CHERE
CENTRE FOR HEALTH ECONOMICS RESEARCH AND EVALUATION

Final Report

Evaluation of the Brisbane North Team Care Coordination program

October 2017

A report by the Centre for Health Economics Research and Evaluation as part of the evaluation of the Brisbane North Team Care Coordination program for Partners 4 Health Limited

UTS
UNIVERSITY OF TECHNOLOGY, SYDNEY

About CHERE

CHERE is an independent research unit affiliated with the University of Technology Sydney. It has been in operation since 1991 and in that time CHERE has developed a strong reputation for excellence in research in health economics and public health.

CHERE has extensive experience in evaluating health services and programs, and in assessing the effectiveness of policy initiatives. The Centre provides policy support to all levels of the health care system, through both formal and informal involvement in working parties, committees, and by undertaking commissioned projects. For further details about CHERE and our work refer to www.chere.uts.edu.au.

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1 Executive Summary

Background

The Brisbane North Primary Health Network (PHN) engaged the Centre for Health Economics Research and Evaluation (CHERE), based at the University of Technology Sydney, to undertake a detailed analysis of the Team Care Coordination program. The objectives of the Program are to:

- Improve patients' ability to manage their own health;
- Increase collaboration between Metro North Hospitals and Health Services to provide integrated care; and
- Reduce unnecessary hospitalisations.

From 2015 onwards, the Team Care Coordination program has accepted referrals from Metro North Hospital and Health Service Facilities.

Methods and aims

This report assesses the effectiveness of the Team Care Coordination program that is administered by the Brisbane North PHN. Our primary aims were to investigate the effectiveness of the Team Care program in terms of its impact on:

- Hospitalisations, emergency department (ED) attendances;
- Patient severity measured in terms of their need for case management using clinical, psychosocial and environmental indicators; and
- Program costs.

One of the primary aims of our evaluation is to investigate the impact of changing referral patterns on patient profile and associated outcomes.

Our evaluation utilises de-identified patient-level data from the records of Brisbane North PHN that have been matched to hospital admission and ED presentation data for Metro North Health Service District hospitals. The source of the hospital data is the Clinical Operations Strategic Implementation (COSI) Analytics team from the Metro North Health Service. The COSI Analytics team also conducted the matching of these data.

We employ a before-and-after analysis to examine whether program participation was associated with improvements in patient and health service outcomes. Several robustness checks are used to provide greater confidence that key findings can be attributed to the Team Care Coordination program.

Results

- **The profile of patients referred to the program differed significantly across referral sources.** Endocrine/metabolic conditions were the most prevalent condition for patients referred from Community and Indigenous Subacute Services (CISS) & other sources, whereas almost half of hospital referrals had respiratory conditions. More than half of patients referred to the Program by GPs had musculoskeletal conditions.

The rate of consent for patients entering the Team Care Coordination program was highest among those referred by their GP (79%), followed by (CISS) and other sources (66%) and hospitals (approx. 39%).

- **Team Care participation was strongly associated with improvements in patient severity (as measured by their acuity scores).** Reductions in patient severity was related with the initial level of complexity of the patient and were associated with improvements to the home environment. This is consistent with the observed allocation of expenditure.

- The greatest incidence of program expenditure coincided with the provision of goods and equipment rather than Allied Health Care referrals. However, it should be noted that this does not include referrals paid by Medicare so these results are likely to underestimate the total resource allocation.

- **Statistically significant decreases in the number of:**
    - Separations for those admitted to hospital due to an emergency, and
    - ED attendances.

Conclusion

Based on these results, we believe that the program has had an important role to play in identifying the underlying causes of emergency hospital admissions and ED presentations, as well as, reducing the frequency of patients returning to hospital for emergency treatments. One of the unique contributions of the program is having Team Care Coordinators perform an assessment of the home environment and assessing the patient's physical/psychosocial status as a follow up in a setting that is outside a medical institution.

2 Introduction

This report focuses on assessing the effectiveness of the Team Care Coordination program that is administered by the Brisbane North Primary Health Network (PHN). The Brisbane North PHN has a range of objectives, including: supporting GPs to provide better care to their patients, to improve health outcomes and reduce the use of hospitals in their community.

The Team Care Coordination (TCC) – Staying Healthy, Staying Home (SHSH) program is an established program that is funded by Queensland Health and managed by Brisbane North PHN.

The objectives of the Program are to:

- Improve patients' ability to manage their own health;
- Increase collaboration between Metro North Hospitals and Health Services to provide integrated care; and
- Reduce unnecessary hospitalisations.

The Brisbane North PHN engaged the Centre for Health Economics Research and Evaluation (CHERE), based at the University of Technology Sydney, to undertake a detailed analysis of the Team Care Program. This report is the final output of this project.

2.1 The Team Care Coordination – Staying Healthy, Staying Home Program

Team Care Coordinators are experienced registered nurses who contribute to GP Management Plans and can mobilise community and health services for high risk, potentially high cost patients with chronic conditions. Services include home visits, visits to primary care practices and liaison with hospitals, general practices and other providers. Team Care Coordinators are also able to suggest modifications to the home environment that can be funded by the program to improve a patient's safety within their own home. Examples include the provision of personal alarms and mobility equipment.

From 2015 onwards, the Team Care Coordination program accepted referrals from Metro North Hospital and Health Service facilities as part of the Staying Healthy, Staying Home (SHSH) program. As the SHSH program may have changed the profile of patients consenting to enter the Team Care Coordination program, one of the initial aims of the project evaluation is to investigate whether differences in referral patterns have changed the profile of the patients in the program. As a reduction in hospital presentations is also one of the aims of the SHSH program, this will be assessed using data for Metro North Health Service District hospitals that has been provided by the Clinical Operations Strategic Implementation (COSI) Analytics team from the Metro North Health Service.

2.2 Evaluation aims and outline of this report

Our evaluation focuses on four main areas of interest.

The first is to review previous coordinated care evaluations to identify the lessons that can be learnt with respect to establishing effective coordinated care. This review of previous coordinated care evaluations was conducted at the beginning of the project to inform the design of our evaluation. It is included at the end of the report in section 8.

The second is to analyse whether the patterns of referrals to the program have changed between the years 2014 and 2016. This may have led to differences in the profile of people consenting to join the program as referrals from hospitals have increased over time.

The third area focuses upon how expenditures have been allocated (both across referral sources and areas of program focus) and whether the program has had an impact on patients based on Acuity scores. These Acuity scores measure the severity of a patient's illness based on their need for case management (Huber & Craig, 2007) using clinical, psychosocial and environmental indicators.

The last area of focus is the measurement of the effectiveness of the program with respect to the number of hospital separations and emergency department (ED) presentations.

Listed below is the structure of this report.

- Section 3 – Data and empirical approach
- Section 4 – Analysis of the patterns of referrals to the program
- Section 5 – Analysis of the impact of the program on patients using Acuity scores and expenditure
- Section 6 – Analysis of data on hospital admissions and ED presentations at Metro North Health Service District hospitals
- Section 7 – Summary of findings
- Section 8 – Review of Coordinated Care evaluations from Australia and elsewhere

3 Data and empirical approach

3.1 Data

We have obtained data for the analysis from two sources. The first source was the Brisbane North PHN who provided us with detailed data on the patients referred to the program and key variables that they collected as part of the implementation of the program once patients consented. We received data on over 7000 patients referred to the program between 2006 and 2016. We have focused on a subset of this group based on the availability of key variables during 2014, 2015 and 2016. For the period between 2014 and 2016 there were 2544 patients who had the key demographic data available.

The second data source was the Clinical Operations Strategic Implementation (COSI) Analytics team at the Metro North Health Service. They provided data on the hospital admissions and ED presentations of relevant patients for the period between 1 January 2015 and 31 March 2017. This includes data from Caboolture Hospital, Kilcoy Hospital, Royal Brisbane & Women's Hospital, Redcliffe Hospital and The Prince Charles Hospital. To identify the patients referred to the program it was necessary for the COSI Analytics team to conduct a combination of deterministic record matching (using a client's first name, surname and date of birth) and probabilistic matching for those with an imperfect match. These data are used to assess whether the program has helped reduce the rate of hospital separations and ED presentations for those who were enrolled in the program in 2016.

3.2 Empirical approach

One of the main aims of the project evaluation is to investigate whether differences in referral patterns changed the profile of the patients in the program. To do this, we will focus on the profile of patients referred to the program and the profile of those patients who consented to enter the program. This is the focus of section 4. The analysis conducted in this section is based on cross-tabulation tables that include tests for significant differences across columns of data using the Pearson's chi-squared test. In section 5 we review how expenditure in 2016 was allocated across the patients and whether changes in an Acuity score are associated with involvement in the program. The analysis in this section includes cross-tabulation tables, testing for differences in averages and Logistic regression analysis.

Section 6 focuses on whether changes in the number of hospital separations and ED presentations occurred as a result of interacting with the program. As we could not establish a comparison group, we conduct a pre/post analysis using fixed periods of time to observe whether the patterns of hospital separations and ED presentations changed over time for different referral and admission types. Using a period of three/six/twelve months we test whether any differences between the period before and after the intervention are significant and persist across all observation periods. This allows us to measure whether any impact occurs in the short-term and/or long-term. We have taken this approach to confirm whether short term impacts are sustained in the long-term or were influenced by the activities leading up to program enrolment. Note that findings that persist across both the short-term and long-term are likely to be more robust than those that only appear in the short-term.

4 Data analysis of the patterns of referrals

In this section of the report we focus on the Team Care Coordination data to assess the patterns of referrals to the program and identify the patients who consented to participate. The data received includes variables related to the demographics of the patients, whether they gave consent to enter the program and the source of the referral. Across the period between 2014 and 2016 there were 2544 patients referred to the program with data available on key demographics, i.e. age and gender. While we received data on over 7000 patients referred to the program between 2006 and 2016, the selection of this group is based on the availability of key variables during 2014, 2015 and 2016.

As noted in section 2.1, Team Care underwent significant changes in 2015 that affected the pathways by which patients entered the program. One of the main aims of the project evaluation is to investigate whether differences in referral patterns has changed the profile of the patients in the program. Changes in referral pathways can have important implications on the type of patients being enrolled in the program. This in turn, could have an effect on the program's ability to have a positive impact on patient health outcomes and reduced hospitalisations. It is therefore important that these changes are reviewed before analysing the effectiveness of Team Care.

To do this, we will focus on the profile of patients referred to the program and the profile of those patients who consented to enter the program. Section 4.1 will focus on an overview of the 2014-2016 data and section 4.2 will focus on whether the characteristics of patients differed based on the referral source. Section 4.3 will then review whether the characteristics of patients providing consent and entering the program differed based on the referral source.

4.1 Overview of the patients referred to the program

Table 4.1 contains the breakdown of the data by gender for patients who entered the program in 2014, 2015 and 2016, as well as, the entire period between 2014 and 2016. Approximately 62% of the patients referred to the program between 2014 and 2016 were female. The proportion of males has increased over time, and this change was statistically significant[1] (as noted with a p-value of less than 0.01).

Table 4.1 Gender of patients

	2014	2015	2016	2014-2016
Female	67.7%	60.7%	59.6%	62.1%
Male	32.3%	39.3%	40.4%	37.9%
n	*690*	*769*	*1085*	*2544*
Statistical Sig.		p-value = 0.002	(Sig. with 1% CI)	

[1] To test for significant differences across years and referral type we conduct the Pearson's chi-squared test. The null hypothesis of this test is that the distribution of values in the table in question is independent of the variable used to specify the columns. If this is rejected, there is evidence that the variable used to specify the columns is important and helps to explain differences in the sample.

Table 4.2 reports the data by age group over the 2014 to 2016 period. The majority of referrals were patients aged 75 years or older. The proportion of patients aged 75 years or older has decreased over time and the distribution of age groups is statistically different across the years reviewed. It should be noted that in section 4.2, differences in the gender and age of referred patients is found to be associated with the referral source.

Table 4.2 Age of patients

	2014	2015	2016	2014-2016
< 49 years	6.4%	6.8%	5.3%	6.1%
50-64 years	12.0%	13.1%	14.6%	13.4%
65-74 years	17.8%	22.8%	25.5%	22.6%
> 75 years	63.8%	57.3%	54.6%	57.9%
n	*690*	*769*	*1085*	*2544*
Statistical Sig.		p-value = 0.002	(Sig. with 1% CI)	

Table 4.3 and Table 4.4 contain data on the living status and employment status of referred patients. Note that these variables contain a high number of missing observations. For approximately 19% and 25% of referrals the information on living and employment status was missing, respectively. Nevertheless, most patients referred to the program were living with a family member and were retired. Approximately 51% of the patients referred to the program between 2014 and 2016 were living with family. The proportion of missing values has increased over time and this change was statistically significant (as noted with a p-value of less than 0.01).

Table 4.3 Living status of patients

	2014	2015	2016	2014-2016
Missing	9.1%	15.3%	27.8%	19.0%
Lives Alone	31.9%	27.6%	26.0%	28.1%
Lives with family	56.5%	55.1%	44.5%	51.0%
Lives with others	2.5%	2.0%	1.7%	2.0%
n	*690*	*769*	*1085*	*2544*
Statistical Sig.		p-value = 0.000	(Sig. with 1% CI)	

Table 4.4 Employment status of patients

	2014	2015	2016	2014-2016
Missing or unknown	11.7%	20.5%	36.7%	25.0%
Employed Fulltime	0.1%	0.5%	0.2%	0.3%
Employed Part Time	1.2%	1.7%	0.9%	1.2%
Employed in Home Duties	0.3%	0.5%	0.3%	0.4%
Retired	78.6%	71.3%	56.5%	66.9%
Student	0.4%	0.3%	0.1%	0.2%
Unemployed	5.4%	3.5%	3.4%	4.0%
Other	2.3%	1.7%	1.9%	2.0%
n	*690*	*769*	*1085*	*2544*
Statistical Sig.		p-value = 0.000	(Sig. with 1% CI)	

As an initial review of the morbidities of patients referred to the program we focus on the number of morbidities reported in the data. Table 4.5 shows the number of morbidities of referred patients between 2014 and 2016. While statistically significant differences across years are found, most patients had between one and three morbidities across all years. In 2014, those reporting two or three morbidities made up 59% of the sample. In 2016 this was 56% of the sample. It should be noted that the number of morbidities that these patients had is interesting as differences across referral sources are also found in sections 4.2 and 4.3.

Table 4.5 Number of morbidities

	2014	2015	2016	2014-2016
1	11.9%	10.3%	14.4%	12.5%
2	33.2%	30.9%	26.8%	29.8%
3	25.5%	26.9%	29.0%	27.4%
4	14.3%	17.4%	14.3%	15.3%
5	6.2%	5.7%	4.0%	5.1%
6	2.6%	1.8%	1.3%	1.8%
7 or more	0.6%	0.0%	0.1%	0.2%
Missing/None	5.7%	6.9%	10.1%	7.9%
n	*690*	*769*	*1085*	*2544*
Statistical Sig.		p-value = 0.000	(Sig. with 1% CI)	

4.2 Comparison of referrals by source

In this section, we focus on the data reviewed in section 4.1 and examine the data by year and the source of referral. These tables separate the data into three sources of referrals, these being referrals from general practitioners (GPs), Community and Indigenous Subacute Services (CISS) and other sources, and hospitals (Hosp.). It also shows how the referrals have changed over time with hospital referrals notably increasing in 2015 onwards. However, in all periods the majority of the referrals were from GPs and this type of referral accounted for 2148 out of 2544 patients referred to the program between 2014 and 2016. Table 4.6 shows the gender of referred patients by referral source. While the majority of referrals from all of the sources were female, differences across sources are present. As indicated by the p-values from the Pearson's chi-squared test[2], the differences in the number of females referred to the program by the different referral sources are statistically significant for 2016 and the entire period.

Table 4.6 Gender of referrals by referral source

	GP	CISS & Other	Hosp.	All Sources	Statistical Sig.
			2014		
Male	32.2%	.	.	32.3%	n/a
Female	67.8%	.	.	67.7%	
n	*683*	.	.	*690*	
			2015		
Male	38.7%	.	45.5%	39.3%	p-value = 0.368 (Not Sig. with 10% CI)
Female	61.3%	.	54.5%	60.7%	
n	*684*	.	*77*	*769*	
			2016		
Male	36.7%	52.0%	49.5%	40.4%	p-value = 0.000 (Sig. with 1% CI)
Female	63.3%	48.0%	50.5%	59.6%	
n	*781*	*25*	*279*	*1085*	
			2014-2016		
Male	35.9%	45.7%	48.5%	37.9%	p-value = 0.000 (Sig. with 1% CI)
Female	64.1%	54.3%	51.5%	62.1%	
n	*2148*	*35*	*361*	*2544*	

Note that '.' indicates cases where the data was below 10 observations.

[2] As previously specified, we use the Pearson's chi-squared test to test for significant differences across referral types. The null hypothesis of this test is that the distribution of values in the table in question is independent of the referral type. If this is rejected, there is evidence that referral type is important in explaining the differences in the variable focused on.

Table 4.7 contains information on the age of referrals by referral source. While the majority of referrals from all of the sources were for patients who were 75 years old or older, differences across referral sources are evident. These differences are significant for 2015, 2016 and the entire period. CISS and other sources tended to refer a younger age cohort and had the greatest spread across the age groups with only 34% of referrals aged 75 years or older. This compares to 59% and 52% from GPs and hospitals, respectively. Over time, the new referral sources have led to a slightly younger age profile of enrolled patients.

Table 4.7 Age of referrals by referral source

	GP	CISS & Other	Hosp.	All Sources	Statistical Sig.
			2014		
< 49 years	6.4%	.	.	6.4%	n/a
50-64 years	11.9%	.	.	12.0%	
65-74 years	17.7%	.	.	17.8%	
> 75 years	64.0%	.	.	63.8%	
n	683	.	.	690	
			2015		
< 49 years	7.3%	.	2.6%	6.8%	p-value = 0.000
50-64 years	12.0%	.	20.8%	13.1%	(Sig. with 1% CI)
65-74 years	21.1%	.	37.7%	22.8%	
> 75 years	59.6%	.	39.0%	57.3%	
n	684	.	77	769	
			2016		
< 49 years	5.6%	16.0%	3.6%	5.3%	p-value = 0.047
50-64 years	14.2%	28.0%	14.3%	14.6%	(Sig. with 5% CI)
65-74 years	25.2%	24.0%	26.5%	25.5%	
> 75 years	54.9%	32.0%	55.6%	54.6%	
n	781	25	279	1085	
			2014-2016		
< 49 years	6.4%	11.4%	3.3%	6.1%	p-value = 0.000
50-64 years	12.8%	28.6%	16.1%	13.4%	(Sig. with 1% CI)
65-74 years	21.5%	25.7%	28.8%	22.6%	
> 75 years	59.3%	34.3%	51.8%	57.9%	
n	2148	35	361	2544	

Note that '.' indicates cases where the data was below 10 observations.

Table 4.8 contains the number of morbidities of referred patients by the referral source. For 2015, 2016 and the entire sample, the Pearson's chi-square test finds that there was a notable difference in the number of morbidities of referred patients depending on referral source. Again, this difference is driven by referrals from CISS and other sources. More than 25% of CISS and other sources referrals have only 1 morbidity whereas this was 16% and 12% hospital and GP referrals, respectively. Almost 58% of referrals from GPs and almost 55% of referrals from hospitals had 2-3 morbidities compared to 48.6% of CISS and other referrals with 2-3 morbidities.

Table 4.8 Number of morbidities of referrals by referral source

	GP	CISS & Other	Hosp.	All Sources	Statistical Sig.
			2014		
1	11.9%	.	.	11.9%	
2	32.8%	.	.	33.2%	
3	25.8%	.	.	25.5%	
4	14.3%	.	.	14.3%	
5	6.3%	.	.	6.2%	n/a
6	2.6%	.	.	2.6%	
7	0.6%	.	.	0.6%	
Missing/None	5.7%	.	.	5.7%	
n	*683*	.	.	*690*	
			2015		
1	10.1%	.	9.1%	10.3%	
2	31.7%	.	27.3%	30.9%	
3	26.6%	.	31.2%	26.9%	
4	17.7%	.	15.6%	17.4%	p-value = 0.058
5	5.6%	.	7.8%	5.7%	(Sig. with 10%
6	1.8%	.	1.3%	1.8%	CI)
7	0.0%	.	0.0%	0.0%	
Missing/None	6.6%	.	7.8%	6.9%	
n	*684*	.	*77*	*769*	
			2016		
1	12.8%	24.0%	17.9%	14.4%	
2	27.1%	32.0%	25.4%	26.8%	
3	29.4%	24.0%	28.3%	29.0%	
4	16.9%	4.0%	7.9%	14.3%	p-value = 0.000
5	4.7%	0.0%	2.2%	4.0%	(Sig. with 1%
6	1.3%	0.0%	1.4%	1.3%	CI)
7	0.1%	0.0%	0.0%	0.1%	
Missing/None	7.6%	16.0%	16.8%	10.1%	
n	*781*	*25*	*279*	*1085*	
			2014-2016		
1	11.6%	25.7%	16.1%	12.5%	
2	30.4%	28.6%	26.3%	29.8%	
3	27.4%	20.0%	28.5%	27.4%	
4	16.3%	5.7%	9.7%	15.3%	p-value = 0.000
5	5.5%	0.0%	3.3%	5.1%	(Sig. with 1%
6	1.9%	2.9%	1.4%	1.8%	CI)
7	0.2%	0.0%	0.0%	0.2%	
Missing/None	6.7%	17.1%	14.7%	7.9%	
n	*2148*	*35*	*361*	*2544*	

Note that '.' indicates cases where the data was below 10 observations.

4.3 Comparison of patient consent by referral source

In this section, we focus on the rates of consent that were received from the referred patients. As shown in Table 4.9, notable differences in the rate of consent are observed across the different sources of referrals. Overall, approximately 73% of patients referred between 2014 and 2016 did provide consent and entered the program. Almost 79% of patients referred by GPs between 2014 and 2016 gave consent and entered the program. This is notably different to the rate of consent associated with referrals from Community and Indigenous Subacute Services (CISS) and other sources (66%) and hospitals (approx. 39%). These differences are statistically significant across all of the years reviewed.

Table 4.9 Consent by referral source

Consent granted	GP	CISS & Other	Hosp.	All Sources	Statistical Sig.
			2014		
Yes	85.2%	.	.	84.9%	n/a
No	14.8%	.	.	15.1%	
n	683	.	.	690	
			2015		
Yes	78.1%	.	53.2%	75.7%	p-value = 0.000
No	21.9%	.	46.8%	24.3%	(Sig. with 1% CI)
n	684	.	77	769	
			2016		
Yes	73.8%	60.0%	34.1%	63.2%	p-value = 0.000
No	26.2%	40.0%	65.9%	36.8%	(Sig. with 1% CI)
n	781	25	279	1085	
			2014-2016		
Yes	78.8%	65.7%	38.5%	72.9%	p-value = 0.000
No	21.2%	34.3%	61.5%	27.1%	(Sig. with 1% CI)
n	2148	35	361	2544	

Note that '.' indicates cases where the data was below 10 observations.

While the proportion of patients giving consent differed by the source of the referral, most of the patients providing consent were female and the proportion of females across all of the referral sources tended to be around 60% (refer to the 2014-2016 estimates). Table 4.10 confirms this and shows that the majority of patients entering the program were female and this was consistent for the entire period between 2014 and 2016. Table 4.11 shows the age of those consenting to the program. Most patients were over 75 years old and in 2016 there was a limited difference in the age profile of patients consenting from different referral sources. This is shown in a p-value above 0.10 and is associated with the age profile of consenting patients referred by their GP shifting away from the over 75 group towards those between 50 and 74 years old.

Table 4.10 Gender of consenting patients by referral source

Gender	GP	CISS and Other	Hosp.	All Sources	Statistical Sig.
		2014			
Male	31.1%	.	.	31.2%	n/a
Female	68.9%	.	.	68.8%	
n	582	.	.	586	
		2015			
Male	37.8%	.	36.6%	37.6%	p-value = 0.873 (Not Sig. with 10% CI)
Female	62.2%	.	63.4%	62.4%	
n	534	.	41	582	
		2016			
Male	36.3%	53.3%	50.5%	38.6%	p-value = 0.015 (Sig. with 5% CI)
Female	63.7%	46.7%	49.5%	61.4%	
n	576	15	95	686	
		2014-2016			
Male	35.0%	43.5%	46.8%	36.0%	p-value = 0.016 (Sig. with 5% CI)
Female	65.0%	56.5%	53.2%	64.0%	
n	1692	23	139	1854	

Note that '.' indicates cases where the data was below 10 observations.

Table 4.11 Age of consenting patients by referral source

Consent granted	GP	CISS and Other	Hosp.	All Sources	Statistical Sig.
		2014			
< 49 years	4.5%	.	.	4.4%	n/a
50-64 years	11.5%	.	.	11.6%	
65-74 years	18.0%	.	.	18.3%	
> 75 years	66.0%	.	.	65.7%	
n	582	.	.	586	
		2015			
< 49 years	4.9%	.	2.4%	4.6%	p-value = 0.014 (Sig. with 5% CI)
50-64 years	11.4%	.	17.1%	12.0%	
65-74 years	21.7%	.	43.9%	23.4%	
> 75 years	62.0%	.	36.6%	60.0%	
n	534	.	41	582	
		2016			
< 49 years	4.9%	6.7%	4.2%	4.8%	p-value = 0.544 (Not sig. with 10% CI)
50-64 years	14.2%	33.3%	13.7%	14.6%	
65-74 years	24.7%	20.0%	27.4%	24.9%	
> 75 years	56.3%	40.0%	54.7%	55.7%	
n	576	15	95	686	
		2014-2016			
< 49 years	4.7%	4.3%	3.6%	4.6%	p-value = 0.005 (Sig. with 1% CI)
50-64 years	12.4%	30.4%	15.1%	12.8%	
65-74 years	21.5%	26.1%	32.4%	22.3%	
> 75 years	61.4%	39.1%	48.9%	60.2%	
n	1692	23	139	1854	

Note that '.' indicates cases where the data was below 10 observations.

Table 4.12 shows the number of morbidities of consenting patients by referral source. The number of morbidities of consenting patients was notably different across referral source in 2015, 2016 and for the entire sample. Generally, the majority of patients had between 2 and 3 morbidities reported, but the spread across referral source was different with approximately 35% of consenting patients from CISS and other sources having one morbidity reported, compared to 11% and 18% for GPs and hospitals, respectively.

Table 4.12 Number of morbidities of consenting patients by referral source

	GP	CISS & Other	Hosp.	All Sources	Statistical Sig.
			2014		
1	11.9%	.	.	11.9%	
2	34.5%	.	.	34.8%	
3	26.3%	.	.	26.1%	
4	15.5%	.	.	15.4%	
5	7.0%	.	.	7.0%	n/a
6	2.9%	.	.	2.9%	
7	0.7%	.	.	0.7%	
Missing/None	1.2%	.	.	1.2%	
n	582	.	.	586	
			2015		
1	9.4%	.	4.9%	9.5%	
2	31.8%	.	22.0%	30.8%	
3	28.1%	.	43.9%	29.0%	
4	19.5%	.	17.1%	19.2%	p-value = 0.007
5	6.7%	.	9.8%	6.9%	(Sig. with 10%
6	2.1%	.	2.4%	2.2%	CI)
7	0.0%	.	0.0%	0.0%	
Missing/None	2.4%	.	0.0%	2.4%	
n	534	.	41	582	
			2016		
1	11.3%	33.3%	23.2%	13.4%	
2	26.6%	40.0%	25.3%	26.7%	
3	31.9%	13.3%	25.3%	30.6%	
4	18.2%	6.7%	6.3%	16.3%	p-value = 0.000
5	4.9%	0.0%	3.2%	4.5%	(Sig. with 1%
6	1.2%	0.0%	1.1%	1.2%	CI)
7	0.0%	0.0%	0.0%	0.0%	
Missing/None	5.9%	6.7%	15.8%	7.3%	
n	576	15	95	686	
			2014-2016		
1	10.9%	34.8%	18.0%	11.7%	
2	31.0%	30.4%	25.2%	30.5%	
3	28.8%	13.0%	30.2%	28.7%	
4	17.7%	8.7%	9.4%	16.9%	p-value = 0.000
5	6.2%	0.0%	5.0%	6.0%	(Sig. with 1%
6	2.1%	4.3%	1.4%	2.0%	CI)
7	0.2%	0.0%	0.0%	0.2%	
Missing/None	3.2%	8.7%	10.8%	3.8%	
n	1692	23	139	1854	

Note that '.' indicates cases where the data was below 10 observations.

Table 4.13 Percent of patients with key morbidities by referral source

	GP	CISS & Other	Hosp.	All Sources	Statistical Sig.
		2014			
Digestive	17.9%	.	.	17.9%	
Eye	14.6%	.	.	14.5%	
Cardiovascular	49.8%	.	.	49.5%	
Musculoskeletal	56.7%	.	.	56.5%	
Neurological	16.8%	.	.	16.7%	n/a
Psychological	29.9%	.	.	29.9%	
Respiratory	23.0%	.	.	23.4%	
Endocrine/Metabolic	29.9%	.	.	29.7%	
n	*582*	.	.	*586*	
		2015			
Digestive	13.9%	.	14.6%	13.7%	
Eye	12.5%	.	9.8%	12.2%	
Cardiovascular	47.9%	.	43.9%	47.4%	
Musculoskeletal	53.0%	.	46.3%	52.4%	p-value = 0.062
Neurological	20.0%	.	12.2%	19.6%	(Sig. with 10%
Psychological	33.7%	.	36.6%	33.8%	CI)
Respiratory	26.0%	.	56.1%	28.2%	
Endocrine/Metabolic	32.8%	.	36.6%	33.2%	
n	*534*	.	*41*	*582*	
		2016			
Digestive	14.9%	0.0%	8.4%	13.7%	
Eye	12.8%	0.0%	5.3%	11.5%	
Cardiovascular	39.8%	33.3%	41.1%	39.8%	
Musculoskeletal	59.2%	40.0%	13.7%	52.5%	p-value = 0.000
Neurological	16.3%	20.0%	14.7%	16.2%	(Sig. with 1% CI)
Psychological	26.0%	20.0%	24.2%	25.7%	
Respiratory	26.9%	13.3%	40.0%	28.4%	
Endocrine/Metabolic	33.2%	46.7%	24.2%	32.2%	
n	*576*	*15*	*95*	*686*	
		2014-2016			
Digestive	15.6%	0.0%	10.8%	15.0%	
Eye	13.4%	0.0%	6.5%	12.7%	
Cardiovascular	45.8%	30.4%	41.0%	45.3%	
Musculoskeletal	56.4%	39.1%	23.7%	53.7%	p-value = 0.000
Neurological	17.7%	21.7%	13.7%	17.4%	(Sig. with 1% CI)
Psychological	29.8%	26.1%	27.3%	29.6%	
Respiratory	25.3%	21.7%	45.3%	26.8%	
Endocrine/Metabolic	31.9%	43.5%	27.3%	31.7%	
n	*1692*	*23*	*139*	*1854*	

Note that '.' indicates cases where the data was below 10 observations.

Table 4.13 shows the percent of patients with specific morbidities and compares this across the referral sources. Across all of the periods, over half of the patients had musculoskeletal conditions and almost half of the patients had cardiovascular conditions. Around 30% of

patients had a psychological condition and a similar proportion of patients had an endocrine/metabolic condition. Differences in the prevalence of certain morbidities across the referral source are present. Endocrine/metabolic conditions were the most prevalent condition for patients referred from CISS & other sources whereas almost half of hospital referrals had respiratory conditions. More than half of the consenters from GP referrals had musculoskeletal conditions.

The majority of referrals to the program are still from GPs. While differences in the types of patients referred to the program by source are statistically significant, it does not seem to have impacted the overall profile of the patients in the most recent year reviewed (i.e. 2016). Generally, the profile of the overall patient profile matches that of the profile of patients referred by GPs. This can be seen by comparing the GP and All Sources numbers in the tables provided. If there are a greater number of referrals from hospitals this may change. Based on the referral patterns observed for 2016, in future years, the program may need to contend with a greater proportion of patients with respiratory disease and a lower proportion of patients with musculoskeletal conditions. Whether this is a barrier to future success is yet to be seen, however, it is an issue that may need to be dealt with.

5 The allocation of expenditure and the impact on Acuity scores

This section focuses upon how expenditures were allocated (both across referral sources and areas of the program's focus) and whether the program has had an impact on patients, as measured by the reported Acuity scores. Section 5.1 focuses on how the program's expenditures were allocated across referral groups and the types of goods/services provided. Section 5.2 focuses on the Acuity scores that were recorded by a Team Care Coordinator before and after the program intervention took place. These scores measure a patient's complexity using a selection of clinical, psychosocial and environmental indicators. Our aim is to measure whether the recorded indicator scores improved, on average, for the patients referred into the program.

5.1 Program expenditure

Table 5.1 compares the average expenditure for the main types of goods/services provided in 2016 across referral sources. These goods/services have been grouped into five activity groups, consisting of: (i) allied health care referrals; (ii) the provision of goods and equipment; (iii) domestic assistance; (iv) home maintenance; and (v) nursing care. Generally, the greatest incidence of expenditure coincided with the provision of goods and equipment. Within all categories of expenditure the largest average cost and the most common type of expenditure were associated with personal alarms. The next most common type of expenditure was on mobility equipment such as wheeled walkers, shower stools, wheelchairs and bed rails.

Note that referrals paid by Medicare are not captured in these data. As a result, a potentially large part of the program's referrals to medical services are not incorporated in this analysis.

While Table 5.1 shows the average expenditure for each referral and expenditure type, Table 5.2 contains the average total expenditure by referral source. Using an independent samples t-test we find that there was no significant difference in average total expenditure across referral sources. Amongst the 461 patients allocated expenditure on goods/services, the average was approximately $220 regardless of the referral source.

Table 5.1 Average expenditure in 2016 by referral and the main types of expenditure

	GP		CISS & Other		Hosp.		*All*
	$	*n*	$	*n*	$	*n*	*n*
			Allied Health Care Referrals				
Alternative Therapy	112	.	.	.	.	.	.
Chiropractic	212	.	.	.	.	.	.
Diet / Nutrition	70	.	.	.	.	.	.
Exercise Physiology	129	.	250	.	.	.	.
Hydrotherapy	178	.	.	.	183	.	.
Occupational Therapy	81	47	.	.	71	.	56
Physiotherapy	106	37	180	.	154	10	48
Podiatry	76	.	.	.	.	.	.
Psychology	89	12	.	.	.	.	12
Social Work	95	.	106	.	.	.	.
Speech Pathology	52	13	.	.	.	.	14
			Provision of Goods and Equipment				
General/In home support	107	42	140	.	114	.	49
Medical equip.	119	11	.	.	93	.	16
Mobility equip.	123	93	112	.	125	22	120
Personal Alarms	188	211	174	.	193	43	257
Personal Care	103	49	.	.	82	.	58
Sensory	80	.	.	.	50	.	.
			Domestic Assistance				
General housework	101	21	.	.	139	.	23
Shopping/banking	150	.	.	.	.	.	.
			Home Maintenance				
House	65	.	.	.	80	.	.
Lawns & Gardens	40	.	.	.	.	.	.
Rails	143	.	25	.	.	.	.
			Nursing Care				
Nursing - Continence	43	.	.	.	.	.	.

Note that '.' indicates cases where the data was missing or below 10 observations.

Table 5.2 Average total expenditure in 2016 by referral source

	GP	CISS & Other	Hosp.	All Sources
Average expenditure	$218.27	$228.05	$220.51	$219.52
n	374	10	77	*461*
		p-value = 0.796 (Not sig. with 10% CI)	p-value = 0.878 (Not sig. with 10% CI)	

5.2 Acuity scores

This section focuses on the Acuity scores recorded at the commencement of the program (i.e. entry) and the completion of the intervention (i.e. exit). These scores were recorded by the Team Care Coordinators using three dimensions (i.e. clinical, psychosocial and environmental indicators) to assess a patient's need for care management. For total Acuity, the highest score is 12 (i.e. the highest complexity) and the lowest score is 3 (i.e. basic complexity). For the three individual dimensions, the highest score is 4 and the lowest score is 1.

Table 5.3 contains the average acuity scores for the commencement and the completion of the intervention episode by referral source. Note that CISS referrals have been removed due to the low number of patients with scores recorded at the point of entry into the program and at the point of exit. Across all of the referral sources, the average Acuity score at the commencement of the intervention was 5.8 and at the completion of the intervention it was 5.3. The difference implies than an improvement occurred. This improvement was significantly different from zero with a 1% confidence interval. All three sub-groups of the Acuity indicator had a decrease in the average score between program entry and exit; however, the largest decrease coincided with improvements to the home environment.

Table 5.3 Average acuity scores at the beginning and end of the intervention

Program	GP	Hosp.	Total	Statistical Sig.
		Clinical		
Entry	2.30	2.45	2.34	
Exit	2.28	2.39	2.31	
Difference	-0.02	-0.07	-0.03	p-value = 0.016 (Sig. with 5% CI)
		Psychosocial		
Entry	1.71	1.66	1.71	
Exit	1.63	1.59	1.62	
Difference	-0.08	-0.07	-0.09	p-value = 0.004 (Sig. with 1% CI)
		Environmental		
Entry	1.74	1.66	1.74	
Exit	1.37	1.20	1.36	
Difference	-0.37	-0.46	-0.38	p-value = 0.000 (Sig. with 1% CI)
		Total		
Entry	5.75	5.77	5.84	
Exit	5.29	5.18	5.30	
Difference	-0.47	-0.59	-0.50	p-value = 0.000 (Sig. with 1% CI)
n	*219*	*44*	*266*	

The Acuity score can also be classed into five categories of complexity. These range from basic complexity to high complexity. Table 5.4 shows the complexity score before and after the intervention. Generally, most people remained in the same complexity score class and these people are shown in grey highlighting. However, 39% of those patients who were classed as having a good level of complexity at the commencement of the intervention had basic complexity after the intervention. 49% of those rated as having fair complexity at commencement moved to a good complexity class.

As there are a few factors driving the decreases in Acuity scores, we have run a Logistic regression to investigate the factors that are related to the changes shown in Tables 5.3 and 5.4. The Logistic regression results shown in Table 5.5 reveal that having a decrease in the Acuity score after the intervention was strongly related to expenditure and the initial level of complexity that the patients had at the commencement of the intervention. The greatest decrease in Acuity scores coincided with the environmental indicators and this confirms that the provision of basic home safety equipment proved effective in improving the home environment for those with less than moderately severe complexity. It is important to note that the initial level of complexity score was associated with the largest coefficients within the regressions. This confirms that, within the confines of the current program, those with Acuity improvements tended to be patients who were less complex.

Table 5.4 Patient complexity scores at the beginning and end of the intervention

		Complexity score after intervention					
		Basic	**Good**	**Fair**	**Moderate**	**Highest**	***n (before)***
Equivalent Acuity score:		*3-4*	*5-6*	*7-8*	*9-10*	*11-12*	
Complexity score before intervention	**Basic**	60	.	.	.	.	*65*
	Good	47	65	5	.	.	*120*
	Fair	.	32	28	.	.	*65*
	Moderate	.	.	.	.	.	*12*
	Highest	.	.	.	.	.	.
n (after)		*110*	*103*	*38*	.	.	*266*

Note that '.' indicates cases where the data was below 10 observations.

Table 5.5 Logistic regression of a decrease in the Acuity score

	Total	**Clinical**	**Psychosocial**	**Environmental**
Expenditure ($)	0.004***	0.001	-0.002	0.004***
	(0.00)	(0.00)	(0.00)	(0.00)
Age (Years)	0.009	0.008	0.001	0.018
	(0.01)	(0.02)	(0.01)	(0.01)
Number of morbidities	0.009	0.148	0.071	0.058
	(0.11)	(0.16)	(0.13)	(0.11)
Complexity score before intervention – Moderate	2.021***	2.658***	1.528**	1.519**
	(0.67)	(0.94)	(0.62)	(0.69)
Complexity score before intervention – Fair	2.351***	1.706**	0.931**	2.079***
	(0.44)	(0.81)	(0.38)	(0.45)
Complexity score before intervention – Good	2.070***	1.287*		1.742***
	(0.40)	(0.78)		(0.41)
Constant	-2.852***	-4.489***	-2.117*	-3.790***
	(0.98)	(1.51)	(1.17)	(1.01)
Pseudo R Squared	0.167	0.065	0.052	0.139
Chi-square	61.49***	11.97*	11.85**	50.27***
n	*266*	*266*	*266*	*266*

Note: Standard errors in parentheses and statistical significance is denoted as * for p<0.01, ** for p<0.05 and * for p<0.1.**

6 Analysis of external data on hospital separations, length of stay and ED presentations

To complete the analysis the focus now turns to the wider impacts of the program, specifically whether there is evidence of reduced numbers of hospital separations and ED presentations. Within this part of the analysis, we utilise data on hospital admissions and ED presentations provided by the Clinical Operations Strategic Implementation (COSI) Analytics team at the Metro North Health Service. These data are used to assess whether the program has helped reduce the rate of hospital separations and ED presentations for those who were enrolled in the program in 2016. This analysis is conducted as a pre/post analysis where we measure whether a decrease in hospitalisations and ED presentations occurred after people engaged in the program. We also review whether there were differences in the distribution of hospitalisations and ED presentations by referral source and admission type.

The referral types are those used in the previous section. The admission status are the classifications used by Metro North Health Service District hospitals to classify patients into emergency admissions, elective admissions and admissions not assigned a classification (which includes obstetrics, statistical admissions and planned readmissions). Note that we focus on all admissions, emergency admissions and elective admissions.

As we could not establish a comparison group, we conduct this pre/post analysis using fixed periods of time to observe whether the patterns of hospital admissions and ED presentations changed over time for different referral and admission types. This allows us to assess whether any differences in separations and ED presentations are limited to a short amount of time after the intervention. Using a period of three/six/twelve months we test whether any differences between the period before and after the intervention are significant and persist across all observation periods.

The number of patients in each observation period changes depending upon the date that they joined the program. We have also excluded patients who were not in the data used in section 4 and 5, as well as, those patients who died in hospital during the observation period (n=8).

6.1 Hospital separations

Table 6.1 compares the number of separations that occurred three months before and after the program intervention across referral type and admission status. The distributions were not significantly different based on referral type and this holds across all of the admission categories reviewed. For all types of attendances and emergency attendances, there was an increase in the number of patients with zero attendances three months after the program intervention. This in turn coincided with a decrease in the number of separations.

Based on the average number of separations before and after the intervention (shown in Table 6.2) only the decrease in emergency related separations was significantly different. This is based on a paired sample t-test of the average number of separations before and after the intervention. Note that these averages include zero values and capture changes in the number of separations and whether more people had no hospital admissions recorded by the Metro North Health Service District hospitals. When we focused on those who were admitted for injuries in the previous three months (i.e. 22 patients), we found that the

number of admissions due to an injury had decreased to zero. Table 6.3 focuses on the number of overnight bed days. It shows that there was no significant difference in the average length of stay before and after the intervention using a three month period of observation.

Table 6.1 Number of separations by referral and type of admission – Three months before and after engagement in the program

Number of separations	Three months before				Three months after			
	GP	CISS & Other	Hosp.	All Sources	GP	CISS & Other	Hosp.	All Sources
Admission classification - All								
0	89.5%	.	86.3%	89.0%	92.1%	.	92.5%	92.3%
1	6.6%	.	12.5%	7.7%	5.2%	.	2.5%	4.6%
2	2.6%	.	1.3%	2.3%	0.7%	.	1.3%	0.8%
3	0.0%	.	0.0%	0.0%	0.7%	.	2.5%	1.0%
4 to 10	1.0%	.	0.0%	0.8%	1.3%	.	1.3%	1.3%
11 or more	0.3%	.	0.0%	0.3%	0.0%	.	0.0%	0.0%
n	*305*	.	*80*	*392*	*305*	.	*80*	*392*
Statistical Sig.	p-value = 0.707 (Not sig. with 10% CI)				p-value = 0.854 (Not sig. with 10% CI)			
Admission classification - Emergency								
0	91.8%	.	87.5%	91.1%	95.4%	.	92.5%	94.9%
1	6.9%	.	11.3%	7.7%	3.9%	.	3.8%	3.8%
2	1.0%	.	1.3%	1.0%	0.3%	.	3.8%	1.0%
3	0.3%	.	0.0%	0.3%	0.0%	.	0.0%	0.0%
4 to 10	0.0%	.	0.0%	0.0%	0.3%	.	0.0%	0.3%
11 or more	0.0%	.	0.0%	0.0%	0.0%	.	0.0%	0.0%
n	*305*	.	*80*	*392*	*305*	.	*80*	*392*
Statistical Sig.	p-value = 0.844 (Not sig. with 10% CI)				p-value = 0.239 (Not sig. with 10% CI)			
Admission classification - Elective								
0	97.0%	.	98.8%	97.4%	96.1%	.	96.3%	96.2%
1	2.6%	.	1.3%	2.3%	3.0%	.	2.5%	2.8%
2	0.3%	.	0.0%	0.3%	0.3%	.	0.0%	0.3%
3	0.0%	.	0.0%	0.0%	0.0%	.	1.3%	0.3%
4 to 10	0.0%	.	0.0%	0.0%	0.7%	.	0.0%	0.5%
11 or more	0.0%	.	0.0%	0.0%	0.0%	.	0.0%	0.0%
n	*305*	.	*80*	*392*	*305*	.	*80*	*392*
Statistical Sig.	p-value = 0.911 (Not sig. with 10% CI)				p-value = 0.756 (Not sig. with 10% CI)			

Note that '.' indicates cases where the data was below 10 observations.

Table 6.2 Average number of separations by type of admission – Three months before and after engagement in the program

	Mean	Statistical Sig.
	Admission classification - All	
Three months before	0.20	p-value = 0.297 (Not sig. with 10% CI)
Three months after	0.15	
n	*392*	
	Admission classification - Emergency	
Three months before	0.10	p-value = 0.099 (Sig. with 10% CI)
Three months after	0.07	
n	*392*	
	Admission classification - Elective	
Three months before	0.03	p-value = 0.112 (Not sig. with 10% CI)
Three months after	0.06	
n	*392*	

Table 6.3 Average number of overnight bed days by type of admission – Three months before and after engagement in the program

	Mean	Statistical Sig.
	Admission classification - All	
Three months before	0.87	p-value = 0.840 (Not sig. with 10% CI)
Three months after	0.80	
n	*392*	
	Admission classification - Emergency	
Three months before	0.48	p-value = 0.819 (Not sig. with 10% CI)
Three months after	0.43	
n	*392*	
	Admission classification - Elective	
Three months before	0.14	p-value = 0.342 (Not sig. with 10% CI)
Three months after	0.32	
n	*392*	

Table 6.4 compares the number of separations that occurred six months before and after the program intervention for each referral type and admission classification. As in the case of a three month observation period, the distributions were not significantly different based on referral type across all admission categories. For all types of attendances and emergency attendances, there was an increase in the amount of patients with zero attendances six months after the program intervention. Based on the average number of separations before and after the intervention (shown in Table 6.5), the decreases in the overall number of separations and emergency attendances were found to be statistically significant. Consistent with the previous analysis, the average number of overnight bed days (shown in Table 6.6) was not significantly different for any type of admission using a six month period of observation.

Using a twelve month period of observation there were significant differences in the number of separations by referral type (as shown in Table 6.7), however this only coincides with the period before the intervention occurred. For the period before the intervention, a higher number of patients referred by GPs had zero emergency related admissions in comparison to patients referred by hospitals. This gap decreases in the twelve months after the intervention. Based on the average number of separations (shown in Table 6.8), the decreases in the overall number of separations and emergency separations were found to be significantly different and this was established using a 1% CI. This means that for the subsample with data on the 12 months before and after the intervention there was a notable reduction in the number of separations linked to emergencies. As in the other periods of observation, no statistically significant difference was found for length of stay before and after the intervention, however, the decreases were measured to be above one night of stay (on average).

Table 6.4 Number of separations by referral and type of admission – Six months before and after engagement in the program

Number of separations	Six months before				Six months after			
	GP	CISS & Other	Hosp.	All Sources	GP	CISS & Other	Hosp.	All Sources
Admission classification - All								
0	79.5%	.	77.4%	78.7%	84.5%	.	88.7%	85.2%
1	11.9%	.	11.3%	11.9%	6.8%	.	3.8%	6.5%
2	3.7%	.	3.8%	4.0%	3.7%	.	1.9%	3.2%
3	1.4%	.	1.9%	1.4%	1.8%	.	3.8%	2.2%
4 to 10	2.7%	.	5.7%	3.2%	2.7%	.	1.9%	2.5%
11 or more	0.9%	.	0.0%	0.7%	0.5%	.	0.0%	0.4%
n	*219*	.	*53*	*277*	*219*	.	*53*	*277*
Statistical Sig.	p-value = 0.831 (Not sig. with 10% CI)				p-value = 0.943 (Not sig. with 10% CI)			
Admission classification - Emergency								
0	84.0%	.	79.2%	82.7%	87.7%	.	88.7%	87.7%
1	11.0%	.	11.3%	11.6%	9.1%	.	5.7%	8.7%
2	2.7%	.	1.9%	2.5%	1.4%	.	5.7%	2.2%
3	1.8%	.	3.8%	2.2%	0.9%	.	0.0%	0.7%
4 to 10	0.5%	.	3.8%	1.1%	0.9%	.	0.0%	0.7%
11 or more	0.0%	.	0.0%	0.0%	0.0%	.	0.0%	0.0%
n	*219*	.	*53*	*277*	*219*	.	*53*	*277*
Statistical Sig.	p-value = 0.302 (Not sig. with 10% CI)				p-value = 0.627 (Not sig. with 10% CI)			
Admission classification - Elective								
0	92.2%	.	92.5%	92.1%	93.6%	.	94.3%	93.9%
1	6.4%	.	7.5%	6.9%	4.6%	.	3.8%	4.3%
2	0.5%	.	0.0%	0.4%	0.9%	.	0.0%	0.7%
3	0.5%	.	0.0%	0.4%	0.0%	.	1.9%	0.4%
4 to 10	0.5%	.	0.0%	0.4%	0.9%	.	0.0%	0.7%
11 or more	0.0%	.	0.0%	0.0%	0.0%	.	0.0%	0.0%
n	*219*	.	*53*	*277*	*219*	.	*53*	*277*
Statistical Sig.	p-value = 0.973 (Not sig. with 10% CI)				p-value = 0.693 (Not sig. with 10% CI)			

Note that '.' indicates cases where the data was below 10 observations.

Table 6.5 Average number of separations by type of admisison – Six months before and after engagement in the program

	Mean	Statistical Sig.
	Admission classification - All	
Six months before	0.53	p-value = 0.051 (Sig. with 10% CI)
Six months after	0.35	
n	*277*	
	Admission classification - Emergency	
Six months before	0.28	p-value = 0.036 (Sig. with 5% CI)
Six months after	0.18	
n	*277*	
	Admission classification - Elective	
Six months before	0.11	p-value = 0.776 (Not sig. with 10% CI)
Six months after	0.10	
n	*277*	

Table 6.6 Average number of overnight bed days by type of admission – Six months before and after engagement in the program

	Mean	Statistical Sig.
	Admission classification - All	
Six months before	2.27	p-value = 0.792 (Not sig. with 10% CI)
Six months after	2.07	
n	*277*	
	Admission classification - Emergency	
Six months before	1.14	p-value = 0.676 (Not sig. with 10% CI)
Six months after	1.38	
n	*277*	
	Admission classification - Elective	
Six months before	0.61	p-value = 0.933 (Not sig. with 10% CI)
Six months after	0.58	
n	*277*	

Table 6.7 Number of separations by referral and type of admission – Twelve months before and after engagement in the program

Number of separations	Twelve months before				Twelve months after			
	GP	CISS & Other	Hosp.	All Sources	GP	CISS & Other	Hosp.	All Sources
Admission classification - All								
0	32.7%	.	27.8%	31.4%	46.9%	.	55.6%	48.3%
1	35.7%	.	27.8%	34.7%	23.5%	.	22.2%	23.7%
2	15.3%	.	11.1%	14.4%	14.3%	.	5.6%	12.7%
3	3.1%	.	0.0%	2.5%	7.1%	.	0.0%	5.9%
4 to 10	9.2%	.	33.3%	13.6%	7.1%	.	16.7%	8.5%
11 or more	4.1%	.	0.0%	3.4%	1.0%	.	0.0%	0.8%
n	*98*	.	*18*	*118*	*98*	.	*18*	*118*
Statistical Sig.	p-value = 0.312 (Not sig. with 10% CI)				p-value = 0.860 (Not sig. with 10% CI)			
Admission classification - Emergency								
0	46.9%	.	33.3%	44.1%	60.2%	.	55.6%	59.3%
1	32.7%	.	22.2%	32.2%	27.6%	.	27.8%	28.0%
2	9.2%	.	11.1%	9.3%	7.1%	.	5.6%	6.8%
3	6.1%	.	5.6%	5.9%	2.0%	.	0.0%	1.7%
4 to 10	4.1%	.	27.8%	7.6%	3.1%	.	11.1%	4.2%
11 or more	1.0%	.	0.0%	0.8%	0.0%	.	0.0%	0.0%
n	*98*	.	*18*	*118*	*98*	.	*18*	*118*
Statistical Sig.	p-value = 0.077 (Sig. with 10% CI)				p-value = 0.903 (Not sig. with 10% CI)			
Admission classification - Elective								
0	74.5%	.	72.2%	73.7%	76.5%	.	83.3%	78.0%
1	18.4%	.	16.7%	17.8%	14.3%	.	11.1%	13.6%
2	3.1%	.	5.6%	3.4%	6.1%	.	0.0%	5.1%
3	2.0%	.	0.0%	2.5%	1.0%	.	5.6%	1.7%
4 to 10	2.0%	.	5.6%	2.5%	2.0%	.	0.0%	1.7%
11 or more	0.0%	.	0.0%	0.0%	0.0%	.	0.0%	0.0%
n	*98*	.	*18*	*118*	*98*	.	*18*	*118*
Statistical Sig.	p-value = 0.010 (Sig. with 1% CI)				p-value = 0.846 (Not sig. with 10% CI)			

Note that '.' indicates cases where the data was below 10 observations.

Table 6.8 Average number of separations by type of admission – Twelve months before and after engagement in the program

	Mean	Statistical Sig.
	Admission classification - All	
Twelve months before	2.21	p-value = 0.004 (Sig. with 1% CI)
Twelve months after	1.20	
n	*118*	
	Admission classification - Emergency	
Twelve months before	1.19	p-value = 0.002 (Sig. with 1% CI)
Twelve months after	0.65	
n	*118*	
	Admission classification - Elective	
Twelve months before	0.47	p-value = 0.235 (Not sig. with 10% CI)
Twelve months after	0.36	
n	*118*	

Table 6.9 Average number of overnight bed days by type of admission – Twelve months before and after engagement in the program

	Mean	Statistical Sig.
	Admission classification - All	
Twelve months before	8.92	p-value = 0.204 (Not sig. with 10% CI)
Twelve months after	6.19	
n	*118*	
	Admission classification - Emergency	
Twelve months before	5.09	p-value = 0.443 (Not sig. with 10% CI)
Twelve months after	3.95	
n	*118*	
	Admission classification - Elective	
Twelve months before	1.90	p-value = 0.764 (Not sig. with 10% CI)
Twelve months after	1.64	
n	*118*	

6.2 ED attendances

This section focuses on the number of ED attendances before and after engagement in the program. Table 6.10 shows the number of ED attendances by referral type for a three month pre and post intervention observation period. As was the case for emergency related hospital separations in the twelve months before the intervention, there were significant differences in the number of ED attendances by referral type before and after the intervention. Only 54% of hospital referrals to the program were patients who had no ED attendance during the previous three months. In contrast, 88% of patients referred by hospitals had no ED attendance in the three months after the intervention. For GP referrals, there were 72% of patients with zero ED attendances in the three months before the intervention and this increased to 78% in the three months after the intervention.

Based on the average number of ED attendances (shown in Table 6.11) the decrease in ED attendances was significantly different for the three months before and after the intervention. This is based on a paired sample t-test of the average number of ED attendances before and after the intervention. Note that these averages include zero values. The interpretation is the same as that for hospital separations. Hence, this average captures changes in the number of ED attendances and also captures whether more people had no ED attendances recorded by the Metro North Health Service District hospitals in the period after the intervention.

Table 6.10 Number of ED attendances by referral – Three months before and after engagement in the program

Number of ED attendances	Three months before				Three months after			
	GP	CISS & Other	Hosp.	All Sources	GP	CISS & Other	Hosp.	All Sources
0	71.6%	.	53.6%	68.0%	78.0%	.	88.1%	83.4%
1	21.7%	.	26.2%	22.6%	16.4%	.	2.4%	4.1%
2	3.8%	.	7.1%	4.6%	2.9%	.	1.2%	0.7%
3	1.5%	.	7.1%	2.5%	2.1%	.	2.4%	0.9%
4 to 10	1.5%	.	4.8%	2.1%	0.6%	.	1.2%	1.2%
11 or more	0.0%	.	1.2%	0.2%	0.0%	.	0.0%	0.0%
n	*341*	.	*84*	*434*	*341*	.	*84*	*434*
Statistical Sig.	p-value = 0.011 (Sig. with 5% CI)				p-value = 0.035 (Sig. with 5% CI)			

Note that '.' indicates cases where the data was below 10 observations.

Table 6.11 Average number of ED attendances – Three months before and after engagement in the program

	Mean	Statistical Sig.
Three months before	0.54	p-value = 0.013 (Sig. with 5% CI)
Three months after	0.40	
n	*434*	

Table 6.12 shows the number of ED attendances by referral type for a six month period of observation. Again, there were significant differences in the number of ED attendances by referral type both before and after the intervention. Only 28% of hospital referrals to the program were patients who had no ED attendance during the previous six months. In contrast, 50% of these patients had no ED attendance in the six months after the intervention. For GP referrals, there were 56% of patients with zero ED attendances in the six months before the intervention and this increased to 63% in the six months after the intervention.

Based on the average number of ED attendances (shown in Table 6.13) the decrease in ED attendances were significantly different for the six months before and after the intervention.

Table 6.12 Number of ED attendances by referral – Six months before and after engagement in the program

	Six months before				Six months after			
	GP	**CISS & Other**	**Hosp.**	**All Sources**	**GP**	**CISS & Other**	**Hosp.**	**All Sources**
0	55.8%	.	27.6%	50.4%	62.6%	.	50.0%	60.6%
1	29.5%	.	29.3%	30.0%	27.0%	.	19.0%	25.4%
2	8.3%	.	15.5%	9.6%	5.4%	.	19.0%	7.9%
3	3.2%	.	10.3%	4.4%	4.0%	.	5.2%	4.1%
4 to 10	3.2%	.	15.5%	5.2%	1.1%	.	5.2%	1.7%
11 or more	0.0%	.	1.7%	0.3%	0.0%	.	1.7%	0.3%
n	*278*	.	*58*	*343*	*278*	.	*58*	*343*
Statistical Sig.	p-value = 0.000 (Sig. with 1% CI)				p-value = 0.006 (Sig. with 1% CI)			

Note that '.' indicates cases where the data was below 10 observations.

Table 6.13 Average number of ED attendances – Six months before and after engagement in the program

	Mean	**Statistical Sig.**
Six months before	1.01	p-value = 0.000 (Sig. with 1% CI)
Six months after	0.68	
n	*343*	

Table 6.14 shows the number of ED attendances by referral type for a twelve month period of observation. This time there are no significant differences in the number of ED attendances by referral type both before and after the intervention. Only 17% of hospital referrals to the program were patients who had no ED attendance during the previous twelve months. In contrast, 39% of these patients had no ED attendance in the twelve months after the intervention. For GP referrals, there were 39% of patients with zero ED attendances in

the twelve months before the intervention and this increased to 46% in the twelve months after the intervention.

Based on the average number of ED attendances (shown in Table 6.15) the decrease in ED attendances were significantly different for the twelve months before and after the intervention.

Table 6.14 Number of ED attendances by referral – Twelve months before and after engagement in the program

	Twelve months before				Twelve months after			
	GP	CISS & Other	Hosp.	All Sources	GP	CISS & Other	Hosp.	All Sources
0	39.2%	.	16.7%	34.7%	46.1%	.	38.9%	46.0%
1	33.3%	.	27.8%	33.1%	35.3%	.	33.3%	34.7%
2	11.8%	.	22.2%	13.7%	10.8%	.	16.7%	11.3%
3	3.9%	.	5.6%	4.8%	3.9%	.	0.0%	3.2%
4 to 10	9.8%	.	27.8%	12.1%	3.9%	.	11.1%	4.8%
11 or more	2.0%	.	0.0%	1.6%	0.0%	.	0.0%	0.0%
n	*102*	*.*	*18*	*124*	*102*	*.*	*18*	*124*
Statistical Sig.	p-value = 0.157 (Not sig. with 10% CI)				p-value = 0.790 (Not sig. with 10% CI)			

Note that '.' indicates cases where the data was below 10 observations.

Table 6.15 Average number of ED attendances – Twelve months before and after engagement in the program

	Mean	Statistical Sig.
Twelve months before	1.65	p-value = 0.001 (Sig. with 1% CI)
Twelve months after	0.93	
n	*124*	

7 Summary of findings

This last section of the report discusses the key findings of the evaluation. These are: the profile of the referred patients and the rate of consent across referral sources (section 7.1), expenditure allocation and changes to the Acuity score (section 7.2), and the impact of the intervention on the number of hospital separations and ED presentations (section 7.3).

7.1 Profile of referred patients and the rate of consent across referral source

The majority of the referrals were from GPs and this type of referral accounted for 2148 out of 2544 patients referred to the program between 2014 and 2016. Most of the referrals were patients aged 75 years or older, who lived with a family member, were retired and had between two and three morbidities.

Overall, approximately 73% of patients referred between 2014 and 2016 did provide consent and entered the program. Almost 79% of patients referred by GPs between 2014 and 2016 gave consent. This is statistically different to the rate of consent associated with referrals from Community and Indigenous Subacute Services (CISS) and other sources (66%) and hospitals (approx. 39%).

For those who consented, there were differences in the prevalence of certain morbidities across the referral sources. Endocrine/metabolic conditions were the most prevalent condition for patients referred from CISS & other sources whereas almost half of hospital referrals had respiratory conditions. More than half of the consenters from GP referrals had musculoskeletal conditions.

In 2016, the majority of referrals to the program were still from GPs. Based on the trends in the referral patterns, in future years, the program may be referred a greater proportion of patients with respiratory disease and a lower proportion of patients with musculoskeletal conditions. In turn, this may have consequences on the target patient groups, the types of services needed and the generalisability of the results reported in this report.

7.2 Expenditure allocation and changes to Acuity score

The greatest incidence of expenditure coincided with the provision of goods and equipment rather than Allied Health Care referrals. However, it should be noted that this does not include referrals paid by Medicare so these results are likely to underestimate the total resource allocation. Within all categories of expenditure, the largest average cost and the most common type of expenditure was associated with personal alarms. The next most common type of expenditure coincided with mobility equipment. Average expenditure was similar across all referral sources. For the 461 patients with non-zero expenditure, the average spent was $220 regardless of referral source.

Across all of the referral sources, the average Acuity score at the commencement of the intervention was 5.8 and at the completion of the intervention the average was 5.3. While this indicates that an improvement occurred, both of these scores placed the average

patient within the *good* level of complexity (which has a range between 5 and 6). Generally, there was an improvement in Acuity scores and, at times, this was significant using a 1% confidence interval. All three sub-groups of the Acuity indicator had a decrease in the respective average scores; however, the largest improvements were found in the home environment dimension. This is consistent with the largest proportion of expenditure being committed to personal alarms, mobility equipment and medical equipment.

Decreases in Acuity were found to be related with the initial level of complexity of the patient and tended to be concentrated in improvements to the home environment. Using the average score, the average patient remained within the good classification of complexity and did not move down to the basic complexity category. However, approximately 39% of those patients classified as good before the intervention did move down to the basic complexity classification. This reflects the finding that the initial level of complexity was important in determining whether patients improved. It is expected that the most complex patients were less likely to have improved Acuity classifications in a short amount of time. It should be noted that without a proper control group, it is difficult to ascertain the direct impact of the Team Care program on the Acuity score. It is plausible that the before-and-after comparisons underestimate the effect of the program if, for example, Acuity scores would have increased over time without program participation.

7.3 Separations, length of stay and ED attendances

As we could not establish a comparison group, we conducted a pre/post analysis using fixed periods of time to observe whether the patterns of hospital separations and ED presentations changed over time for different referral and admission types. Using a period of three/six/twelve months, we tested whether any differences between the period before and after the intervention were significant and persisted across all observation periods.

The admission classifications used are those that classify patients into emergency admissions, elective admissions and admissions not assigned a classification (which includes obstetrics, statistical admissions and planned readmissions). The number of separations for all admissions and emergency admissions were found to have decreased in the majority of cases and were statistically significant. This was particularly the case for an observation period of twelve months after the intervention occurred. In none of the observation periods was a reduction in length of stay found to be statistically significant.

Whether the full extent of the decrease in separations is directly attributable to the program is hard to gauge without a valid comparison group, however, it should be noted that when we focused on those patients who were admitted for injuries it was the case that notable reductions in admissions for injuries were found. For those patients who were admitted to hospital for injuries in the previous three months before the intervention (i.e. 22 patients), we found that the number of admissions due to an injury in the three months after the intervention had decreased to zero. While this was a small proportion of the overall group participating in the program, it reflects the improved safety in the home environment, and this is one of the key objectives of the program. Furthermore, the largest change in the Acuity scores coincided with improvements in the home environment for those patients with less than moderately severe complexity.

Statistically significant decreases in the number of separations for those admitted to hospital due to an emergency across all of the periods of observation does suggest that the program

has reduced the frequency of patients returning to hospital after the intervention. In addition, reductions in ED attendances were also found for all observation periods and were statistically significant.

As the program sends Team Care Coordinators to a patient's home and assesses the risks that are present using an Acuity score that focuses on clinical, psychosocial and environmental indicators, we believe that the program has had an important role to play in identifying the underlying causes of emergency attendances and ED presentations. The program's role in mitigating the risk of emergency attendances and ED presentations is reflected in the provision of general/in-home support, medical equipment, mobility equipment and personal alarms. While the program also links patients with allied health care professionals, we believe that one of the unique contributions of the program is having Team Care Coordinators perform an assessment of the home environment and assessing the patient's physical/psychosocial status as a follow up in a setting that is outside of a medical institution (i.e. a GP practice or hospital). It should be noted that Bodenheimer (2008) identified a range of practices that were deemed as useful for effective care management after hospital discharge. This included having nurses conduct post-discharge home visits.

While we assessed the allocation of funds to certain participants to evaluate whether this led to changes in outcomes, we do not expect that program expenditures will be directly counter-balanced by reduced expenditures in other sections of the healthcare sector. This is not a component of the program's design and the data we had access to was inappropriate for such an investigation. It could be an interesting topic for future research as our results show decreased hospitalisations and ED attendances. However, to do such an evaluation there would be a need to gain access to other healthcare utilisation data, including comprehensive data on the use of medical services for both an intervention and control group.

Furthermore, to strengthen the causal interpretation of the results in this report the identification of a comparison group would have been beneficial. With an appropriate comparison group, we would have been able to compare how a reference group's complexity and hospital admissions changed without the intervention. With such a comparison, results focusing on a short-term observation periods are likely to be more reliable. While we investigated options with Brisbane North PHN to establish a comparison group (including patients from neighbouring regions), it was determined that this was not feasible at the time. That said, the consistency in the results over alternative observation periods provides additional confidence in the robustness of our findings.

8 Coordinated Care evaluations from Australia and elsewhere

Section 8 contains the review of Coordinated Care evaluations from Australia and elsewhere. The discussion is separated into the evaluations that were conducted in Australia (section 8.1) and the US and UK (section 8.2). Section 8.3 discusses a range of recommendations on program design from a range of studies. Section 8.4 provides an overview of the issues discussed by the evaluations. Section 8.4.1 concludes the review of past Coordinated Care evaluations with a list of the main lessons that we believe are important to keep in mind for the assessment.

8.1 Australian evaluations

In this section, we focus on the coordinated care trials that were conducted in Australia between 1997 and 1999 and a second round of trials conducted between 2002 and 2005. Section 8.1.1 discusses the national evaluation and the local evaluations that formed the first round of the Australian coordinated care trials. The first national evaluation report concludes with a set of recommended strategies and these are discussed in the conclusion of section 8.1.2. Section 8.1.3 then focuses on the second round of the Australian coordinated care trials. As the second round of the Australian coordinated care trials focused on the period between 2002 and 2005, in section 8.1.4 we focus on a selection of coordinated care evaluations conducted in Australia in the period after 2005.

8.1.1 The first round of the Australian coordinated care trials

The first round of the Australian coordinated care trials arose from a Council of Australian Government (COAG) proposal that healthcare and community services be restructured into three streams based on whether individuals needed occasional or uncomplicated care, specialised services for acute conditions or a coordinated healthcare service for an extended period. The evaluation that commenced three years after this proposal has been labelled as being ambitious and was conducted in a wide range of locations (two in South Australia[3], two in NSW, two in Victoria, one in the Australian Capital Territory, one in Queensland and one in Tasmania); significant reductions in hospital admissions were only found in three of the nine trials and most trials incurred an operating deficit, which means that they did not operate using existing resources; thereby breaking one of the requirements (Department of Health and Aged Care, 2001).

The evaluation of the first round of trials focused on a range of hypotheses that were designed before the trials were launched. The primary hypothesis to be evaluated was "that coordination of care of people with multiple service needs, where care is accessed through individual care plans and funds pooled from existing Commonwealth, State and joint programs, would result in improved individual client health and well-being within existing resources" (Department of Health and Aged Care, 2001). The quantitative measures related to hypothesis one used the 36-item short form health survey (SF-36) as the basis of the

[3] SA HealthPlus was comprised of four sub-trials that targeted different groups within central Adelaide, southern Adelaide, western Adelaide and the Eyre Peninsula.

measurement of health and well-being. The national evaluation combined all participants in local trials into one group and showed inconclusive results when the coordinated care participants were compared to a control group. And while the evaluation report concluded that some clients may have had improved well-being, it also noted that any improvements were not achieved using existing resources. The first national evaluation report also noted that the original expectation of improved well-being was likely to have been unrealistic within the time available.

In discussing the lessons learned from the trials, Esterman and Ben-Tovim (2002) identified five design shortcomings that prevented the trials from achieving their objectives. These were: i) the short observation period for the intervention (which tended to be 12 months or less due to a preceding recruitment period and wind-down phase of six months); ii) difficulties in recruitment that led to individuals being included in the trial who were unable to benefit from coordinated care; iii) the application of the same intervention to participants regardless of their condition's severity or their ability to respond to the intervention; iv) inconsistent interventions across trials; and v) inappropriate outcomes used to assess an intervention that was applied over a short trial period (Esterman & Ben-Tovim, 2002).

In addition to these issues, the national evaluation report pointed out that the evaluation was limited in several ways. This included the following issues:

- A hypothesis driven evaluation framework was locked-in from the beginning and imposed restrictions that were inappropriate for the evaluation of the programs implemented.
- Programs were developed 'on the run' and no pilot stage was allowed for before full implementation.
- Timelines were tight for both the trials and the evaluators. This was judged to have placed limitations on what could be achieved.
- The instrument used to evaluate hypothesis one, SF-36, was chosen as a measure of health status. However, this was in contrast to the feasible benefit that was likely to result from care coordination. The national evaluation report notes that a feasible benefit would have been an improved functioning within an existing health status and as a result the instrument used was inappropriate to detect subtle changes that could have occurred during the trial period.
- Data limitations impacted the trials and the evaluation.
- The relationships between stakeholders were complex and prevented an adjustment of the expectations and requirements of the trials when issues became apparent.
- The characteristics of the clients who became trial participants were important and the assessment of the trials depended upon the ability of the evaluators to measure the impact of these characteristics when determining trial effect.

- The trials depended upon coordinator skill and interest in utilising the model of coordination within their area.

As each local trial was intended to be a local test of the hypothesis proposed, a range of studies have focused on evaluating the individual trials that were part of the first round of the Australian coordinated care trials. Accordingly, we now turn our attention to the individual context/circumstances and results associated with a selection of these trials. The selection of the trials that are focused upon in this paper is based on whether we believed the study provided information that was relevant to the limitations identified by the first national evaluation. Sections 8.1.1.1 and 8.1.1.2 review the selected studies.

8.1.1.1 Southern Health Care Network Coordinated Care Trial

The Southern Health Care Network Coordinated Care Trial was conducted in a region on the outskirts of South East Melbourne by the Southern Health Care Network and included 2,742 participants. The trial, as described and assessed in Segal et al. (2004), utilised a randomised control design, an economic appraisal and an evaluation that involved quantitative and qualitative data collection. Within the program design, risk levels were used to determine the frequency of care plan review by the GP care coordinator. Low-risk patients had care plans reviewed every 12 months by the care coordinator. This low-risk cohort included 1,254 clients or 70% of the intervention group. Medium risk patients had care plans reviewed every 6 months and phone based support was provided by a service co-ordinator who monitored implementation of the care plan and addressed emergent problems as they arose. This cohort included 441 clients or 24% of the intervention group. High-risk patients had care plans reviewed every 3 months and clients were allocated a case manager who provided traditional intensive case management services. This high-risk cohort included 94 clients or 5% of the intervention group.

While the intervention was designed with different responses for these risk levels, the assessment of client and cost outcomes did not utilise this information and compared a control group to the overall sample of coordinated care participants. The assessment found that there were no significant differences using two quality of life measures and no difference in mortality rates between the two groups. With a high proportion of the coordination care group being low risk and with a short time horizon used, improved quality of life and mortality rates would be a surprising finding. Total resource usage in the coordinated care group was substantially higher due to the extra costs for care planning, case management and for administering the coordinated care model (Segal et al., 2004).

8.1.1.2 Australian Capital Territory (ACT) Coordinated Care Trial

The Australian Capital Territory (ACT) Coordinated Care Trial was conducted by Care Plus and included 1271 participants. Within this program, GPs were the care coordinators and eligible participants were those with complex needs who could benefit from improved care coordination (as identified by their GP). There was no age limit, with Gardner and Sibthorpe (2002) reporting that clients ranged in age from 0 to 91 years, and there was no disease or morbidity eligibility criteria. While there was no discernible impact on client health and well-being, the program was found by Gardner and Sibthorpe (2002) to have operated within existing resources. In addition to reviewing whether outcomes were observed, Gardner and

Sibthorpe (2002) also examined the reasons for the trial's lack of success in achieving its objectives. They concluded that mixed success in implementing the program led to a system where key features of a coordinated care model were set up but participation from GPs was insufficient to make the program effective. The paper stated that "Care Plus was able to establish a pool of funds, control its income through risk management strategies and report on costs, but was unable to induce GPs to become effective purchasers and had no other strategies by which it could manage the pool" (Gardner & Sibthorpe, 2002). Links between care planning and purchasing were not established as GPs tended to be unaware of their role as purchasers or opposed rationing (or both). Gardner and Sibthorpe (2002) also noted that cost-saving strategies were not utilised for a range of reasons. These included a lack of GP awareness of the availability of the funding pool and limited information on costs and quality. In addition to this, "improvements in continuity of care were impeded by limited provider network development and GPs' reluctance to collaborate with other providers" (Gardner & Sibthorpe, 2002).

8.1.2 Recommendations for the development and evaluation of the second-round trials

In late 1998 it became known that additional coordinated care trials were likely to occur and the funding of these trials was confirmed in the 1999/2000 Federal Budget with the allocation of $33.2 million (AUD) for further trials as part of an Enhanced Primary Care Package (Department of Health and Aged Care, 2001). This meant that the context and the scope of the first national evaluation had changed to include the lessons learnt that were useful for the second round of coordinated care trials. Accordingly, the national evaluation report concludes with a section that focuses on strategies that should inform the design of the round two trials and evaluations. These strategies included:

- Establishing an overarching structure that specifies who has responsibility for making a range of decisions that impact both the trial and the evaluation;
- Developing a detailed understanding of usual care (both quantitatively and qualitatively) within the region in which each trial is situated;
- Developing a realistic expectation of feasible changes to the service mix and the likelihood of achieving clearly defined improvements in care;
- Allowing for a prioritisation of strategies at the trial and client level rather than expecting every strategy to be implemented across the board;
- Developing a flexible approach that enables adaptation to occur based on ongoing experience.
- Maximising the effectiveness of data collection and management;
- Ensuring the coordinator role(s) within the trial model were effective;
- Developing a comprehensive approach to client benefit; and
- Refining processes to identify efficiency savings from coordinated care and their availability for use within trials.

8.1.3 The second round of the Australian coordinated care trials

The second round of the Australian coordinated care trials involved five trials that were in operation between 2002 and 2005. As previously noted, the second round of trials was part of the Enhanced Primary Care Package announced in the 1999/2000 Federal Budget. The goal of the package was to improve health outcomes and quality of life for older Australians and people with chronic and complex conditions (PwC and Department of Health and Ageing, 2007). Accordingly, the second round of trials focused on improved access and delivery of services using a whole-of-population approach (with a focus on communities) and the coordination of care for people with chronic and complex needs. The overarching objective of the program was "to provide additional benefits to clients and communities through coordination and integration of care and effective use of resources for identified populations" (PwC and Department of Health and Ageing, 2007). It should be noted that these trials included two trials that targeted a general population and were called the mainstream trials. Three trials focused on Indigenous Australians and were called the Indigenous trials.

Based on the recommendations from the national evaluation of the first round of trials, the key features of the second-round trials were supposed to include:

- A continued focus on exploring approaches to improving care within existing resources;
- A larger scale with each trial expected to include at least 2000 clients;
- A longer period of 'live' operation;
- A focus on increased consumer empowerment;
- Better targeting of coordination services;
- Further exploration and development of best practice disease management approaches and evidence-based protocols of multidisciplinary care;
- Exploration and development of effective partnerships between general practice and non-medical primary and community care;
- Further exploration and development of flexible funding arrangements; and
- The involvement of residential aged care facilities when appropriate (PwC and Department of Health and Ageing, 2007).

In reality, many of the enhancements that were intended to be implemented in the second round of trials were not realised in practice. The second national evaluation report noted that the reasons for this included:

- The trials in the second round did not have many more participants than those in the first round;

- The period of intervention was generally not longer than those in the first trial;
- Neither of the mainstream trials were able to achieve a true pooling of funds;
- Residential aged care facilities were not included in the continuum of care; and
- Access to data was protracted and difficult (PwC and Department of Health and Ageing, 2007).

As the second round of trials covered a broad range of locations, health needs and existing services, the second national evaluation found that there was limited comparability between the two mainstream trials based in Queensland and Victoria and the three trials that focused on Indigenous Australians and were located in New South Australia, the Northern Territory and Western Australia (PwC and Department of Health and Ageing, 2007). As a result, the second national evaluation reviewed the two sets of trials separately and aimed to capture both specific and general lessons from the trials that could inform future policy direction. The discussion of the findings from the second-round evaluation is separated into the mainstream trials (section 8.1.3.1) and the Indigenous trials (section 8.1.3.2).

8.1.3.1 Mainstream trials within the second national evaluation

In the case of the mainstream trials, the evaluation focused on different intervention groups and was able to obtain some positive findings for self-reported health and wellbeing data using the Medical Outcome Short Form (36) Health Survey (SF-36). For people who were deemed early in the trajectory of their chronic condition there was an improvement in health and well-being and improved access to services. The frail elderly reported improved access to services and an improved sense of security about their health. Across all groups there was evidence of improved access to services, improved self-reported health and well-being, and improved health-related empowerment (PwC and Department of Health and Ageing, 2007).

The second national evaluation also noted that if the time horizon was longer, the total intervention cost of the mainstream trials "would have probably fallen below control costs, and may have perhaps absorbed the costs of care coordination" (PwC and Department of Health and Ageing, 2007). However, for the case of frail elderly clients there were notable costs of care coordination and the trial was more expensive than usual care. The second national evaluation report states that the absorption of costs was related to "delivered tangible benefits which may well have expanded with more time, possibly with concurrent reductions in the cost of (especially inpatient) service delivery and, significantly, avoidable hospital admissions" (PwC and Department of Health and Ageing, 2007).

8.1.3.1.1 Team Care Health II (TCHII) trial

The Team Care Health II (TCHII) trial was one of the mainstream trials and was conducted in North Brisbane between February 2003 and June 2005. It had a randomised control design with 1774 patients in the intervention group and 946 in the control group. The trial length was more than 24 months. The outcomes reviewed were i) the use of inpatient services, their cost and a patient's length of stay, ii) avoidable hospitalisations, and iii) ambulatory-sensitive care utilisation.

Many of the outcomes were found to have no significant difference between control and intervention participants. However, service substitution, defined as having increased MBS services and a decrease in inpatient admissions, was found to have occurred. There was a 25% decrease in the utilisation of inpatient admissions based on pre-commencement period in comparison to trial period. At the same time, there was an increase in MBS services of 8%. It should be noted that the finding of service substitution was not strong and that controlling for pre-commencement utilisation did not result in a substitution effect (PwC and Department of Health and Ageing, 2007).

8.1.3.2 Indigenous trials

Within the Indigenous trials, increased access to health services was a key finding of the second round of trials and was attributed to "a range of barriers to access being addressed and the provision of more culturally appropriate services" (PwC and Department of Health and Ageing, 2007). Findings were based on qualitative information that focused on the community level and were related to the removal of barriers to access by addressing physical constraints or the lack of frequent visits of healthcare professionals to remote communities; decreased language barriers through the use of local languages or reducing the complexity of spoken and written English; improved understanding of Indigenous sensitivities (such as the need for gender specific health professionals); and minimising perceived discrimination against Indigenous people by mainstream workers. Nevertheless, the second national evaluation report notes that the level of unmet health need during the Indigenous trials was striking and "despite increasing access, the level of utilisation for health services remained well below Australian population norms given the population health outcomes of the Indigenous trial communities" (PwC and Department of Health and Ageing, 2007).

Before moving onto more recent examples, it should be noted that the second evaluation report also contains features of program design that were thought to be associated with success. These features will be discussed in section 8.3 when we discuss a range of evaluations and studies that formulate a list of program elements that were either classified as being conducive or created barriers to effective coordinated care programs.

8.1.4 Recent experience

The Care Navigation (CN) program was a hospital-based coordinated care program that focused on 500 participants who had presented to the emergency department of Nepean Hospital in Sydney, New South Wales and were identified as having a high-risk of an unplanned admission. High-risk was defined as either a patient over the age of 69 who had three or more unplanned hospital admissions in the previous twelve months, or patients aged between 16 and 69 years who had at least one admission for cardiac or respiratory disease, or those patients judged by a Care Navigation nurse to be high risk and likely to benefit from the program (Plant et al., 2015). Plant et al. (2015) conducted a randomised controlled trial to test whether patients within the Care Navigation intervention had improved quality of life and reduced emergency re-presentations or hospital readmissions in comparison to those with the standard care provided by Nepean Hospital. In addition, the evaluation reviewed whether the program extended the time to first re-presentation and

first readmission, reduced a patient's length of stay and had an impact on the mortality rate. The evaluation found no significant differences in the outcome measures listed above, but did find that the treatment group was more likely to have their medications reviewed by a hospital pharmacist on presentation to hospital and received more community services per year (Plant et al., 2015).

Discussing the implementation of the intervention, Plant et al. (2015) note that Care Navigation was subject to real-world variations and difficulties that are faced by many interventions. Specifically, they listed "staff change, funding sources change, and higher service priorities" (Plant et al., 2015) as factors impacting the intervention. Notably, the number of nurses participating in Care Navigation was reduced from two to one 18 months after recruitment of patients commenced. The loss (and non-replacement) of a key staff member was a crucial factor as the "remaining CN nurse reviewed existing risk assessments, updating participants' requirements where required, but did not carry out any other part of the Inbound CN role due to availability of time and a lack of expertise in ED nursing" (Plant et al., 2015).

8.2 Overseas evaluations

This section focuses on coordinated care evaluations that occurred outside of Australia. Our initial focus is on the United States with a review of the Medicare Coordinated Care Demonstration, followed by a focus on the National Evaluation of the UK Department of Health's Integrated Care Pilots that were conducted in England between 2009 and 2011.

8.2.1 The US Medicare Coordinated Care Demonstration programs

The Medicare Coordinated Care Demonstration was initially legislated in Section 4016 of the Balanced Budget Act of 1997. In 2002, the Centers for Medicare & Medicaid Services (CMS) selected 15 demonstration programs that had initial authorisation to operate for four years. Enrolment of patients occurred between April and September 2002. The demonstration was aimed at evaluating "whether providing coordinated care services to Medicare fee-for-service beneficiaries with complex chronic conditions can yield better patient outcomes without increasing program costs" (CMS, 2008). As it was part of the Balanced Budget Act, the projects were required to be budget neutral and the demonstration was tasked with testing whether coordinated care programs could run using Medicare fee-for-service settings while reducing hospitalisations, improving health status and reducing cost (CMS, 2008).

CMS was required to submit reports to Congress on a bi-annual basis and the discussion that follows focuses on these reports. The first Report to Congress reported on the program's implementation and was released in May 2004 (R. Brown et al., 2004). The second Report to Congress, released in March 2007, evaluated the first two years of the program. The evaluation utilised a self-reported survey of patients' health status, knowledge, behaviour, satisfaction with their health care, quality of care, and quality of life; and also utilised claims-based measures of patients' Medicare service use and expenditures, and the quality of care received (R. S. Brown et al., 2007). After two years, it was found that, in general, patients and

physicians were very satisfied with the program, but only a few of the 15 programs were associated with a statistically significant change in patients' behaviour or use of Medicare services. Differences in Medicare expenditures between the treatment group and the control group were not significantly different for the majority of programs. This was attributed to large variation in Medicare expenditures and the small number of participants in some programs (R. S. Brown et al., 2007).

The third Report to Congress was released in January 2008. The evaluation of the first four years of operation found that most of the programs were associated with a limited or near-zero improvement in the quality of care (Peikes, Brown, Chen, & Schore, 2008). Only a few programs achieved cost neutrality that were deemed to be sustainable (two of the fifteen programs) and none of the programs reduced total Medicare expenditures when care coordination fees were accounted for (Peikes et al., 2008). Overall, it was found that the demonstration programs had increased the Medicare expenditures of the treatment group by 11 percent in comparison to the control group (Peikes et al., 2008). And while Peikes et al. (2008) acknowledged that budget neutrality had not been achieved and conceded that preventing additional costs created by care coordination fees could only be guaranteed with the termination of all of the demonstration programs, they also noted that "failing to pursue effective programs such as Health Quality Partners or QMed (and possibly Mercy Medical Center) may mean a missed opportunity to substantially improve the quality of care for chronically ill beneficiaries at no increase in cost to Medicare" (Peikes et al., 2008). In accordance with these findings, three programs were considered for extension by CMS, but only Health Quality Partners continued to operate beyond 2008 and at the time of the fourth Report to Congress a revised version of the Health Quality Partners program had been extended until June 2013 (Schore, Peikes, Peterson, Gerolamo, & Brown, 2011).

The fourth Report to Congress was released in March 2011 and reported on the two programs that were in operation for the entire period between April 2002 and September 2008 (Schore et al., 2011). The report focused on 2,965 participants from the Health Quality Partners (HQP) and Mercy Medical Center programs and found that while neither of the programs were cost effective overall, there were promising results for high-risk patients. In relation to this, the report noted that "for a subgroup of enrolees at greater risk of hospitalization and high costs, HQP generated savings for CMS of $397 per beneficiary per month after including the care coordination fee" (Schore et al., 2011). Note that the high-risk group included those who had congestive heart failure (CHF), coronary heart disease (CAD), or chronic obtrusive pulmonary disease (COPD) and at least one hospitalisation in the year prior to enrolment in the program (Schore et al., 2011). While the patients and providers in the program were highly satisfied, there was limited evidence of improvements to the quality of care. A few improved measures of preventative services and lower mortality rates were found for Health Quality Partners, but findings for the high-risk group were not statistically significant and this was deemed to be due to small sample sizes (Schore et al., 2011).

8.2.2 Health Quality Partners Extension – Post-2010

Based on favourable results from the first few reports to Congress, the Health Quality Partners program was extended on multiple occasions and ran for a total of twelve years. Peterson, Zurovac, Mutti, Stepanczuk, and Brown (2015) conducted the final evaluation related to the Medicare Coordinated Care Demonstration by focusing on the entire history of the Health Quality Partners program, which ran from 2002 until 2014. It should be noted that an interim report on the post-2010 extension found that in contrast to strong findings before the extension, the period between 2010 and 2014 was not associated with significant reductions in hospitalisations or Medicare expenditures for any of the samples (Zurovac, Peterson, Stepanczuk, & Brown, 2014). In addition, "for the high-risk group, HQP increased expenditures by an estimated 17 percent during the extension, after factoring in program fees" (Zurovac et al., 2014). Accordingly, the final evaluation report included a strong focus on possible explanations for the decline in impact between 2010 and 2014.

In response to finding increased expenditures, Peterson et al. (2015) tested five hypotheses that were potential explanations for the lack of the project's impact between 2010 and 2014. These were that patient tenure was shorter during the project extension; usual care of the control group improved; the population was either too ill or too complex to benefit from the intervention; the intervention became less intensive for high-risk patients; or service disruptions related to near-complete shutdowns of services in 2010 and 2013 made the HQP program less effective. The final evaluation report found evidence for only one of these explanations, this being that an improvement in usual care had occurred. However, it should be noted that Peterson et al. (2015) were unable to attribute an improvement in usual care to any factor that could explain a reduction in hospitalisations for the control group (Peterson et al., 2015).

Based on the extension period, Peterson et al. (2015) noted that the "results of this evaluation substantially reduce the confidence that HQP's model of fee-for-service care management can improve quality and reduce Medicare expenditures in today's health care environment, at least in the geographic region in which HQP operated" (Peterson et al., 2015). They conclude that improved usual care in the geographic area where the intervention took place limited the ability of the Health Quality Partners program to repeat its earlier success. As a result, Peterson et al. (2015) conclude that a similar program could be effective in a region where the quality of usual care is sufficiently low for high-risk patients. As initiatives like patient-centred medical homes, accountable care organisations and hospital-based transitional care programs have become more common, Peterson et al. (2015) note that an initial review of whether a gap in services exists would be warranted before a coordinated care program is considered and implemented. If notable preventable hospitalisations amongst high-risk patients are found, the program elements that were conducive to success in the pre-2010 period of the Health Quality Partners program (discussed in section 8.3) may be useful for policy design purposes.

8.2.3 National Evaluation of the Department of Health's Integrated Care Pilots

The UK Department of Health's Integrated Care Pilots was a two-year initiative that aimed to explore different ways of providing integrated care through 16 pilots run by organisations across England between 2009 and 2011. The quantitative analysis within the national evaluation used hospital utilisation data, surveys of the staff-members of the programs and surveys of patient/service-user experience (RAND Europe and Ernst & Young, 2012). Similar to the evaluations in Australia and the US, many of the English pilots aimed to reduce hospital utilisation. The national evaluation did find that there were reductions in planned admissions and in outpatient attendance, but found no evidence of a widespread reduction in emergency admissions. Accordingly, there was no general change in the costs of secondary care utilisation that was statistically significant; however, a net reduction in combined inpatient and outpatient costs was attributed to case management sites (RAND Europe and Ernst & Young, 2012).

The national evaluation noted that increases in the use of care plans and the development of new roles led staff to believe that these process improvements resulted in care improvements. However, it was found that this was not a view shared by patients and that the changes were a professional rather than user-driven change, or that it was too soon to assess whether valid change had occurred. The national evaluation concluded that improvements in the quality of care could occur within a well-managed project that is tailored to local circumstances and patient need, noting that improvements were not likely to occur in the short term. While cost savings were not inevitable, "case management approaches used in the pilots could lead to an overall reduction in secondary care costs" (RAND Europe and Ernst & Young, 2012).

8.3 Discussion

The studies discussed have focused on the evaluation of coordinated care programs. There are a range of evaluations that formulate a list of program elements that are conducive to or create barriers to establishing effective coordinated care programs. After reviewing the recommendations from the second round of Australian trials (section 8.3.1) and the Medicare coordinated care demonstration (section 8.3.2), we focus on studies that formulate recommendations based on a range of evaluations. This is important as it confirms whether the issues found in these major trials hold for a wider range of evaluations.

8.3.1 Recommendations on program design from the second round of Australian trials

The second evaluation of the Australian trials presented four drivers of success that were associated with the second round of national trials. These were:

- Gaining effective participation of GPs through the use of financial incentives (or alternatively reducing the disincentives) and engaging with key organisations (such as divisions of general practice) or building partnerships with existing providers;
- Ensuring that trained health staff are available to manage the care coordination and service coordination workload and ensuring that this is linked to financing that is based on accurate estimates of the time taken to conduct participant follow-up, which accounts for the complexity and acuity of conditions that patients are likely to have;
- Accounting for the considerable amount of time that is needed to build governance and management processes/systems that need to be in place from the outset of the intervention; and
- Successfully implementing information management and technology to ensure effective electronic communication, networking and data flows (PwC and Department of Health and Ageing, 2007).

8.3.2 Recommendations on program design from the Medicare coordinated care demonstration

Within the fourth report to Congress (Schore et al., 2011) and a publication in Health Affairs (R. S. Brown, Peikes, Peterson, Schore, & Razafindrakoto, 2012), six approaches were identified as being conducive to success as they were practiced by care coordinators in at least three of the four successful Medicare coordinated care demonstration programs. As listed within R. S. Brown et al. (2012) these practices involved care coordinators:

- Conducting frequent in-person meetings with patients (as opposed to relying upon phone calls);
- Occasionally meeting with providers in person;
- Acting as a communications link between providers;

- Delivering education to patients that is reliable and based on evidence;
- Providing assistance to achieve strong medication management; and
- Providing assistance to achieve comprehensive transitional care after hospitalisations (R. S. Brown et al., 2012).

In addition, the fourth report to Congress (Schore et al., 2011) specified that using highly educated and experienced registered nurses as care coordinators and having social work resources available for patients with psychological problems were additional recommended features for future care coordination programs.

8.3.3 Recommendations from a review of a range of studies

Bodenheimer (2008) reviewed a range of studies with the aim of providing examples of improved care coordination and barriers to seamless coordination. With respect to the coordination between primary care providers and specialty care providers, Bodenheimer (2008) noted that electronic referrals and referral agreements were important. A range of practices were identified as being useful in relation to the care provided after hospital discharge. This included hospitalist-initiated projects related to developing a comprehensive discharge plan; having advanced-practice nurses conduct in-hospital and post-discharge home visits; and training patients and/or their families to assist in the coordination of their own care in a manner that fosters independence. Barriers to seamless coordination included an overstressed primary care system, a lack of inter-operable computerised records, dysfunctional financing and a reliance on small independent providers who are unable to access patient records from other independent care providers (Bodenheimer, 2008).

Davies et al. (2008) conducted a review of the literature between 1995 and 2006 to identify 85 studies that focused on care coordination in Australia, the United States, the United Kingdom, New Zealand, Canada and The Netherlands. These studies were used to classify the types of strategies used to coordinate care. These strategies were grouped into those that were implemented at the patient and provider level, the organisational level and the system level. The majority of strategies were implemented at the patient and provider level with a focus on providing communication and support for providers and patients or providing structural arrangements to support coordination. All of the individual strategies at the patient/provider level were associated with improved health or patient satisfaction in at least half of the studies that measured these outcomes. Accordingly, none of the strategies were singled out as being more successful than another, however Davies et al. (2008) noted that interventions using several strategies were more likely to be successful than those using single strategies. The strategies implemented at the patient and provider level included:

- Arrangements aimed at improving communication between service providers (mentioned in 56 studies);
- Systems that supported care coordination (mentioned in 47 studies). This includes care plans, shared decision support, patient-held or shared records, shared information or communication systems, and a register of patients;

- Structured arrangements for coordinating service provision between providers (mentioned in 37 studies). This includes joint consultations, shared assessments, and arrangements for priority access to another service;

- Providing support for service providers (mentioned in 33 studies). This includes support or supervision for clinicians, training, reminders, and arrangements for facilitating communication;

- Structuring the relationships between service providers and with patients (mentioned in 33 studies). This includes co-location, case management, multidisciplinary teams or assigning patients to a particular primary health care provider; and

- Providing support for patients (mentioned in 19 studies). This includes education, reminders, and assistance in accessing primary health care. (Davies et al., 2008)

A report commissioned by the European Commission's Directorate-General for Health and Consumers focused on the evidence of the economic impacts of integrated care and concluded that there was mixed evidence for the cost-effectiveness of integrated care. While utilisation and cost were the most common economic outcomes assessed, the reporting of measures was found to be inconsistent and the quality of the evidence was deemed to be low (Nolte & Pitchforth, 2014). One of the challenges was deemed to be the variety of definitions and descriptions of integrated care interventions, as well as the types of care under study. In relation to this, Nolte and Pitchforth (2014) noted that none of the studies that they had reviewed focused on explicitly defining the term 'integrated care' and that revisiting what integrated care is and seeks to achieve will be important for future evaluations (Nolte & Pitchforth, 2014). Nolte and Pitchforth (2014) ask whether integrated care interventions "ought to be cost-effective and support financial sustainability, or whether it is to be interpreted and evaluated as a complex strategy to innovate and implement long-lasting change in the way services in the health and social-care sectors are being delivered and that involve multiple changes at multiple levels" (Nolte & Pitchforth, 2014). Nolte and Pitchforth (2014) indicate that the evidence they have reviewed points towards a need for extended evaluations and implies that the latter view is appropriate.

So while Nolte and Pitchforth (2014) and many of the studies reviewed have claimed that the evaluation of integrated care has led to inconclusive evidence and that a focus on what integrated care is and aims to achieve is warranted, enthusiasm for integrated care continues to be supported by claims of documented evidence. For example, a recent WHO report opened with the claim that "the benefits of a people-centred and integrated approach are well documented: increased delivery efficiency, decreased costs, improved equity in uptake of service, better health literacy and self-care, increased satisfaction with care, improved relationships between patients and their care providers, and an improved ability to respond to health-care crises" (World Health Organization, 2015).

8.3.4 Summary of recommendations

In many ways, the recommendations made for future evaluations were based on the issues that programs faced during their lifetime. In most of the studies directly reviewed in this paper, the coordinated care programs were short-lived trials and the lack of longevity of the programs was related to many of the issues they faced. Establishing effective and engaged participation from GPs and care coordinators (who were recommended to be qualified healthcare professionals) is dependent upon stable financial incentives and many of the programs reviewed faced issues in ensuring their funding was maintained. Many of the programs faced a battle to be funded beyond a few years and this impacted upon the staffing and implementation of the programs. Building the infrastructure needed for effective care coordination was difficult without appropriate financing and this is reflected in many of the recommendations. These include gaining qualified staff, implementing information management systems and needing more time to either implement or evaluate the programs. In many cases, the programs were required to be budget neutral within a limited amount of time and many studies highlighted a need for the trial design to correctly account for the time and financial resources needed to establish effective care coordination. It should be acknowledged that one evaluation did run for twelve years; however this involved four extensions of its lifetime[4] and changes to the target group based on the risk of hospitalisation and expansions into new geographic areas (Peterson et al., 2015).

8.4 Conclusion of discussion on coordinated care evaluations

Over the past twenty years a range of evaluations of coordinated care programs have fuelled interest in the integration of care but have found mixed or poor results with respect to their impacts on outcomes (such as quality of life, mortality, hospital admissions and emergency department visits) and cost neutrality. In many cases the limited longevity of programs impacted upon the feasibility of a positive evaluation and in some cases, such as the Australian trials, a second round of trials that intended to learn from previous mistakes largely failed to do so. Reoccurring issues with the evaluation of coordinated care programs tend to be related to how the project was implemented and include difficulties in securing or maintaining the participation of qualified staff to act as care coordinators (either a GP or nurse). Many studies criticised the limited timeframes for the commencement, intervention and evaluations of programs. Financing the infrastructure (both personnel and IT-related) and correctly accounting for the time needed to establish effective care coordination were key reoccurring recommendations for future coordinated care programs.

Rather than focusing on a long-term appraisal of the costs and benefits of a coordinated care program, the evaluations have tended to focus on a randomised control evaluation with the added constraint that cost neutrality be achieved in the short term (a few years). Indeed, balancing the costs of coordination and achieving cost savings through decreased hospitalisations may be a long-term achievement that is infeasible without long-term program stability. In many cases, a successful evaluation rested upon reducing the number of hospitalisations as this was both an outcome and a key cost saving. In some cases this was reinforced as the intervention group focused upon those patients who were deemed to have

[4] Starting from the initial Medicare Coordinated Care Demonstration phase between 2002 and 2006 these extensions covered 2006-2008, 2008-2010, 2010-2013 and 2013-2014.

a high-risk of hospitalisation using criteria that were based on a previous hospitalisation. And while service substitution will be an important factor in the success of coordinated care, many studies found an increase in costs related to primary care that was not offset by a reduction in inpatient services. Whether cost neutrality is an appropriate consideration in the short-term needs to be assessed and long-term reductions in hospitalisations may be one of the appropriate outcomes to be assessed in future studies. Research that focuses on whether a cycle of hospitalisations can feasibly be broken will be important for cases where high-risk patients are identified using previous hospitalisations. (Davies et al., 2008)

8.4.1 Important evaluation lessons for this project

There are key lessons for this project based on the previous evaluations. In this section, we list the main lessons that we believe are important to keep in mind for the assessment.

1. **It is important to understand who are the targets of the intervention and confirm that those participating in the program are the intended recipients.** Note that this validates the evaluation design as one of the main aims of the project evaluation is to investigate whether differences in referral patterns have changed the profile of the patients in the program. This is confirmed as those patients referred from GPs, CISS and hospitals differed across multiple dimensions, including age, sex and the prevalence of certain morbidities.
2. **Assessments of whether the outcomes focused upon in the evaluation and intervention are appropriate will need to consider the type and duration of the intervention implemented.** With respect to this point we utilise a range of outcomes to evaluate the program. As part of this, it was important to account for the range of strategies and the types of interventions that occur within the program. In addition to reduced hospitalisations and ED presentations, we focus on the Acuity scores that measure a patient's complexity to analyse how the program has impacted on patients.
3. **Shared data records and reliable information management systems were important factors mentioned by multiple evaluations.** With the support of staff from the Clinical Operations Strategic Implementation (COSI) Analytics team within the Metro North Hospital and Health Service we have been able to utilise data on hospital admissions and ED presentations. This entailed the COSI team performing a deterministic linkage of data so that we could match data from Brisbane North PHN to that provided by the Metro North Hospital and Health Service. This linkage was performed using data from five hospitals and was based on the client's name and date of birth.
4. **Establishing a reliable comparison group and monitoring changes in usual care and other programs will also be important.** This was one of the core challenges of assessing the outcomes of the project and unfortunately, we have been unable to secure data for an appropriate reference group. Our evaluation relies upon pre and post data analysis.
5. **Cost neutrality in the short-term was central to previous national evaluations and as this is not a core objective of the program this was not be a major component of the evaluation.** While we assess the allocation of funds to certain participants to evaluate whether this led to changes in outcomes, we do not expect that program expenditures will be directly counter-balanced by reduced expenditures in other sections of the healthcare sector. This is not a component of the program's design and the data we have access to will be inappropriate for such an investigation.

9 References

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