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# Heart Failure Hospitalisations in the Hunter New England Area Over 10 years. A Changing Trend

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## Background

Heart failure carries a major burden on our health system, mainly related to the high rate of hospital admission. An understanding of the recent trends in heart failure hospitalisation is essential to the future allocation of health resources. Our aim is to analyse the temporal trends in heart failure hospitalisation.

## Methods

We extracted all separations in the Hunter New England Local Health District between 2005–2014 (n=40,119) with an ICD 10 code for heart failure (I-50) in the first four diagnoses on discharge. The numbers of hospitalisations were age-standardised to the 2001 Australian population and compared based on gender and remoteness.

## Results

There was a decline in the age-standardised hospitalisation. However, there was a clear inflection point between 2009–2010, after which the decline levelled off. The absolute number of hospitalisations increased between 2010 and 2014. Heart failure hospitalisation was higher in males compared to females and rural compared to metropolitan inhabitants.

## Conclusion

The gains in heart failure treatment noted in recent years seem to have come to an end. Patients aged 75 years and older are contributing the majority of age-standardised hospitalisations.

## Keywords

Heart Failure • Hospitalisation • Remoteness

## Introduction

Heart failure (HF) is a major health issue worldwide. It is estimated that more than 37.7 million people worldwide had symptomatic heart failure in 2010[1]. In Australia, HF was the second leading cause of cardiovascular hospitalisations in 2012–2013 and was responsible for 57,450 hospitalisations

as a principal diagnosis in 2012–2013[2]. The prevalence of HF in Australia is estimated to be between 1 and 2%, however, the prevalence differs by age, sex and remoteness[3]. The primary outcome of this observational study was to assess trends in heart failure admissions over 10 years and compare admission rates based on age, gender and remoteness.

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## Methods

We identified all hospitalisations with heart failure in the Hunter New England Local Health District (HNELHD) from 2005 to 2014. Records with an ICD10 (International Statistical Classification of the Diseases and Related Health Problems) code for heart failure (I-50) as a principal diagnosis or one of the first three secondary diagnoses on discharge were extracted. Patients' presentations to emergency departments not resulting in admission and patients younger than 15 years old were excluded. Comorbidities were identified from any ICD10 code in the first 30 diagnoses on discharge documentation of the index hospital admission. For remoteness, we divided the HNELHD area into rural and metropolitan depending on the patient's residential address. According to the Australian Bureau of Statistics, Newcastle and Lake Macquarie local government areas (LGA) are part of the Statistical Local Area 4 entitled "Newcastle and Lake Macquarie". Both LGAs have a population of greater than 100,000 residents. "Newcastle and Lake Macquarie" are hereafter referred to as "Metropolitan". The other LGAs (23 areas) each have a population of less than 100,000 residents and are hereafter collectively referred to as "Rural".

Patients were divided into three age groups, less than 65 years old, between 65 and 74 and 75 years old or more. Data were analysed using STATA/SE 14.1 version. The ethics approval for the study was granted by HNE Human Research Ethics Committee (Approval number: AU201603-15).

## Statistical Analysis

We used median and interquartile range for continuous variables, and numbers and percentages for the binary variables. The numbers of hospitalisations were age-standardised to the 2001 Australian population and are presented per 100,000 populations. Negative binomial regression and Poisson regression were used to assess the trend over time.

## Results

Between 2005–2014, there were 40,199 hospitalisations, representing 21,909 patients, for HF in HNE area. Patient demographics and co-morbidities are listed in Table 1.

Overall HF hospitalisation declined by 1% per year (95% CI, 0.6–1.3,  $P<0.001$ ) during the entire study period. However, there was a clear inflection in the middle of the graph for trend. From 2005–2010, HF hospitalisation declined by 2.3% per year (95% CI, 1.4–3.3%,  $P<0.001$ ), while after 2010 there was an increase by 1.2% per year (95% CI, 0.2–2%,  $P=0.014$ ) (Figure 1A).

Age-standardised HF hospitalisation rates were persistently higher in males compared to females ( $P<0.001$ ). Over the 10-year period, HF admissions dropped in both genders ( $p<0.001$ ), but there appeared to be an inflection point around 2009–2010. For males, between 2005–2010, HF hospitalisations dropped by an average of 4.2% per year (95% CI, 2.9–6.7%,

**Table 1** Patient demographics

Patient Demographics	n=21,909
Age (years), Median (IQR)	80 (72-85)
Male, n (%)	10,689 (48.8)
Indigenous n (%)	532 (2)
<b>Remoteness LGA, n (%)</b>	
Metropolitan	8,301 (37.9)
Rural	13, 608 (62.1)
<b>Comorbidities, n (%)</b>	
Hypertension	8,559 (39.1)
Coronary artery disease	6,289 (28.7)
Atrial fibrillation/flutter	6,632 (30.3)
Chronic renal disease	4,659 (21.3)
Diabetes Mellitus	5,081 (23.2)
<b>Average Age-Standardised Hospitalisation (%)</b>	
<b>Males</b>	
<65 year-old	91.5 (17.7)
65–74 year-old	105.4 (20.4)
≥75 year-old	319.6 (61.9)
<b>Females</b>	
<65 year-old	53.2 (12.9)
65–74 year-old	76.5 (18.6)
≥75 year-old	281.5 (68.5)
<b>Rural</b>	
<65 year-old	79.5 (16.3)
65–74 year-old	97.5 (20)
≥75 year-old	311.4 (63.7)
<b>Metropolitan</b>	
<65 year-old	62.4 (14.8)
65–74 year-old	79.8 (19)
≥75 year-old	278.7 (66.2)

LGA = Local Government Area, IQR = Inter quartile range

$P<0.001$ ). However, after 2010, there was no further reduction in HF hospitalisations ( $P=0.467$ ). In females, from 2005 to 2010, the average decline was 3.2% per year (95% CI, 1–5.3%,  $P=0.006$ ), similarly, there was no significant change after 2010 ( $P=0.445$ ) (Figure 1B).

For remoteness, the difference between rural and metropolitan areas was significant ( $P<0.001$ ) and there was a significant reduction in HF hospitalisations in both metropolitan and rural areas. Overall, the average reduction was 3.1% per year (95% CI, 2.4–3.8,  $P<0.001$ ). Similarly, there is an inflection point after 2009 and no further drop in the latter five years was seen (Figure 1C).

In males, 61.9% of the age-standardised hospitalisations were in patients aged ≥75 years, 20.4% in patients aged 65–74 years and only 17.1% in patients less than 65 years. In females, 68.5% of the admissions were the older age group and only 12.9% were in the youngest age group. There was a significant difference between the age groups ( $P<0.05$ ).

Patients aged ≥75 years were responsible for 63% of hospitalisations in both rural and metropolitan areas. The rest

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