคำแนะนำการรักษาของ ACC/AHA 2009 guidelines สำหรับผู้ป่วยภาวะหัวใจวายที่มีค่าการบีบตัวของหัวใจต่ำต่อการได้รับยาครบตามมาตรฐาน และผลลัพธ์ของการรักษา*

วัสดุและวิธีการ: *การศึกษานี้เป็นการศึกษาแบบ prospective cohort with historical controlled cohort ในผู้ป่วยหัวใจวายที่มีค่าการบีบตัวของหัวใจต่ำ ที่ได้รับการตรวจยืนยันด้วยการทำ echocardiography ภายในระยะเวลา 6 เดือน ที่คลินิกโรคหัวใจและตึกผู้ป่วยนอกของแพทย์ประจำบ้านต่อยอด สาขาวิชาหทัยวิทยา ภาควิชาอายุรศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล โดยเปรียบเทียบระหว่างกลุ่มควบคุมซึ่งได้รับการวินิจฉัยภาวะหัวใจวายระหว่างเดือนมกราคม ถึง ตุลาคม พ.ศ. 2554 กับกลุ่มทดลองซึ่งได้รับการวินิจฉัยภาวะหัวใจวายระหว่างเดือนมกราคม ถึง ตุลาคม พ.ศ. 2555 ในกลุ่มควบคุมเป็นการเก็บข้อมูลผู้ป่วยที่เคยมาตรวจที่คลินิกโรคหัวใจครั้งแรก และมาตรวจติดตามการรักษาที่ 3 และ 6 เดือน โดยเก็บข้อมูลจากเวชระเบียนย้อนหลัง สำหรับในกลุ่มทดลองจะได้รับการใช้แบบติดตามการดูแล(checklist) โดยแบ่งเป็น 3 ครั้ง คือ ครั้งแรกที่มาตรวจที่คลินิกโรคหัวใจ และมาติดตามการรักษาที่ 3 และ 6 เดือน*

ผลการศึกษา: *ผู้ป่วยทั้งหมด 93 ราย แบ่งเป็นกลุ่มควบคุม 50 ราย และกลุ่มทดลอง 43 ราย ในผู้ป่วยกลุ่มทดลองที่มีการใช้แบบติดตามของการได้รับยาและการให้คำแนะนำด้านสุขภาพจะได้รับการใช้ยา diuretics (97.6% vs. 72%, p<0.001), β-blocker (95.1% vs. 48%, p<0.001), ACEI หรือ ARB (87.8% vs. 66%, p = 0.016), aldosterone antagonist (63.4% vs. 30%, p = 0.001) และ hydralazine plus nitrates (75.6% vs. 54%, p = 0.033) มากกว่ากลุ่มควบคุมตั้งแต่ครั้งแรกที่มารับการรักษาที่คลินิกโรคหัวใจ เมื่อติดตามการรักษาที่ 6 เดือน พบว่าการใช้ยา diuretics (100% vs. 81.8%, p = 0.003), β-blockers (95.3% vs. 68.2%, p<0.001), ACEI หรือ ARB (93% vs. 70.5%, p = 0.007), aldosterone antagonist (72.1% vs. 34.1%, p<0.001) และ hydralazine plus nitrates (90.7% vs. 72.7%, p = 0.031) อยู่ในระดับที่สูงกว่ากลุ่มควบคุม เมื่อพิจารณาผลลัพธ์ของการรักษาพบว่าผู้ป่วยกลุ่มทดลองมีระดับความดันโลหิตทั้งซิสโตลิกและไดแอสโตลิก ที่ 6 เดือน ต่ำกว่ากลุ่มควบคุม (118.5±17.4 vs. 131.3±10.8 มม.ปรอท, p = 0.021 และ 71.1±10.6 vs. 81.1±8.1 มม.ปรอท, p = 0.004) อัตราการเข้ารับการรักษาซ้ำจากภาวะหัวใจวายพบว่ากลุ่มทดลองต่ำกว่า (4.7% vs. 20.8%, p = 0.027) และอัตราตายของกลุ่มทดลองต่ำกว่าแต่ไม่ต่างกันอย่างมีนัยสำคัญทางสถิติ (0% vs. 12%, p = 0.053)*

สรุป: *การใช้แบบติดตามการได้รับยาและการให้คำแนะนำด้านสุขภาพตามมาตรฐานการรักษาในผู้ป่วยภาวะหัวใจวายที่มีค่าการบีบตัวของหัวใจต่ำช่วยเพิ่มอัตราการได้รับยาของผู้ป่วย รวมทั้งช่วยทำให้ผลลัพธ์ของการรักษาดีขึ้นโดยลดอัตราการเข้ารับการรักษาซ้ำจากภาวะหัวใจวายที่ 6 เดือน*