

# **CAN AN INTEGRATED HEART FAILURE SERVICE IMPROVE DIAGNOSIS AND MANAGEMENT OF HEART FAILURE?**

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## Abbreviations

ACE	Angiotensin-converting enzyme inhibitor
ARB	Angiotensin receptor blocker
BMI	Body mass index
BNP	Brain natriuretic peptide
BP	Blood pressure
COPD	Congestive obstructive pulmonary disease
CXR	Chest x-ray
Echo	Echocardiogram
ESRF	End stage renal failure
GP	General practitioner
HF	Heart failure
PND	Postural nocturnal dyspnoea
SOB	Shortness of breath

## **1 The service**

### **1.1 Introduction**

HF (HF) is a debilitating and costly disease<sup>1</sup>. The aging population and enhanced survival of coronary heart disease patients now means that HF is a significant public health concern<sup>2</sup>. In February 2009, the Waikato HF interest group received funding for a community-based integrated HF service. The service has been piloted in Te Kuiti and Tokoroa.

Within the Waikato DHB, the HF interest group had representation from secondary and primary care, both clinicians and nursing staff, Public Health, Te Puna Oranga (Maori Health Service), Planning and Funding; as well as the Waikato Clinical School (University of Auckland). The service's team consisted of primary care doctors and nurses, specialist HF nurse, community cardiologist and other relevant community workers. We wished to investigate the impact of this new service on patient outcomes. It was an observational (comparative) study looking at a quality improvement intervention. The project involved developing a database for data collection and analysis. Data was collected at baseline, and intervention during the year.

### **1.2 Aim**

The aim of the service was to improve, jointly with primary and secondary care, diagnosis and management of HF in the community.

### **1.3 Objectives**

The objectives were to improve detection of HF, to provide better local access to diagnostics and specialist care, to improve communication between providers and between providers and patients, and to identify any inequalities in particular for Maori HF patients.

## 1.4 Background

HF is the only major cardiovascular disease to have an increasing prevalence with a significantly poor prognosis. HF occurs mainly as a result of coronary heart disease, but can also result from rheumatic heart disease, hypertension, cardiomyopathy and other cardiac disease. There are disparities in outcome for Māori with chronic HF<sup>3</sup> and for those living in rural areas<sup>4</sup>.

In Waikato, there is an average of 643 admissions for HF annually. Fifty-six percent of all admissions are aged 65 years and over; with admission rates increasing with age from 169 per 100,000 in those aged 45 to 64 years to 2,940 per 100,000 in those aged over 85 years<sup>5</sup>. The HF admission rate for males is about one and a half that for females. Seventy-two percent of all admissions are of European ethnicity. However, Maori have four times the number of age-standardised admission rates than European. Maori present with HF at a younger age with rates in Maori aged 45 to 64 years five times that of European in the similar age group. Rates of HF admissions also differ by Territorial Authority (TA). In Waikato the highest TA crude admission rates are in Waitomo, South Waikato and part Ruapehu; almost twice that of Hamilton and Matamata-Piako TA.

The service was established as a pilot in Tokoroa and Te Kuiti; areas where the highest crude admission rates for HF existed and where there was a local hospital. The estimated population over 45 years of age in Tokoroa township is 4,422 and in Te Kuiti township 1,484.

Despite significant advances in management, outcome for HF remains poor. The diagnosis of HF is associated with poor quality of life and high morbidity and mortality<sup>3</sup>. A US study showed less than 50 % survival at 5 years post-diagnosis<sup>6</sup>. A Scottish study<sup>7</sup> suggested that one-fifth of patients with HF die within a month of admission, nearly half are dead one year on and three-quarters by five years. Median survival was estimated at 1.5 years from first admission to hospital.

The Waikato annual crude mortality rate for HF is 23 deaths per 100,000 population. Mortality rates increase with age from 14 deaths per 100,000 in those aged 45 to 64 years to 1007 deaths per 100,000 in those aged over 85 years. For Maori living in Waikato, the mortality rate for HF is four times that of European and specifically for those aged 45-64 years the Maori mortality rate is 30 times that of European (NB: numbers are small).

HF is one of the few areas of medical treatment where there is good evidence for the effectiveness of treatment and clear evidence that early and consistent treatment prolongs life<sup>8</sup>. Significant “gaps” have, however, been identified in HF care within New Zealand in multiple research studies. These include:

- Difficulties with diagnosis and investigation of suspected HF, in particular under use of echocardiography
- Under utilisation of evidence-based treatment including:
  - Under use and suboptimal dose of angiotensin-converting enzyme inhibitors (ACE)
  - Under use and suboptimal dose of beta-blockers
- Under use of education/lifestyle modification activities

It is important that patients are diagnosed accurately and managed appropriately to improve quality of life, prolong life and to prevent unnecessary hospital admissions.

The most recent New Zealand HF guidelines and other national guidelines recommend that an organised system of specialist HF care be established<sup>8 9 10</sup>. Having specialist HF care has been found to reduce all-cause mortality, decrease all-cause readmissions and decrease HF readmissions.

The content of the disease management interventions have involved a varying combination of patient self-management, education, attention to compliance, structured follow up (often in shared-care structures with hospital and primary care), social support and other initiatives. Common themes emerge from these interventions but successful programmes need to be flexible to the individual patient and the local healthcare environment. The role of the HF nurse specialist has been identified as one of the key roles in disease management interventions and works as part of a multidisciplinary team.

In conclusion, HF is a major public health problem with marked inequalities for Waikato. A service was launched in two areas of highest need. A multidisciplinary team was established and an evaluation was completed during the initial 12 months of the service.

## **2 The study**

In order to assess the service against its aim, objectives and indicators it was decided to carry out a formal evaluation of the service. This would be run alongside the setting up and first year of the service in both pilot sites. It would be both quantitative and qualitative in design.

### **2.1 Aims**

The aims of the study were to describe the prevalence of HF, to describe the diagnosis and management of HF, and to evaluate the service from initiation to implementation against its aims and objectives.

### **2.2 Methods**

#### **2.2.1 Design**

An observational study (comparative) was carried out looking at a quality improvement intervention.

#### **2.2.2 Setting**

The settings were primary care practices in two areas identified as having high admission rates for HF. All patients with a primary care coded diagnosis of HF were identified. Using a standardised form, baseline data were collected on each patient which included demographic information, risk factors, investigations and medications.

Each patient record was evaluated to establish their HF diagnosis using baseline data, information from GP regarding possible issues and secondary care information. Patients

were then either referred back to their GP as not HF or for further GP assessment in liaison with the HF nurse as identified through a developed care pathway. The more severe or more complicated patients identified were offered a clinic intervention or other carried out by the service.

### 2.2.3 Intervention

The intervention was a clinic assessment at the new Integrated HF Service. Information from the clinic assessment of patients was collected via a standardised form which included risk factors, HF symptoms information, history of echocardiography and other investigations, and any further work required.

### 2.2.4 Analysis

Data analysis was carried out using Microsoft Excel®, Epi Info Stat Calc®. The Student t-test for independent samples and chi squared test were used to compare proportions and Wilcoxon Two-Sample Test was used to compare differences between medians. Tests of significance were 2-sided, and a p value < 0.05 was considered statistically significant. Crude prevalences were calculated using denominator values derived from New Zealand Census 2006 usually resident population data for both Te Kuiti and Tokoroa township census area units (CAU), thus 42 patients who were resident outside of each township were excluded for these calculations.

## 2.3 **Evaluation of the service**

Objectives of the evaluation were to establish the views of stakeholders, patients and GPs on the HF service

### 2.3.1 Methods

There were three parts to the evaluation:

Key stakeholders involved in the service at Te Kuiti and Tokoroa were invited to participate in a face-to-face interview using a semi-structured questionnaire format.

Clients of the service were invited to complete an anonymous Patient Satisfaction Survey and provided with a return envelope.

GPs of the service were invited to complete an anonymous self completed questionnaire regarding the service.

#### Key stakeholders interviews

Interviews were held with a number of key stakeholders using a semi-structured questionnaire format including questions regarding their involvement, the strengths and weaknesses, structure and processes issues, etc relating to the initiation and implementation of the service.

#### Patient Satisfaction Survey

The Patient Satisfaction Survey was an anonymous survey developed and sent to patients who had attended the Integrated HF Service. Patients of the Service had to have a diagnosis of HF and had to have agreed to further input from the Service. The lists of patients from Te Kuiti and Tokoroa were sent to the respective nurses and checked to ensure they met these criteria. Patients who had died were excluded. The aim of the Patient Satisfaction Survey was to ascertain views about different aspects of the Service including communication, time with health professional, explanation, usefulness, self-management, mobility, nurse input, follow-up, re-hospitalisation, location and acceptability. The survey consisted of 27 items of multi-choice and open ended questions.

#### GP survey

An anonymous semi-structured survey was sent to GPs to ascertain views about communication and acceptability for those involved in the Integrated HF Service.

### **3 Results**

#### **3.1 Baseline characteristics**

From November 2009 to November 2010, 404 patients with a primary care coded diagnosis of HF were identified from GP lists. All (100%) had baseline data collected. The overall crude prevalence of HF in the community (Te Kuiti and Tokoroa townships (n=362)) was 2.0%; 6.1% for those aged 45 and over years and 15.% for those aged 60 years and over.

Of the 404 patients coded with HF 44% were from a Te Kuiti and 56% were from a Tokoroa GP practice. Thus, the crude HF prevalence in those aged 45 years and over for Te Kuiti was 9.9% and 4.9% for Tokoroa town and for those aged 60 years and over it was 19.6% for Te Kuiti and 8.9% for Tokoroa.

There were equal proportions of male and female (Table 1). The median age at collection of baseline data was 74 years and the median age at diagnosis of HF was 66 years. Approximately 40% of patients were diagnosed with HF before they were 65 years old and half were aged between 65 to 85 years old.

Fifty-four percent of patients were of European ethnicity, 31% Maori, 9.3% Pacific, 6% Other and less than 1% Asian; 69.4% Non Maori (includes all ethnic groups except Maori) and 30.6% Maori.

Table 1: Characteristics of study population, at baseline.

<b>Characteristics</b>	<b>n = 404</b>	
	<b>n</b>	<b>% (Range)</b>
Females	199	49.3
Age at study (median)	74	
Age at diagnosis (median)	66.4	(30.4-94.3)
Age group at diagnosis:		
<45 years	20	5.0
45-64 years	147	36.4
65-84 years	202	50.0
85+ years	12	3.0
Ethnicity		
European	215	53.3
Maori	123	30.6
Pacific	38	9.3
Asian	3	0.7
Other	24	5.7
Non Maori	279	69.4
Area		
Te Kuiti	179	44.4
Tokoroa	224	55.6

Weight measurements were available in 70.8% of patients. Almost a third of those with a recorded weight were heavier than 100kg. The median weight of patients at diagnosis was approximately 90kg (Table 2). The median BMI was 33, with over two-thirds having a BMI greater than 30, suggesting that our patients were predominantly obese. Only 10% of those with a recorded BMI were within the normal range (18.5-24.9).

Only a small proportion of patients (15%) were current smokers, however almost half were ex-smokers, of which 10% had stopped within the past 12 months. A significant number of patients had other cardiac diseases which may have contributed to their HF. These included 70% with hypertension, 40% with atrial fibrillation, 25% with angina, 20% with a previous myocardial infarction, and 15 % with valve disease. In addition many patients had other significant, non cardiac co-morbidities including 40% with type 2 diabetes, 20% with chronic obstructive pulmonary disease (COPD), and 10% with end stage renal failure (ESRF).

Table 2: Risk factors and co morbidities, at baseline.

variable	n = 404	% (range)
weight (kg)	90.5	(46-171)
Weight group		
<50kg	18	4.5
50-79kg	67	16.6
80-99kg	99	24.5
>=100kg	102	25.2
No weight available	118	29.2
BMI	33.26	(17.8-62.4)
<18.5 under weight	1	0.2
18.5-24.9 normal	20	5.0
25-29.9 overweight	46	11.3
30+ obese	139	34.4
Smoker	46	11.3
Ex smoker	172	42.6
HT	277	68.6
Diabetes (Type2)	151	38
AF	153	37.9
Valve disease	60	14.9
Angina	98	24.3
previous MI	82	20.3
COPD	71	17.6
ESRF	48	11.9

At the time of the diagnosis, nearly 60% were complaining of shortness of breath and 30% of swollen ankles. The patient's diagnosis of HF was most commonly based on clinical symptoms alone with the additional use of chest x ray in 50% of patients (Table 3). Approximately 27% of patients had a BNP blood test and 35% had an Echo, the recommended diagnostic test for HF, performed within a year after diagnosis to verify their diagnosis.

Approximately 80% of patients at baseline were prescribed a diuretic; the most common was Frusemide (92%) (Table 3). Half of the patients were prescribed a beta-blocker (73% Metoprolol and 12% Atenolol), 66% an angiotensin-converting enzyme (ACE) inhibitor (65% Quinapril and 19% Clizapril), 13% an Aldosterone antagonist (Spironolactone) and 11% an angiotensin receptor blocker (ARB) (Candesartin).

Table 3: HF symptoms, investigations, and prescribed medications at baseline

	<b>n = 404</b>	
	<b>n</b>	<b>%</b>
<b>Symptoms</b>		
SOB	230	56.9
Swollen ankles	126	31.1
PND	76	18.8
Orthopnea	80	19.8
Effort	45	11.1
<b>Investigations</b>		
CXR	236	58.4
BNP	110	27.2
Echo	143	35.4
<b>Medications</b>		
ACE	270	66.3
Beta-blocker	210	51.6
Diuretic	322	79.1
Aldosterone antagonist	55	13.5
ARB	46	11.3

### 3.2 GP visits and hospital admissions.

The median number of times patients in the study population had seen their GP in the past two years was one (0 to 22). Approximately 45% had not visited their GP in the last two years.

From 2005 to 2009, the 404 patients who had baseline data collected had 1,277 admissions to hospital. Hospitals they were most commonly admitted to included Waikato, Te Kuiti and Tokoroa. Of these admissions, 115 (9%) were coded as a primary diagnosis of HF and a further 53 secondary diagnosis of HF. The length of stay for 115 HF (primary diagnosis) admissions ranged from 0 to 29 days, with 70% of patients staying less than five days. The other 1,162 admission were for a range of diagnoses including: 37 for Myocardial infarction, 32 for angina, 35 for atrial flutter, 19 for cellulites of lower limb, 48 for COPD, and 47 for Non familial hypo-gammaglobulinaemia.

### 3.3 Ethnicity

Baseline characteristics in the majority of HF patients separated into Non-Maori and Maori are shown in Table 4. For Non-Maori and Maori patients with HF the majority of baseline characteristics measured were similar. However, Maori patients were significantly younger at diagnosis by almost ten years; 61 years for Maori compared to 70 years for Non-Maori. Approximately 60% of Maori were diagnosed with HF before they were aged 65 years compared to only 30% of Non-Maori. Maori were over 10kg heavier at diagnosis than non-Maori (98.8 vs 87kg); average BMI in Maori was 37 vs non-Maori 32.

Approximately 10% more Maori were current smokers and almost half of Maori were ex-smokers compared to 40% of non-Maori. Forty-five percent of Maori had type 2 diabetes and 44% had COPD, almost 10% greater than corresponding non-Maori figures. In contrast 25% of non-Maori had angina compared to 16% of Maori.

Table 4: Characteristics of study population, at baseline, by ethnicity

Characteristic	Non Maori n = 279		Maori n =123		p-value
	n	% (range)	n	% (range)	
Females	142		55		NS
Age (median)	79	38-100	68.0	39-88	
Age at diagnosis	70		60.7		<0.001
Age group					
>45	8	2.9	12	9.8	<0.001
45-64	80	28.7	66	53.7	
65-85	161	57.7	40	33.3	
85+	12	4.3	0	0	
weight (kg)	87	46-171	98.8	50-170	<0.001
BMI	32.4	17.8-62.4	37.1	22.6-46.2	<0.001
Smoker	22	7.9	21	17.0	0.006
Ex smoker	108	38.7	64	52.0	0.01
HT	190	68.1	86	69.9	NS
Diabetes (Type2)	98	35.0	56	45.5	0.004
AF	99	35.5	53	43.1	NS
Valve disease	39	14	21	17.1	NS
Angina	78	28	20	16.3	0.01
previous MI	60	21.5	22	17.9	NS
COPD	44	15.8	27	22	NS
ESRF	36	12.9	12	9.8	NS

Maori were more likely to present with postural nocturnal dyspnoea (PND) and orthopnea, and less likely to present with swollen ankles compared to non-Maori (Table 5). Although not significant, there was a difference in the use of BNP at diagnosis with 29% of Non-Maori and 23% Maori having the test. A similar proportion of both groups (35%) had an Echo at diagnosis.

In general the proportions of prescribed HF medication were similar for Non Maori and Maori except for ACE inhibitors; 10% more non Maori were on an ACE inhibitor. Although not significant, 10% more Maori were prescribed a beta-blocker.

Table 5: HF symptoms, investigations, and prescribed medication, at baseline by ethnicity

Variable	Non Maori n = 279		Maori n = 123		p value
	n	%	n	%	
Symptoms					
SOB	121	43.3	51	41.5	NS
Swollen ankles	94	33.7	31	25.2	NS
PND	47	16.8	29	23.6	NS
Orthopnea	43	15.4	37	30.1	<0.001
Effort	29	10.4	16	13.0	NS
Investigations					
CXR	159	57	76	61.8	NS
BNP	80	28.7	28	22.8	NS
Echo	96	34.4	46	37.4	NS
Medications					
ACE	179	64.2	91	74.0	0.05
Beta-blocker	153	54.8	56	45.5	NS
Diuretic	224	80.3	97	78.9	NS
Aldosterone antagonist	37	13.3	18	14.6	NS
ARB	33	11.8	13	10.6	NS

### 3.4 Area

Approximately 44% of patients were from Te Kuiti GP practices and 56% from Tokoroa. There were some differences in patient characteristics between the two sites (Table 6). Approximately 40% of Te Kuiti patients were Maori compared with a quarter of Tokoroa ( $p < 0.001$ ). The mean age of Te Kuiti patients at the time of their HF diagnosis was almost four years younger than patients from Tokoroa (68.9 vs 65.3;  $p = 0.006$ ). In Tokoroa 10% more

patients had a diagnosis of hypertension and 15% more end stage renal failure, but 10% had less AF.

Table 6: Characteristics, risk factors and co-morbidities, at baseline, by area

	Te Kuiti N = 179		Tokoroa N = 224		p-value
	n	% (range)	n	% (range)	
Non Maori	109	61.2	196	75.8	0.001
Maori	69	38.8	54	24.2	
Pacific	0	0	38	17.0	
European	107	59.7	108	48.2	
Asian	2	1.1	1	0.4	
Other	0	0.0	23	10.3	
Females	86	48.0	113	50.1	NS
Age (median)	76.2	(39.1-100.3)	71.9	(38.0-94.6)	0.02
Age at diagnosis	68.9	(32.5-91.3 )	65.3	(30.4-94.3)	0.006
Weight (kg)	90	(46-170 )	91.5	(46.2-171)	NS
BMI	33.5	(19.1-54.6)	3.1	(17.8-62.5)	NS
Smoker	19	10.6	24	10.7	NS
Ex smoker	69	38.5	103	46.0	NS
HT	139	77.7	198	88.4	0.0038
Diabetes (Type2)	63	35.2	91	40.6	NS
AF	77	43.0	76	33.9	0.06
Valve disease	21	11.7	39	17.4	NS
Angina	40	22.3	58	26.0	NS
Previous MI	30	16.8	52	23.2	NS
COPD	33	18.4	38	17.0	NS
ESRF	6	3.4	42	18.8	<0.001

Although not statistically significant, there were observed differences between the two areas in the use of Echo and BNP for diagnosis (Table 7). In Te Kuiti, approximately a third of individuals had a BNP test to assist in their HF diagnosis compared to only a quarter in Tokoroa; a similar result was observed for the use of echo-cardiography.

Similar proportions of patients in each area were prescribed a diuretic and an aldosterone antagonist; the most common drugs prescribed in each category were Frusemide and Spironolactone. Slightly more patients in Tokoroa were prescribed an ACE inhibitor; the

most common ACE prescribed overall was Quinapril. Te Kuiti patients were prescribed slightly less beta-blockers; the most common beta-blocker prescribed overall was Metoprolol.

Table 7: HF investigations and prescribed medication, at baseline, by area

Variables	Te Kuiti n=179		Tokoroa n = 224		p-value
	n	%	n	%	
<b>Investigations</b>					
CXR	115	64.2	121	53.7	0.038
BNP	58	32.4	52	23.2	0.026
Echo	59	33	84	224	NS
<b>Medications</b>					
Diuretic	142	79.3	180	80.0	NS
Aldosterone antagonist	26	14.5	29	12.9	NS
ACE	112	62.6	158	70.2	NS
Beta-blocker	84	46.9	126	56.0	NS
ARB	25	14.0	20	8.9	NS

### 3.5 Clinic intervention

Of the 404 HF patients with baseline data collected, 131 had a clinic intervention by the HF service (seen a cardiologist and nurse specialist at a local HF clinic) in their area. A total of 13 clinics have been held, six in Te Kuiti and seven in Tokoroa. There has been almost 100% attendance at the clinics with only five patients not attending their appointment, of whom two attended at a subsequent clinic and/or were followed up by a nurse. Twenty two individuals have been seen in clinic by the service more than once during the year.

Of those assessed, 53% were males and 40% were Maori (Table 8) which differed slightly from the total baseline Maori population studied of 30% (Table 1). The median age of those assessed in clinic was 74 years (38 to 94 years) which is similar to the overall study population median age. The median weight was 83 kg which was slightly less than overall weight (90kg).

Table 8: Characteristics, risk factors, co-morbidities and HF investigations (at diagnosis) at clinic intervention, overall and by ethnicity

Variables	Overall n = 131		Non Maori n = 81 (62%)		Maori n =50 (38%)		P- value
	n	%	n	%	n	%	
Te Kuiti	61	46.6	33	40.7	28	54.9	
Tokoroa	70	53.4	48	59.3	22	45.1	NS
Pacific	6	4.5					
European	71	53.8					
Asian	0	0.0					
Other	3	2.2					
Age (median)	74	(38-94)	77.9	(37.8-94.0)	66.7	(40.1-87.2)	<0.001
Females	62	47	39	48.1	23	46.0	NS
Risk factors and Co morbidities							
Smoker	18	13.8	10	12.7	8	16.0	NS
Ex-smoker	68	52.4	43	54.5	25	50.0	NS
Hypertension	90	68.1	55	67.9	34	68.0	NS
Hypercholesterolaemia	67	50.8	42	51.8	24	48.0	NS
Diabetes (Type2)	44	33.3	28	34.6	16	32.0	NS
Ischaemic Heart Disease	32	24.4	19	23.4	13	26.0	NS
COPD	35	26.5	23	28.4	12	24.0	NS
ESRF	10	7.5	6	7.4	4	8.0	NS
IHD	33	25	19	23.5	13	26.0	NS
Symptoms							
Ankle oedema	50	37.9	29	35.8	20	40.0	NS
Crepitations	24	18.1	14	17.5	8	16.0	NS
Raised JVP	10	7.5	5	6.2	7	14.0	NS
Palpitations	21	15.9	11	13.6	10	20.0	NS
Investigations							
BNP at diagnosis	48	36.4	34	38.3	13	26.0	0.06
Echo at diagnosis	47	35.6	31	38.3	16	32.0	NS

At their clinic intervention, approximately 40% of patients were assessed as having ankle oedema, 20% crepitations, 15% were complaining of palpitations and 10% had a raised jugular venous pressure (JVP) (Table 8). Almost 70% of patients were hypertensive and 50% had hypercholesterolemia; other co- morbidities included 30% with type 2 diabetes, 20% with angina, 25% with COPD, and 25% with ischaemic heart disease. Approximately 10% had end stage renal failure; one case was on dialysis. In comparison to overall baseline information there were more patients with diabetes and COPD and slightly less with angina

and ESRF. Only 35% of patients assessed had an Echo at the time of their original diagnosis of HF and a similar proportion a BNP.

Seventy-six patients at intervention had the cause of their HF recorded (Table 9). Approximately 25% of HF diagnoses were categorised as cardiomyopathy, 30% hypertensive, 20% ischaemic and 8% valvular.

Table 9: Causes of HF of study population who had a clinic intervention, overall and by ethnicity

Cause of HF	Overall		Non Maori		Maori	
	n	%	n	%	n	%
Cardiomyopathy	12	15.8	10	22.7	2	6.3
Cardiomyopathy /hypertensive	7	9.2	4	9.1	3	9.4
Diastolic	1	1.3		0.0	1	3.1
Hypertensive	24	31.6	16	36.4	8	25.0
Ischaemic	14	18.4	8	18.2	6	18.8
Ischaemic/Hypertensive	5	6.6		0.0	5	15.6
Valvular	6	7.9	3	6.8	3	9.4
Other	7	9.2	3	6.8	4	12.5

One hundred and twenty six patients (96%) had an echo assessment at clinic. Of these 45% had a moderately or severely dilated left ventricle and 45% had left ventricular hypertrophy. Approximately 15% had severe valve disease, half of which was severe tricuspid regurgitation. Almost 45% had an element of diastolic dysfunction. Approximately 45% of patients had an ejection fraction (EF) greater than 60; and approximately 45% had an EF less than 45. A larger proportion of non Maori patients (20%) had an EF less than 40 than Maori (6%).

Table 10: Clinic intervention: echocardiography values, overall and by ethnicity

Echo values	Overall n = 126		Non Maori n = 77		Maori n = 49		p-value
	n	%	n	%	n	%	
Ejection fraction							
> 60	60	47.6	37	48.1	23	46.9	NS
51-60	13	10.3	6	7.8	7	14.3	
41-50	26	20.6	18	23.4	8	16.3	
31-40	15	11.9	7	11.8	8	16.3	
21-30	9	7.1	8	10.4	1	2.0	
<21	3	2.4	1	1.3	2	4.1	
Dilated left ventricle	36	28.6	26	33.8	11	22.4	NS
Left ventricular hypertrophy	37	29.4	21	27.3	19	38.8	NS
Severe valve disease	16	12.7	12	15.6	7	14.3	NS
Diastolic dysfunction	58	46.0	34	44.2	24	50.0	NS

Fifty five percent of patients were in sinus rhythm and 42% in AF (Table 11). For those patients who were categorised by NYHA, 25% had no symptoms of HF, approximately 30% were categorised as I and II and 22% either III or IV.

Table 11: Prescribed HF medications prior to clinic intervention; heart rhythm and NYHA classification at clinic intervention, for intervention population, overall and by ethnicity

Variables	Overall n = 131		Non Maori n = 81		Maori n = 50		p-value
	n	%	n	%	n	%	
Medications							
ACE	93	70.5	56	69.1	37	72.5	NS
Beta-blocker	76	57.6	45	55.6	31	60.8	NS
Diuretic	122	92.4	78	96.3	44	86.3	NS
Aldosterone antagonist	18	13.6	12	14.8	6	11.8	NS
ARB	22	16.7	14	17.3	8	15.7	NS
Heart rhythm							
AF	55	41.7	36	46.2	19	38.0	NS
Sinus	73	55.3	42	53.8	31	62.0	NS
NYHA Classification							
N	25	21.4	15	21.1	10	21.7	NS
I	33	28.2	21	29.6	12	26.1	NS
II	33	28.2	17	23.9	16	34.8	NS
III	24	20.5	17	23.9	7	15.2	NS
IV	2	1.7	1	1.4	1	2.2	NS

Overall 92% of patients assessed were prescribed a diuretic, 14% an aldosterone antagonist, 71% an ACE, 17% an ARB and 58% on a beta-blocker (Table 11). Eighty-eight percent of patients had their HF medications optimised by the service on intervention. This included approximately 26 patients who had their diuretic dose altered, 19 had their ACE dosage altered and 14 had their beta-blocker dose altered.

Clinic data was analysed further by ethnicity (Table 8-11). There were several differences observed, in particular, more Non-Maori compared to Maori at intervention were in AF (46% vs 38%), and had a dilated left ventricle (33% vs 29%), but this was reversed for left ventricular hypertrophy (40% vs 52.8%). There were slightly more Non-Maori than Maori categorised as NYHA III or IV (25% vs 17%).

### **3.6 Not HF diagnosis**

A quarter of patients assessed in clinic were found not to have HF. This did not differ by location. Those who did not have HF were more likely to be female (60% vs 42.9%) (Table 12) and their median weight was significantly less; a median of 67kg for non HF to 84 kg for those with a HF diagnosis. Approximately 20% more HF patients smoked compared to non-HF patients of whom only 3% were a current smoker.

The use of diagnostics for diagnosis differed with only 25% of non HF having had an Echo at diagnosis compared to 40% of those with HF and only 30% having a BNP test compared to 38%.

Not HF patients had similar proportions of co-morbidities compared to those with HF except for COPD. Almost a third of non HF patients had COPD compared with 22% of those with HF. Slightly more of those without HF had AF (53% vs 37.8%).

Significantly at intervention, 70% of HF patients had their medications altered or added to compared with only 40% of those with a not HF diagnosis. There was slight difference in medications with 16% of those with HF on an aldosterone compared to 6% of non HF.

Table 12: Characteristics, risk factors, co-morbidities; and HF investigations and prescribed medications prior to intervention; for population who had a clinic intervention, by HF diagnosis (made at intervention)

Variables	HF		Not HF		p-value
	n	% (range)	n	% (range)	
<b>Characteristics</b>					
Te Kuiti	46	75.5	15	24.5	NS
Tokoroa	52	75.0	18	25.0	
Non Maori	61	62.2	20	66	NS
Maori	37	37.8	14	44	
Pacific	5	5.1	1	3	
European	52	53.1	19	53	
Asian	0	0.0	0	0.0	
Other	3	3.1	0	0.0	
Females	42	42.9	20	59	0.07
Age (median)	74	38-94	73	41-88	NS
weight (kg)	84	43-161	67	94-166	
<b>Risk factor and co-morbidities</b>					
smoker	17	17.3	1	3	0.05
ex smoker	45	45.9	23	69.7	0.003
HT	68	69.4	22	65	NS
Diabetes (Type2)	33	33.7	11	32	NS
AF	37	37.8	18	53	0.03
Angina	17	17.3	5	15	NS
COPD	22	22.4	13	38	0.025
<b>Investigations</b>					
Echo at diagnosis	39	39.8	8	24	NS
BNP at diagnosis	38	38.8	10	29	NS
<b>Medications</b>					
ACE	68	69.4	25	74	NS
Beta-blocker	54	55.1	21	62	NS
Diuretic	88	89.8	34	100	NS
Aldosterone antagonist	16	16.3	2	6	NS
ARB	15	15.3	6	18	NS

Echo findings at intervention varied considerably between the two groups (Table 13). Approximately 70% of those without HF had an EF greater than 60 and all had an EF greater than 40. In comparison, 36% of those with HF had an EF greater than 60 and 26% had an EF less than 40. Only one patient without HF had a dilated LV compared to more than a third of those with HF. Fifteen percent of those with HF had severe valve disease compared to none of those not HF. Significantly 40% and 30% of patients had some diastolic dysfunction observed at Echo. Approximately 30% of both groups had some LVH observed at Echo. Of

those patients who had their symptoms classified using the NYHA classification (I - IV), the majority of those without HF had none or very mild symptoms. Over half of those with HF were classified as II or above and 25% as III or IV. Only two patients of those assessed were classified as NYHA IV.

Table 13: Heart rhythm, echocardiography values at clinic and NYHA classification of population who had a clinic intervention by HF diagnosis

Variable	HF		Not HF		p value
	n	%	n	%	
<b>Heart rhythm</b>					
AF	37	37.8	18	54.5	0.001
Sinus paced	57	59.2	14	42.4	
	3	3.1	1	3	
<b>Echo values</b>					
<b>Ejection Fraction</b>					
>60	36	36.7	24	71	<0.001
51-60	10	10.2	3	9	
41-50	21	21.4	5	15	
31-40	15	15.3	0	0.0	
21-30	9	9.1	0	0.0	
<=20	3	3.0	0	0.0	
LV	35	35.7	1	3	<0.001
LVH	29	29.6	8	24	NS
severe valve disease	15	15.3	0	0	
diastolic	44	44.9	13	38	NS
<b>NYHA classification</b>					
N	9	9.1	16	16.3	<0.001
I	23	23.5	10	30.3	
II	30	30.6	1	3.0	
III	22	22.5	2	6.1	
IV	2	2.0	0	0.0	

### 3.7 Baseline and clinic intervention

Patients who had a clinic intervention were slightly younger and weighed slightly less than the overall baseline assessment. The proportions of patients with co-morbidities were similar in both groups, apart from slightly greater proportion of patients with COPD at intervention compared to baseline. There was a slightly greater proportion of Maori seen at intervention compared to baseline (30 vs 38%). Those chosen for an intervention were thought to have more severe HF or their diagnosis was not clear.

At intervention, a significant improvement was observed in the use of investigations for diagnosis of HF from baseline. The number of patients who had an echo-cardiography improved from 30% to 96% ( $p<0.001$ ) and who had a BNP test improved from 27% to 70% ( $p<0.001$ ).

Overall approximately 60% of patients at intervention had prescribed HF medications altered or started (Table 14). Approximately 15% of patients had their prescribed beta blocker altered; 20% (4) had one started and 74% had it increased. Only one patient had their beta blocker decreased. 1 in 5 patients at intervention had their ACE dose altered. Twenty percent had an ACE started and 70% had their already prescribed ACE increase, one patient had their ACE stopped. Other medications altered included 12% of patients for a diuretic; two patients had it started and 10 had an increase, three had the dose decreased and two had it stopped. Less than 10% had either an ARB or angiotensin altered; five had their ARB increased and two had an AI started. Two patients had their ARB stopped. Thus there was not a significant difference in the number of patients after intervention on HF medications part from ACE and beta blocker, but many had their dosage optimised.

At intervention 30% of patients had other investigations ordered to improve or add to their diagnosis, these included spirometry, holter monitoring, and exercise tolerance testing. Approximately 10% of patients at intervention were sent or referred onto the hospital for further procedures including angiography, cardiac catheterisations, ICD implantation and valve replacement. There were significant difference between changes in medication and further testing between those with a HF diagnosis and those not HF.

Table 14: Changes to prescribed medication at intervention and other investigations requested, overall and by HF diagnosis

Variables	Overall n = 131		HF n = 98		Not HF n = 33		p-value
	n	%	n	%	n	%	
Medications altered							
Overall	83	63.4	70	71.4	13	39.4	<0.001
Beta-blocker	19	14.5	17	17.3	2	6.1	
ACE	25	19.1	24	24.5	1	3.0	<0.001
ARB	5	3.8	5	5.1		0.0	
Angiotensin inhibitor	9	6.9	7	7.1	2	6.1	NS
Diuretic	16	12.2	15	15.3	1	3.0	NS
Other investigations	39	29.8	30	30.6	9	27.3	NS
Other heart medications altered							
Statin	11	8.4	11	11.2		0.0	
Digoxin	7	5.3	6	6.1	1	3.0	
Warfarin	5	3.8	5	5.1		0.0	
Other procedures	13	9.9	11	11.2	2	6.1	NS

### 3.8 Other service interventions

Overall 279 patients with HF have interacted with the service. One hundred and thirty one had a clinic intervention) and 157 have been assessed by a HF nurse in discussion with the cardiologist. Of these 121 (43.4%) had HF and needed continuing input from the service; 14% had HF but did not need further input at the time; 13.3% are already seen by another cardiologist for their HF, and at least 50 patients did not have HF. Of the 108 patients who required further input from the nurses, 80% had approximately 10 hours or less time interaction, 17% had between 10 and 20 hours and 3.7% had over 20 hours.

### **3.9 Qualitative process evaluation**

#### **3.9.1 Interviews with key personnel**

Semi-structured interviews were conducted with key personnel from cardiology – management, nursing and medicine – as well as with specialist HF nurses, personnel from Tokoroa and Te Kuiti and a specialist nurse from Waikato District Health Board who works in the community. In total, eight face-to-face interviews were conducted and one group interview. The interview schedule related to development, initiation and implementation of the service. The following key themes were identified from the interviews regarding the first year of service.

#### **Management**

During the setting up of the service, there was a change in management structure at Waikato Hospital which impacted considerably on the cardiology service. Managers that were initially involved with the service evolution left and for a period of time there was no one available to manage the service and address any issues associated with its setting up. This was a significant risk that the service had to manage and led to a number of issues which are discussed in other topics, in particular organisation of nursing resources and clinics. In fact, the overall management of the service was left to either clinical staff or finally acting management who were not dealing with the cardiology management issues in general.

#### **Administration**

Administration was required for day-to-day running of the service which included booking clinics, appointment letters and feedback to GPs. Although, an administration role was identified as a significant part of the setting up and evaluation of a new service, no funding was made available. This was further hampered by the Waikato DHB freeze on administration positions, thus the Principal Investigator, with clerical support funded from the HRC study, had to carry out a significant number of administrative roles including clinic letters, clinic bookings and initially dealing with the day-to-day running of the service and management issues. The situation was not ideal as neither had insight into the workings of the cardiology department, clinic set up or management roles. This was addressed slowly throughout the

year, as tasks were passed to relevant clinic staff in each locality and systems were identified. However, this has once again become an issue with the day-to-day management and evaluation of the service as it extends into new locations and continues to be evaluated long term.

### Clinic structure and process

Several issues were raised regarding the clinic set-up. It is difficult to establish a clinic without significant lead in time at both hospitals. This issue would have been better addressed earlier if management were available with an understanding of the constraints. The majority of outpatients clinics that are currently booked at each hospital have been in place for many years. These clinics are planned and staffed on a rota developed well in advance. The implement of the Integrated HF service was fortunately able to commence due to clinic space being made available but processes regarding the availability of clinic staff and equipment were less forthcoming. As there was no extra staff allocation for clinics, both specialist nurses were required to run the clinics including carrying out general investigations such as ECGs, weights and heights; thus, were not able to benefit from being present alongside the cardiologist during examination and management of the patients. This was significant as the examination and management of patients with the aid of medical staff was an important part of their training and would, with experience and confidence, enable a move to nurse-led clinics.

A sono-grapher was available to perform echos at clinic and also ran a one day clinic prior to clinic days to enable more patients to have a current assessment prior to being seen by the cardiologist. Access to timely echocardiography alongside the clinical work worked extremely well in providing timely echo without delay. However, this added another dimension to an already overstretched workload for the specialist nurses who were running the clinics.

### Cardiologist position

The employment of the funded cardiologist position for the service was not recruited to until at least four months into the project. While patient management and clinics were more than

adequately provided by other cardiologists involved with setting up the service, they were all particular busy with their own roles and this was added to with the lack of management support, leading to less time to support the specialist nurses in their new role and in this new service as they required.

From the nurses' perspective, there appeared to be a lack of understanding of the nurse's role by other (non service) cardiologists. Support was provided from other nursing and from a population health perspective. Thus adding to lost opportunities in enabling nurses to be trained as discussed above. However once the cardiologist was recruited the situation was much improved.

### Communication-Service

Referrals to the service are a topic that was frequently discussed as a potential issue for the future. Although the service had provided information to all providers and ward users, there continues to be a certain number of individuals who are not aware of it or are aware of it yet do not use it. Internal referral forms from hospital to community were initially used but were not recognised by the community services referral centre, as they did not fit under their usual structures of public health, district nursing, etc. Likewise, GPs could not refer via the Centralised Referrals Centre using their MedTech computerised systems as the service was not based in the hospital. Therefore, referrals had to be sent directly to the specialist nurses. The system requires streamlining and brought into line with the other referral systems especially as it expands into other areas.

There appears to be a lack of understanding of nursing roles sometimes by other nurses, in particular where linkages are required between wards and community. However the linkage to other providers in the community is working well.

### Communication –Patients

Communication to GPs and patients regarding the service and their management appeared to be working well. Issues were highlighted early on and then dealt with, for example, it was noted that if a patient required further tests that clinic letters describing these to the GP were taking over a week and thus nothing was happening until the letter arrived. The nurse

discusses any intervention with the patient's GP regarding issues, follow-up etc that were identified in clinic. Nurses were able to spend a significant amount of time with patients regarding their HF diagnosis and continued management. This was viewed as a significant addition to the service.

### Other issues

Commonly when patients are seen in clinic there may be a number of other tests that are required to be carried out to clarify their diagnosis including spirometry or 24-hour holter monitoring. Patients requiring these test may be expected to then travel to Waikato Hospital, at least an hour away, for what generally take little time. The service has tried and in part has been successful in enabling the two rural hospitals to provide these services such limiting the travel and inconvenience for the patient and allowing a faster turn round in test and thus a more timely diagnosis. Spirometry is now available at both hospitals but there are restrictions on this service at Tokoroa where they require a set amount of patients (12) before spirometry will be performed. In addition, 24-hour holter monitoring remains unavailable.

The specialist nurses lacked experience in their new role which initially led to more medical input from cardiologists. The service had moved away from the initial idea of nurse-led clinics but is beginning to move back to more nurse-initiated clinics and interactions with less involvement from the cardiologist.

Overall interviewees were positive regarding the service and the progress that it has made over the first year in the investigation and management of HF for the patient. It was stressed that although there were teething issues with the process that the patient has received an excellent service. It is the internal processes which require further work.

### 3.9.2 General practitioner survey

Overall 24 GP surveys were distributed by post of which four were excluded as they were sent to locum GPs who were no longer at the practices. Fourteen GPs responded to the survey; a response rate of 70%. Overall, 60% of GPs identified their location as Te Kuiti and 40% from Tokoroa; one GP did not provide a location. Sixty percent of responders were

male. All respondents were aware of the Integrated HF Service and 90% had referred into the service. Of the remaining 10%, one responder cited that “the nurses had been given a list of those coded with HF to the service” and another who had no personal experience of referring noted that some of their patients had been seen by the service.

The following results are based on 13 responders, as one had included only demographic data. Seventy percent of GPs noted marked improvement in their patient’s condition including their symptoms, access to services and self-management. The remainder (30%) reported no change, however no GPs reported worsening symptoms due to the service. Overall GPs identified good communication between the service and improved communication between themselves and the hospital (Table 15).

Table 15: GP responses to GP survey regarding the service, by score

Question	Excellent	Satisfactorily
Client/patient information from the Service was communicated	55%	46%.
Communication between GP and HF nurse	54%	38%.
Communication between GP and Health Waikato had improved as a result of the Service	31%	62%

The GPs were also asked about their views on the mobile echo service provided to their patients by the service. GPs were enthusiastic about access to echo and their comments included: Great; excellent; wonderful; essential and very valuable; useful; good; nice; fantastic; wonderful to have immediate access to diagnostic echo; great to have a speedy service – long time waiting for such a service; appropriate; long-felt need is fulfilled. Easy access, review by cardiologist, comfort for patients, excellent service that is far superior to that provided in the past.

Other comments regarding the service by the GP are listed below under positive and negative comments.

Positive:

- CHF. I think the service is a good idea and beneficial to all.
- Close communication, very useful for diagnosis of type of HF and treatment, a lot of fine tuning of treatment.

- Easy access to HF service. Follow up discussion is facilitated as there is a designated cardiologist
- I think it's good for the patients who can't make it to clinic and it helps monitor patient progress. A great resource. I have several patients benefitting from the programme.
- Nurse liaison communicates extremely well, explanation to patients regarding changes in diagnosis and treatment
- Much better care and management.
- The nurse uses the MedTech PMS to communicate with us. Integration with the HF service is good. The key to any of these integrated care projects is good communication and breaking down the barriers between primary and secondary care.

#### Negative

- Some people are "stuck in their ways".
- No change yet but it is early days.
- The fax reports from the nurse's follow-up can be hard to read
- No change noticed depends on whether patients have been consulted - may not if they are stable.
- The service has not impacted on my practice to any great degree and has not really affected my treatment regimes. However, this depends entirely on my memory and not on any formal audit

#### 3.9.3 Patient Satisfaction Survey

Overall, 52 of the self completed satisfaction surveys sent to patients of the service were returned completed; a 60% response rate. One questionnaire was “returned to sender”, one individual phoned to say they did not have HF and another phoned to say they could not remember attending a clinic. Not all respondents answered every question and results will be based on total respondents, i.e. out of 52.

The median age of the respondents was 72 years (range: 41 – 89 years). Approximately 40% of respondents were female and 44% were male; 16% were left blank. The majority of the respondents with ethnicity data 58% were of European ethnicity, with 22% Māori and 6%

‘Other ethnicity’. Of the 42 who provided information on location, there were equal numbers from both areas.

Approximately 90% of respondents liked having a clinic locally and a similar proportion thought that the clinic staff were considerate. Nearly 80% thought their cultural needs were met by the clinic and a similar number felt the clinic met their health needs.

Approximately 85% of respondents rated the service as good when they were asked on their thoughts on whether the Cardiologists listened to them, took enough time with them, explained to them what they needed to know and gave useful advice and treatment. Nurses were rated similarly on their interaction with the respondents in clinic. Approximately 70% rated the echo service as good and 13% (7/52) as okay.

Approximately 40% thought their heart condition had improved in the past year and 50% reported that their heart condition stayed the same. Only four respondents felt their heart condition had got much worse. Thirty percent reported doing a lot more since attending the HF clinic, while 8% felt they could do far less.

Before attending the service, 71% of respondents reported knowing what medication they were on while 67% knew to check their legs for swelling (Table 16). Approximately 35% of respondents felt that they already knew a lot about their condition. Since attending the service, 80% took note of their breathing pattern, an increase of 10% and 70% weighed themselves regularly, an increase of 36%.

Table 16: Patient responses to questions regarding changes observed after service intervention

	Before %	After %	% Change
Know medications	71	81	+10
Weigh regularly	44	73	+36
Check legs for swelling	67	81	+14
Take note of breathing	58	69	+2
Do none of the above	12	2	-9.5
Know much about HF	35	46	+11

Forty-six percent of respondents thought they already had a healthy lifestyle, while 42% reported that the nurse had motivated them to make healthy lifestyle changes. Approximately half stated that the nurse had helped with other problematic health issues.

Approximately 90% said they were happy for the nurse to visit them at home; only 6% indicated that they would prefer to attend a clinic at the hospital or at their GP surgery. Nurse communication with respondents included: telephone contact 67% and follow-up hospital appointment 48%. A further 13% (7/52) had no further contact since the clinic appointment.

Approximately 60% of respondents stated that their attendance at the clinic had been of benefit to their families while 20% thought it had not been. Sixty-six percent felt that their attendance at hospital for HF had been reduced or there had been no change. No respondents indicated that they were attending hospital more often due to their HF.

The majority of respondents (43%) had been seen by the HF service for a period of between six to 12 months and 35% between 3-6 months. Fifteen percent had attended for less than three months.

Other comments regarding the service from patients are shown below.

#### Positive

- Since having this service in Te Kuiti I don't have to rely on family members to get me to Hamilton for checkups, which is great.
- I have learned more about HF problems
- Nurse always very helpful. Very helpful having clinics in Te Kuiti. Too tiring to travel and spend most of a day at Waikato.
- Contact with nurse is very good
- Keep up the service. I'm sure I'm not the only one in need. Regular monitoring keeps the person focused. Thanks for coming to my aid.
- Very helpful. Still having breathing spasms and legs swelling
- Weight loss has been going great up to 2010/2011 (30kg).
- Nurse has done a lot for me this part year and I appreciate that very much, Thank you.
- I'm satisfied treatment I've received since my heart operation.

- I think it is just wonderful that we have this Service available and I know others in the community who do too.
- Awesome. Happy
- I am very happy with the service. 1st class.
- I was most impressed with the service and pleased someone was monitoring my condition. It was very reassuring.
- The nurse is very considerate. Listens to what I say and answers questions so I understand. Have been sent more information about how to help myself.
- The nurse is very knowledgeable and clear at explaining why I take tablets and what side effects I need to be aware of.
- It only been 6 months but there has been a big difference in my well being. My medication has been very helpful. It's very good when taking medication but does not seem to be getting me better.
- Nurse keeps in contact with me regularly. Having all the info I need about my condition has helped greatly.
- She's very good. She worries when I'm not too well. She contacts other specialists on my behalf for information, etc. They seem to be on top of the problems and I'm feeling pretty so far.
- Since initial two contacts have not been asked to attend clinic. I feel that my contact with the service has been positive - there has been a change to my medication regarding swelling in legs and an increase in dosage was recommended. I weigh myself each morning and keep a record of results - in fact we invested in a new weighing machine!
- Great service
- Very satisfied with service, thank you.
- The HF service has been very helpful to me. They are fantastic.
- Nurse is persistent
- Thank you for taking the time for working with me.

#### Negative

- I dislike the terminology "HF Service" it is intimidation, would prefer something like "Cardiac Support"!! Appreciate that there is such a service available.

- Waste of time. Was regular then told I need to lose 50kg and that was that. No word since.
- Nurse has not got back to me. Perhaps a follow-up phone call from the HF Nurse.
- They were alright but I suppose it's all up to me to keep up with exercises. To try and bring my weight down I think will be helpful.

### 3.10 Education opportunities

The service has provided education and training to a large number of individuals and groups over the year (Box 1)). These sessions vary in content and level of education, but highlight the increased level knowledge of HF that now exists within the two small communities of Te Kuiti and Tokoroa.

Box 1: Groups in both areas who have had HF education provided to them.

- 60 plus group -smoking cessation week,
- community group -registered nurses Te Kuiti hospital ward
- practice nurses Te Kuiti Medical Centre
- Health & Welfare group Te Kuiti
- Aged care facility staff
- One to one talks re role and service
- DSM nurse, -Community corridor staff, DN,PHNs, Pop health, Social workers, Kaitiaki, Dietician
- RNs aged care-sleep clinic-palliative care-diabetic nurse Spec
- GPs 2 practices Te Kuiti-Laboratory staff
- Nurse educator Te Kuiti Hospital-Community worker Maniapoto Marae pact trust
- Te Ngaru O Maniapoto Health Services
- Community House-Work and Income-Hospice
- HF in-service to Cardrona rest home nursing staff and caregivers
- Facilitated HF study day for ward staff and community nurses June 8th,
- HF In-service to ward staff at handover
- Facilitation of monthly HF education sessions with Raukawa outreach nurse and health worker, South Waikato Pacific Island Health Committee nurse and health worker and diabetes CNS to discuss HF management strategies, follow up and case studies
- Have attended 2 education sessions at Raukawa, Education sessions at SWPIHC to their client base. Two further sessions planned. And will incorporate cardiac rehab nurses into future sessions.
- Planned attendance at SWPIHC health promotion day planned for November
- One on one HF education to patients, families in hospital and at home visits, phone follow up.
- HF education to practice nurses with encouragement to give known and new HF patients the HF book

### 3.11 Summary of results

The overall service was evaluated against a set of indicators to assess whether it had met its aims and objectives. All indicators have been addressed in the results section. The indicators are listed below with a statement as to whether they were met.

Table 17: Performance of the service against key indicators

Indicator	Outcome	Improved from baseline
Numbers with an appropriate diagnosis of HF	Met	Yes
Numbers of those with an echo for diagnosis	Met	Yes
Will be assessed further (using new patients)	Met	Yes
numbers and appropriate use of BNP	Met	Yes
Improve the time from referral to diagnosis HF	Met	Yes
The numbers with HF on appropriate medication	Met	Yes
Improved access to cardiologist and service for primary care	Met	Yes
Improved communication between hospital and primary care for a discharged patient	Met	Yes
Improved follow up in primary care for a discharged patient	Met	Yes
Improved experience of HF for the patient and their whanau, the GP and community providers, and hospital-based staff using gathered qualitative based data.	Met	Yes

The service has met all its aims and objectives and all indicators of the service have significantly improved from base line

## **4 Discussion**

The Waikato integrated HF service was acceptable and was successful in improving the diagnosis and management of HF in two rural high need communities. The study improved the use of and access to diagnostics including echo and improved the pharmacological management of patients. The service was seen as useful and a success by GPs and practitioners.

### **4.1 HF in Waikato**

The median age at which patients in Waikato rural areas of Te Kuiti and Tokoroa were diagnosed with HF was 66 years, which is younger than in other similar studies assessing integrated HF management<sup>11,12,13</sup>. There were equal proportions of male to female, which is similar to a Scottish study<sup>14</sup> but differs from a UK study with had slightly greater proportion of males<sup>15</sup>. Approximately 55% of patients were European and a third were Maori. The median weight of HF patients at collection of baseline data was 90kg; BMI 33 with an obesity prevalence of 35%. This is significantly greater than a corresponding similar aged Waikato population<sup>16</sup> reported in 'The New Zealand Health Survey' with an estimated BMI of 28.9; and a obesity prevalence of 29.3%.

The overall crude prevalence of HF in those aged over 60 years in the communities studied was 15.0%; a crude total population prevalence of 2.0%. This is greater than<sup>14 17 18</sup> that observed in other primary care prevalence studies, however it is less than a recent rural urban Australian study<sup>19</sup>. The crude HF prevalence (60 years and over) for Te Kuiti was 19.6% and for Tokoroa was 8.9%.

HF patients have a range of other co-morbidities. Almost 40% of the population studied had diabetes, 70% had COPD, 70% were hypertensive and 20% had a previous MI. Similar proportions have been observed in other studies<sup>12 14</sup>.

## **4.2 HF management interventions**

There is clear evidence that management interventions improve outcomes for those with HF<sup>8</sup> and such models are recommended in most national guidelines for HF management<sup>8 9 10</sup>. Such models are also cost effective<sup>20</sup>. In particular nurse-led services compare more favourably than a normal hospital based setting<sup>13 21-23</sup>.

This quality improvement study has shown that the adapted HF management intervention model for rural Waikato has led to improvement in the investigation and management of HF patients. The study did not focus on what aspect of such a model works but it recognised that the model as a whole can improve the management of care for patients. The model included many of the recommendations made in the recent New Zealand guideline for HF<sup>8</sup>. The Waikato model focussed on comprehensive education to patients and other health professionals, the involvement of the patients, and on patients self management. There was attention given to compliance and optimisation of medication and there was a structured pathway for follow-up shared between primary and secondary care. The HF specialist nurse had a key role in the management. The Waikato model also included access to a mobile echo locally, as part of the service.

Patients and GPs in rural areas have been identified as being less able to access appropriate HF management programmes as these are commonly set up around an urban hospital setting base<sup>19 24</sup>. The Waikato study focus was the rural community setting with significant home-based interventions supported by a cardiology-led outpatients clinic held in the areas under study.

## **4.3 Areas**

In general the Waikato areas of Te Kuiti and Tokoroa have a greater proportion of their population living in areas with of high deprivation based on NZ Deprivation scores<sup>25</sup>, have a higher prevalence of CVD risk factors<sup>5</sup> (e.g smoking<sup>26</sup>) and have higher proportion of Maori residents when compared to urban centres such as Hamilton and to Waikato overall<sup>25</sup>.

There were some differences in characteristics observed between the two HF populations studied. Te Kuiti has a greater crude prevalence of primary care diagnosed HF of 19.6% in those aged 60 years and over, which is high in comparison to other estimated primary care prevalence as already discussed. It corresponds more with rural areas of Australia<sup>19</sup>. It is unclear why there is a difference. Several possible reasons include: patients in Tokoroa may access GP services less and therefore are not diagnosed, or that the prevalence of risk factors for HF may be greater in Te Kuiti. This requires further investigation. Patients in Te Kuiti may be more likely to be diagnosed with HF however this is not backed up by data from this study regarding use of investigations although Tokoroa GPs tended to perhaps use echo more in their diagnosis. Interestingly there was no difference observed in the proportion of the population who had a clinic intervention and were found not to have HF diagnosis by area.

#### **4.4 Medications**

New Zealand and other national HF guidelines<sup>8 9,10</sup> recommend pharmacotherapy for patients with HF. In this study 60% of patients were prescribed an ACE similar to other studies<sup>14</sup>, but only 50% were prescribed a beta blocker which is lower than that observed in a hospital setting<sup>27</sup> (69%). Approximately 11% of patients were prescribed an angiotensin receptor blocker (ARB) which is a greater proportion than those previously studied<sup>28</sup> (hospital based) .

The effectiveness of ACE and beta blockers in improving symptoms and prognosis of HF has been demonstrated<sup>14</sup>. Their use is recommended in a range of national guidelines<sup>8 9 10</sup> for the appropriate management of HF and these medications can be prescribed and managed in primary care. However, there are studies that suggested that many patients in primary and secondary care<sup>14 27 29</sup> do not receive agents or receive sub-optimal doses. Guidelines recommend that ACE should be used in appropriate doses in all patients with HF due to LV systolic dysfunction (LVEF<45%)<sup>8</sup>. In this Waikato study, the proportion of patients seen at clinic

(intervention) who were prescribed an ACE increased slightly to 69%. For those patients with an EF less than 50, 73% were prescribed an ACE.

The guidelines recommend that beta-blockers should be considered for all patients with a HF diagnosis due to systolic dysfunction<sup>8</sup>. In total, 50% of study HF patients were prescribed a beta-blocker which was slightly more than a recent similar study<sup>14</sup>. There may be many reasons why HF medications are not optimally diagnosed, including contraindications to the drugs which was not assessed in the study, concerns of side effects, focus on relief of symptoms (may account for high diuretic use) and clinicians being less informed regarding long term prognosis and prescribing. Recent NZ guidelines<sup>8</sup> state that beta blockers are contra indicated in asthma, heart block and symptomatic hypotension. Recent UK guidelines<sup>9</sup> state that beta blockers can be used on patients with COPD without reversibility, a recent addition. Significantly, 55% of study patients without a diagnosis of COPD were prescribed beta-blockers compared to 33% of those with COPD. This may suggest that the lack of beta blocker prescribing may not be due to contraindications, but is difficult to ascertain in the study

However it was significant that slightly less proportion of HF medications were prescribed to those who were found not to have HF than those that did. In addition, over 70% of those with HF had their HF medication changed, perhaps suggesting non-optimal use of medications. Over 70 patients after intervention had their HF optimised and approximately 10% had new HF medication started; a significant improvement from baseline assessment. There are still considerable opportunities for the service to continue to work with primary care and HF patients to optimise medications.

#### **4.5 Investigations**

Almost 70% of patients studied did not have a BNP test carried out in order to confirm their diagnosis. Incidentally the proportion of baseline patients who had a BNP test increased to 50% when only those diagnosed in the last six years (post 2005) were analysed when BNP became more widely available. Other studies have

identified that the clinical use of BNP is still not widespread within primary care setting<sup>30</sup>. At intervention there was also a considerable increase in the use of BNP to 50% thus the service improved the use of an appropriate investigation for the diagnosis of HF.

It is hoped that with the continued presence of the service and education and communication with GPs that the use of BNP, as a first line in the diagnosis of HF, within the rural communities of Waikato will increase. Recent HF management guidelines<sup>8 9 10</sup> recommend that patients require a BNP, as it assists in the diagnosis of patients presenting with suspected HF and is a useful test to aid clinical decision making. It is also relatively cheap (compared to an echo) and GPs have ready access to it. In HF management it is suggested that BNP may be used as an initial test to rule out HF. The use of BNP as an initial screening test in more rural areas where there is perhaps less access to echo should be encouraged. A recent meta-analysis<sup>31</sup> suggested that BNP should also be used to guide therapy in chronic HF, as it was found to reduce mortality in those aged under 75 years. The service will advise regarding guidelines and education towards this goal in primary care.

Only 30% of baseline patients had an echo investigation as part of their diagnosis. Although low, this is similar to that observed in other community studies<sup>32 14</sup>, but less than hospital based studies. A recent, yet to be published, study carried out at Waikato hospital<sup>27</sup> found that 77% of cases had an echo performed during their admission or arranged to occur post-discharge and a similar finding was observed by the New Zealand Registry<sup>28</sup> which reported that 80% of patients presenting with acute HF had an echo performed within six months. After intervention, this Waikato study observed that 96% of patients had an echo for investigation of their diagnosis. For those where HF cannot be ruled out by a BNP or other tests, it is recommended an echo is required to confirm the diagnosis<sup>8 9</sup>. Echo is a crucial part of the evaluation of HF. As the use of BNP aids in selection, but does not replace the need for echo. However, it was not surprising to observe the low use of echo in the patients studied. Local GPs have already raised the issue that access to echo in Waikato was very difficult with a considerable wait to be seen, and similar issues have been observed in other countries regarding primary care and HF management<sup>9 33 30 34</sup>. Thus many GPs had decided to forgo echo-cardiography in those where they thought the diagnosis was certain. Yet,

this study suggests that many of for many the diagnosis of HF is not certain and that the service via communication with GPs and improvement in access to echo has led to better use and will lead to better use of echo in newly diagnosed HF patients. It has been suggested that there should be more open access for GPs to echo<sup>8 33</sup>, however there are no randomised controlled trials (RCTs) to show that such provision alters the outcome. Yet 25% of the population studied who had an intervention which included an echo were found not to have HF. Improved access to echo should be considered in Waikato.

#### **4.6 Maori**

Interestingly Maori were commonly diagnosed with HF almost 10 years earlier than non-Maori. To the best of our knowledge, this is the first study to investigate an integrated HF programme's impact on HF in rural Maori. An Auckland RCT<sup>12</sup> found that an integrated HF service improved care, but their population included only a small percentage of Maori<sup>12</sup>. In this study, a third of the population studied were Maori and half of those who had a further clinical intervention were Maori.

It was encouraging to observe little difference between characteristics measured between Maori and non-Maori who access primary care. Medications prescribed and tests carried out were similar in either group. These findings were also observed in a recent hospital based study in the Waikato<sup>27</sup>. However, Maori were presenting earlier and appeared to have rates of HF severity similar to that of non-Maori who were presenting later. It is known that Maori, particular in rural areas, have higher rates of HF risk factors, including smoking, obesity, diabetes, and hypertension<sup>3 25 26</sup>, at younger ages and this may lead to an earlier presentation of HF. In Waikato, Maori have poorer HF outcomes with more hospital admissions and mortality<sup>5</sup>. HF is a disease of the elderly, in particular those over 65 years, however in Maori this does not appear to be the case, with one-third of Maori diagnosed with HF before they were 65 years old. Further work is required to continue to address and investigate inequalities for Maori with HF. In particular, to continue to examine more patient-centred community-based models of care for cardiovascular risk factors<sup>8 35</sup> which have been shown to work better than the more hospital-based approaches and can

show improvement in Maori and in those patients who may be more difficult to manage.

#### **4.7 Not HF diagnosis**

A quarter of the population who had an intervention were found not to have HF. Those not HF were more likely to be females, have COPD and be in atrial fibrillation. This stresses the essential use of echo for diagnosis. Most of these not HF diagnoses were based on clinical observations alone and their diagnosis was not confirmed with a timely echo.

Use of diagnostic tools including BNP and echo will help in these circumstances. It is recognised that the diagnosis and management of HF in primary care is increasingly complex<sup>33</sup>. The HF service can help in a more timely manner when the diagnosis is not straight forward and in particular where there may also be an element of COPD. In this study, COPD was present in approximately 30% of patients and is similar to what others have observed<sup>36</sup>. Monitoring of patients is essential and the recoding of those no longer with a HF diagnosis is important, especially if patients are on medication that is no longer required. Updated information regarding risk factors and medications is recommended in primary care, but it is recognised that this may be an additional burden to an already overwhelmed service.

#### **4.8 GP survey**

It was encouraging that 70% of GPs had seen a marked improvement in their patient's condition as a result of the service. One of the areas identified anecdotally in the past as an issue was communication between primary and secondary care. The GPs feedback ice suggests that the service's communication was generally excellent and overall satisfactory.

As already discussed, it was noted anecdotally prior to the service being introduced that although GPs were aware that echo was the definitive test, access to echo in

Waikato was difficult and a delay of many months. The GP feedback regarding the use of the mobile echo for their patients was excellent and was probably the most successful part of the service. Fortunately one of the roles of the new HF cardiologist is to manage the Waikato hospital echo process and this will in the future link more closely with the service and their processes.

Communication via letter to GPs had been identified as an area that requires rather work especially where blood tests or changes in medications were suggested for the GP to action swiftly; this has been discussed elsewhere<sup>32 30</sup>. Such an issue is common across all hospital services and should be addressed within a comprehensive Information Technology strategy. To improve timeliness from clinic appointment to communication with the GP, one Auckland study faxed the clinic letter to the patient's GP on the day of the clinic<sup>12</sup>. The service was able to overcome this as the nurses were able to directly discuss any action required with the relevant GPs in a timely manner. In addition, nurses were able to discuss with the patients regarding their diagnosis and aspects of their clinic visit and at a later date allowing patients to ask questions that they may not have considered at the time. Patients were able to be provided with a personalised management plan, and education regarding their condition which led to having much better knowledge regarding their HF and the medication that control it. In particular, an increasing number of patients were weighing themselves and had a better understanding of the rationale for doing so.

#### **4.9 Patient survey**

The survey found that patients were happy overall with the service and that their HF management had improved, as had their knowledge. This validates evidence that such programmes lead to better self-management in particular weight management and disease understanding<sup>8 37</sup>. Furthermore the service will look to carry out further research with patients to gain more in-depth knowledge regarding their HF management. Inpatient data will be also re-examined in the future to address whether the service has led to a decrease in HF hospital admissions, readmissions and length of stay. Such potential service outcomes were not examined any further than at

baseline in this report as many patients had received less than six months of the service intervention, however they will be evaluated in the future.

#### **4.10 Service**

The service's processes were expected to change over time. The evaluation examined these and identified strengths and weaknesses within the service. As the service expands these shall become more streamline and the database will also be altered to allow more simple collection and analysis of data. Forms have already been changed and this will be a continuing process. The nurses input to individual patients after intervention proved difficult to measure. Much of the data they collect is in a free text format and a form shall be developed with the nurses to assist in capturing their input more simply.

Setting up new services within a DHB setting is challenging. Collection of data and its analysis to justify the existence and continuation of such a service requires considerably more input from a variety of professionals than an already established service, but this tends not to be recognised and extra administration to carry out such work in already financially constrained environment is not forthcoming.

The issues raised regarding management have already been addressed somewhat by the service, but it was a considerable challenge in the initial months and was time consuming. Although there were clearly initial problems with the service infrastructure, it was apparent that this did not impact on the patients' management and thus is a great success for the service staff. Many of whom went above and beyond what was required to deliver a patient centred service.

It was certainly an advantage that the service and interventions were based within each of the communities. Access to cardiology clinics generally involves at least a three or four hour return trip and time can also be spent parking and waiting for appointments. A considerable financial burden for patients is attached to this. The service had minimal non-attendees and anecdotally several HF patients attending the service clinics had been serial non-attendees at Waikato Hospital in the past. With the

ability to offer other investigations such as spirometry and 24hr holter monitoring at the rural hospitals, this will only add to the patient-centred approach to HF management and other cardiovascular diseases in the future.

#### **4.11 Limitations of the study.**

Data collection regarding individuals was not easy. Initial baseline data was collected via primary care MedTech systems; a system used by most GP in Waikato. It was difficult to collect information from the system regarding HF. This has been identified as an issue elsewhere and that there can be marked discrepancies in chronic condition information from GP notes<sup>38</sup>. Information was available in several different fields, was often missing or not recorded. Further data regarding patients was accessed via computerised Waikato DHB hospital records. Individual hospital paper medical notes of baseline patients were not accessed as there was not the additional time or resources. However, these were available on individual patients at the clinic intervention. Echo investigation results were available from several different sources such as the GP notes, hospital system or requested from a separate system held in Cardiology.

The database used required several changes which should have been identified earlier to allow better recording and analysis of the data. This shall be addressed in the adaption of the database for future data collection for the service.

Due to the fact that the study was evaluating a newly operational service, the timelines for collection of data changed considerably. The data collection was carried out by the HF nursing staff who were also involved in the day-to-day management of the service and patients, and thus data collection was slower than had been expected leading to less clinical assessments (interventions) than was hoped. The study was not able to report back on outcomes such as hospital admission, readmission rates or their progress and continued risk factor management etc as many had not had sufficiently long service interaction. These will be collected and reported elsewhere.

During the study the collection of data regarding the nursing input was difficult. This had been captured generally in written form and there was not time or staff to transcribe this into a data format. However, information regarding hours etc was more readily accessible. In retrospect the service was perhaps a little over ambitious in its expectations to analyse all aspects of the service within the time and funding allocated. This information will be transcribed and be made available at a later date.

#### **4.12 Conclusions**

The study described the prevalence of community diagnosed HF in rural Waikato. It assessed the quality of diagnosis and the management of patients in a primary care/community setting. It was successful in achieving all initial indicators and the service was acceptable to patients, GPs and secondary care.

With the recruitment of two further nurses into the service and expansion of the service into the large rural areas of the Coromandel and North Waikato, lessons will be shared throughout the service to allow continued development and improvement in HF outcomes. The service will continue to liaise closely with GPs, in particular improving access to echo, encouraging the appropriate use of BNP, and will continue to provide education on the initial diagnosis and continued management in the community. The service will work to enable management of HF patients within primary care, using the specialist service to aid diagnosis and management of the more severe or more complicated patients and continue to work closely and improve communication. Quality indicators and outcomes will continued to be monitored particular in the two areas studied and will be reported in due course. Further research will be identified and carried out where appropriate to continue to improve the management of HF for Waikato.

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