

**SNAPSHOT OF INTEGRATED CARE IN CENTRAL AND EASTERN SYDNEY:  
ACCESS TO MEASURES OF INTEGRATED CARE FOR PARTICIPANTS  
ATTENDING GENERAL PRACTICE**

**A PRELIMINARY ANALYSIS**



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## EXECUTIVE SUMMARY

**Rationale:** The number of people living with chronic and complex health conditions is increasing rapidly. Ageing of the population, the prevalence of particular behavioural and physiological risk factors and a variety of social and economic determinants are associated with chronic health care problems. Chronic conditions are associated with increasing complex health care needs and increasing health expenditure; 40% of which is spent in hospital setting. Reducing the associated cost of chronic health care has provoked interest in better integrating primary, secondary and tertiary health care in order to better co-ordinate care provision, improve the quality of care and reduce inappropriate use of health services especially hospital inpatient and emergency services.

**Project aims:** The aim of this project was to explore the uptake of measures of integrated care among participants in the 45 and Up Study resident within the common catchment areas of Sydney Local Health District (SLHD), South Eastern Sydney Local Health District (SESLHD), and Central and Eastern Sydney Primary Health Network (CESPHN) in the 12 months following recruitment and to examine the factors that are associated with uptake and the impact on subsequent care such as hospitalisation.

**Methods:** This was a record linkage project. There were 31,115 45 and Up participants who resided in Sydney (SLHD), South East Sydney (SESLHD) Local Health Districts and Central and Eastern Sydney Primary Health Network (CESPHN). Their data were linked to the NSW Admitted Patient Data Collection (APDC), NSW Registry of Births Deaths and Marriages, and Australian Department of Human Services Medicare Benefits Schedule (MBS) data. The final linked data collection comprised 26,429 participants.

Measures of integrated care for this study were extracted from the MBS data for the 8 months prior to and 7 months following recruitment date and included:

- Preparation of a general practice management plan (GPMP) and/or implementation of team care arrangements (TCA); for the purpose of this work these were combined.
- Review of GPMP/TCA;
- Continuity of primary care provider – the percent of participants with more than 80% of their consultation with the same provider and at least four consultations;
- Nursing and allied health care – Medicare claims for allied health or nursing care.

Hospitalisation was defined as any hospitalisation in the 12 months following recruitment. The study factors included demographic characteristics, socioeconomic status, lifestyle and health and wellbeing.

**Results:** A claim for preparation of a GPMP/TCA arrangement was noted for 4,292 (16.2%) and a review of GPMP/TCA by 1,656 (6.3%) of participants. Older age, number of health conditions, physical impairment, psychological distress and frailty were associated with increased likelihood of preparation

or review of a GPMP/TCA. Higher educational attainment and household income were associated with a decreased likelihood of a claim for GPMP/TCA preparation or review.

A third of participants (36.1%) had continuity of care. Continuity increased with age, being born overseas and physical limitation and psychological distress or frailty, and decreased with higher educational attainment and household income. Eleven percent (11.3%) of participants had a claim for a Health Assessment. Claims for health assessment were less frequent with higher educational attainment and household income but more frequent with increasing age, number of conditions and physical limitation. Seven percent of participants (7.3%) had claims for nursing and allied health and these were more frequent in females, older participants, and those who reported more health conditions, physical limitation, psychological distress or frailty and were less frequent in those participants with higher educational attainment or income.

One quarter of participants (27.4%) had one or more hospitalisations in the 12 months following recruitment. Having a GPMP/TCA or review, continuity of care, or claim for Health Assessment, or nursing or allied health care were associated with an increased risk of hospitalisation.

Using a multivariate logistic regression model, females were less likely to be admitted than male; hospital admission increased with age and with Australian country of birth; and the probability of hospitalisation was not associated with income or education. The probability of hospitalisation increased with increased poor health as measured by number of health conditions reported, frailty, physical limitations, and psychological distress. When these variables were included in the full model (model 3) not having continuity of care, not having a GPMP/TCA prepared and not having a claim for access to allied health or a nurse were all significantly associated with increased risk hospitalisation. The associations between hospital admission and review of GPMP/TCA and with health assessments were not statistically significant in the fully adjusted model.

In univariate analysis, the GP processes of care (GPMP/TCA, review of GPMP/TCA, continuity of care, health assessments and nurse/allied health services) were all provided more frequently to participants on the basis of need as defined by their age, country of birth, education, income, number of conditions, physical limitation, mental distress and frailty. However the review of care plans, health assessments and nurse/allied health services were less frequent than was their intent especially in participants with or at risk of chronic conditions.

The association between processes of care and hospitalisation in the 12 months following recruitment was consistent with participants who received these services being at greater risk of hospitalisation and readmission. In the multivariate analysis having continuity of care, a care plan and a claim for nursing/allied health decreased the likelihood of admission. This is consistent with other research in which demonstrated that review of a care plan, continuity of care and multidisciplinary care for participants with diabetes were associated with a decreased likelihood of admission.

### **Implications for health services**

These preliminary findings suggest that there are positive benefits from the implementation of proactive primary care as encouraged by the general practice payments for care planning and

multidisciplinary care for older patients with chronic health conditions. These findings also suggest that GPs and primary care practitioners are able to identify participants at risk and are implementing care planning and multidisciplinary care. There are opportunities to enhance the implementation of these among at risk hospitalised patients to ensure that they are referred back to general practice following an admission for care planning.

### **Further research opportunities**

These preliminary findings demonstrate that there are benefits in implementing the elements of proactive and multidisciplinary care. Further research is needed to explore associations between general practice care and hospitalisation and to examine the factors that are associated with care planning and multidisciplinary care following hospitalisation. The establishment of an ongoing linkage cohort in the region will support this work.

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## BACKGROUND

There is a rising prevalence of chronic conditions in the Australian population in association with the ageing of the population, the prevalence of particular behavioural and physiological risk factors and a variety of social and economic determinants [1]. This in turn requires increasingly complex range of health care services which are associated with increasing health expenditure, forty percent of which is spent on hospital services. It has provoked increased interest in better integrating primary secondary and tertiary health care in order to improve quality of care and reduce inappropriate use of health services especially hospital inpatient and emergency services.

Improving the integration of health care services including strengthening the relationships between primary and secondary services is a strategic priority for both Local Health Districts (LHDs) and the emerging Primary Health Networks (PHNs). Interest in enhancing integration is reflected through development of new initiatives such as "health pathways" and a variety of integrated care projects.

The value of improving integration of services has been shown through a growing body of research in the area. The literature shows that poor integration results in inappropriate use of health services (including ED and inpatient care), unnecessary duplication of care processes such as diagnostic testing, adverse events, and poor health outcomes. Because patients have poorer health outcomes there may also be unnecessary delays or missed opportunities to intervene early, and poor quality of care due to focus on reactive rather than proactive care. Improving integration of care is particularly important for those patients with complex chronic disease, multi-morbidity, vulnerable and disadvantaged groups and those with low health literacy.

Impacts and outcomes that may result from poorly integrated care include:- inconsistent care (e.g. discontinuation of medication on discharge from hospital); failure to return for follow up, poor self-management, health literacy, and compliance with medication and other treatment regimens, preventable hospitalisation, inappropriate presentation to ED rather than primary care, admission due to adverse events, and readmission.

Primary care, particularly general practice is likely to be at the forefront of initiatives to enhance integration of health services because for most patients primary care is the first point of contact to the health care system. Certain conditions have been defined as potentially preventable through interventions in primary health care [4]. In general practice these have been backed up with financial incentives to support GPs to work with other providers and develop multidisciplinary care teams. However more research is needed to clarify the relationship between care models offered in primary health care and hospitalisation.

Integration of care is notoriously difficult to monitor and evaluate. The care processes that are likely to support and encourage better integrated health care include: care planning and case management, health assessments, care and referrals between providers that are consistent with guidelines, communication and shared records, and continuity of primary care provider.

Measuring integration of care is further complicated by the fragmentation of the system. Although Australia has a high quality health care system, funding for health services is provided through Commonwealth and State sources. The Commonwealth's Department of Human Services is responsible for Medicare, Australia's universal health insurance scheme. It funds individual providers of health care including general practice, medical specialists, some allied health care providers such as optometrists and physiotherapists, some nursing services, diagnostic services and medical procedures including surgery for private patients. The State Government's Ministry of Health is responsible for funding services provided through the public health system including hospital and emergency department services. As a result of fragmentation there is no comprehensive data collection that can provide ready access to the data needed to look at integration of care within the community.

Specific MBS item numbers fund planned management in general practice. There are two types of Medicare funded plans: GP management plan (GPMP) and Team Care Arrangements (TCAs). A GPMP provides an organised approach to health care for patients with chronic care needs that identify patient care needs, sets out those to be provided by the GP, and lists the actions for patients to take to manage their condition. TCAs enable a GP to facilitate and collaborate with at least two other health care providers who will provide ongoing care as indicated.

The establishment of the 45 and Up study including collection of participant information through a baseline questionnaire and their permission to link these data to available administrative data provides an opportunity to explore aspect of integration of services between providers.

## PROJECT AIMS

The aim of this project is to explore the uptake of measures of integrated care among participants in the 45 and Up Study who reside within the common catchment areas of SLHD, SESLHD, and CESPHN in the 12 months following recruitment, and to examine the factors that are associated with the uptake and the impact on subsequent care such as hospitalisation. The research group hypothesised that older participants who make appropriate use of enhanced primary care will have fewer hospitalisations and better health outcomes.

## METHODS

This is a record linkage study employing cross-sectional analysis of baseline data from the 45 and Up Study linked to Medicare Benefits Schedule data and NSW Admitted Patient Data Collection. This dataset was also linked to the Registry of Births, Deaths, and Marriages to exclude participants who had died during the study period.

### STUDY DATA

#### THE 45 AND UP STUDY

The Sax Institute's 45 and Up Study comprises more than 250,000 residents of NSW, Australia. Details of the recruitment of this cohort have been described previously (3). Potential study participants aged 45 years or older in NSW were randomly sampled from the Medicare enrolment database. They were sent an invitation to participate, a description of the Study, a self-administered questionnaire, and a consent form. Participants joined the Study by completing the baseline questionnaire and providing consent for long-term follow up, including linkage of their questionnaire data to health records being collected by public health authorities. Recruitment occurred between 2006 and 2009, with 70% of the sample being recruited in 2008. The response rate was 18%. The baseline questionnaire collected information on a range of participant characteristics (available at <https://www.saxinstitute.org.au/our-work/45-up-study/>). PBS and MBS data were supplied by the Australian Government Department of Human Services (formerly Medicare Australia) and deterministically linked to the 45 and Up Study baseline data. The remaining datasets were probabilistically linked by the NSW Centre for Health Record Linkage, with quality audits showing fewer than 0.5% false positive links.

#### DEPARTMENT OF HUMAN SERVICES DATA



Department of Human services is the administering body for Australia’s universal health insurance system: the Medical Benefits Schedule (MBS). The MBS data includes all claims for subsidised medical, diagnostic and some allied health services provided to Australians by registered medical and other eligible health care practitioners(4). We extracted the following information for the purposes of this study: date of the service, the ‘Item Number’ for the service, and provider practice postcode.

#### **NSW REGISTRY OF BIRTHS, DEATH AND MARRIAGES**

The NSW Registry of Births, Death and Marriages is a record of all deaths that have been certified as to cause and date by a registered medical practitioner or a coroner. Information from it was used to identify and exclude study participants who died within 12 months of recruitment.

#### **NSW MINISTRY OF HEALTH: ADMITTED PATIENT DATA COLLECTION**

The NSW Ministry of Health has responsibility for all inpatient services and collates data on admissions into the NSW Admitted Patient Data Collection (APDC). Data were available for 2000-2009. The APDC collates inpatient admissions (discharges, transfers and deaths) from all public, private, and repatriation hospitals, private day procedure centres and public nursing homes in NSW. These data include limited demographic characteristics, diagnoses, date of admission and discharge, and length of stay for individual episodes of hospitalisation. The diagnoses were coded using International Classification of Disease 10th revision-Australian Modification (ICD-10-AM) codes. APDC data were available for this study for 2000-2009. For these analyses, APDC records were extracted for the 12 months following recruitment for each participant.

#### **STUDY POPULATION**

45 and Up Study participants who were resident in Sydney Local Health District (SLHD) or South East Sydney Local Health District (SESLHD) were eligible for the study and were identified for this study using residential postcode at recruitment (Table 1). These LHDs combined formed the catchment for Central and Eastern Sydney Primary Health Network (CESPHN). Participants who died in the 12 months following recruitment were excluded from the study as were participants who were recruited prior to 2007 as the MBS data did not include scrambled provider numbers and late enrolees as they did not have the potential for 12 months of follow-up in hospital records.

**Table 1: Number of exclusion from the 45 and Up Study participants living in LHD**

	Local Health District		CESPHN
	SLHD	SELHD	Total CES
Enrolment date missing	43	58	101
No provider/practice identity (included enrolment before 2007)	1635	2540	4175
Enrolment after 2008 (not 12 months of follow up)	60	105	165
Died within 12months of enrolment	95	143	238
>99 MBS claims within 12 months	2	2	4
Possible linkage error	2	1	3

<b>Total exclusions</b>	<b>1837</b>	<b>2849</b>	<b>4686</b>
<b>Total before exclusion,</b>		<b>31,115</b>	
<b>Total exclusion:</b>		<b>4,686</b>	
<b>Total number in linked data collection</b>		<b>26,429</b>	

## OUTCOME MEASURES

There were two outcomes measure of interest for this study:

- Measures of integrated care

This variable was derived from the MBS data for the 8 months prior to and 7months following recruitment date. These were coded as a dichotomous variable. These included claims for

- *Preparation of a GPMP or TCA combined*
- *Review of GPMP or TCA combined*
- *Continuity of primary care provider –was calculated from the methods of Eriksson and Mattsson [6]; this was calculated as the proportion of participants with more than 80% of their consultation with the same provider and at least four consultations during the 15 months.*
- *Nursing and allied health care. Access to allied health or nursing was based on evidence of a claim for their care*

- Hospitalisation

This was defined as any admission that occurred within the 12 months following recruitment to the 45 and Up Study. Length of stay, number of admissions or readmissions were not included in the study

## STUDY FACTORS

Individual factors were derived from participant responses recorded in the baseline questionnaire and health service use from the administrative datasets. These included six broad categories: demographic, socioeconomic factors, lifestyle factors, health status, wellbeing, and health service use.

### *Demographic characteristics*

- Age (categorised as 45-59, 60-74 and 75 or more years)
- Gender (*male or female*)
- Country of birth (Australia or overseas),

### *Socio-economic factors*

- Highest educational qualification (*University, Trade/diploma, School Certificate, less than Year 10*)
- Annual household income (*>=\$70,000, \$40,000-\$69,000, \$20,000-\$39,000, <\$20,000*)

#### *Wellbeing*

- Psychological distress (*measured using the Kessler-10 score and categorised as low (score of 10-15), moderate (16-21), high (22-29), and very high (30+)[8, 9]*)
- Functional capacity (*measured using the Medical Outcomes Study, Short Form 36 Physical Functioning Scale (SF36-PF) and was classified as no limitation (score of 100), minor (90-99), moderate (60-89), and severe (0-59) limitation[10, 11]*)
- Frailty (*measured using the methods of Searle and colleagues[12]. The Frailty score was developed from the sum of 'reported deficits' that were reported in the recruitment survey[13]. The frailty score is calculated from the sum of the deficits divided by the number of measures included (that is 25 measures) giving a possible range of 0.0 to 1.0. Individuals were categorised as 0-0.10 very fit, 0.11-0.14 fit, 0.14-0.24 vulnerable and >0.25 frail according to their individual score.*)
- Help with daily living activities. (*Participants were asked if they needed help with daily activities using the question: 'Do you regularly need help with daily tasks because of long-term illness or disability? (e.g. personal care, getting around, preparing meal)'. Dichotomous responses were sought.* )

#### **DATA ANALYSIS**

Descriptive analysis were undertaken to describe the study factors that were associated with claims for receipt of processes of care. Multivariate logistic regression models were used to explore the associations between process of care and hospitalisation. Three models were developed. Model 1 controlled for age, gender, country of birth, educational attainment, and household income. Model 2 included the variables from Model 1 as well as measures of wellbeing (physical functioning scale from SF36) and K-10. Model 3 included all the study variables in the model and calculated the odds ratios of association between individual processes of care and hospitalisation. All analyses were carried out in SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). All the tests were two-sided and a p-value of less than or equal to 0.05 was considered statistically significant.

## RESULTS

The final linked dataset included 26,429 participants in the 45 and Up Study who were resident in the combined study regions (10,714 in SLHD and 15,715 in SESLHD) and were successfully linked to the MBS and APDC data. Participants who were recruited prior to 2007 were excluded as the MBS data did not include scrambled provider numbers as well as late enrollees as they did not have the potential for 12 months of follow-up in hospital records.

A claim for preparation of a GPMP/TCA arrangement was noted for 4,292 (16.2%) and a review of care plan in 1,656 (6.3%) of participants. Table 1a and 1b summarise the associations between claim for preparation of a GPMP or TCA and review of these with each individual patient characteristic. Older age, number of health conditions, physical impairment, psychological distress and frailty were associated with increased likelihood of a care plan or review of one. Higher educational attainment and household income were associated with a decreased likelihood of a claim for GPMP/TCA preparation or review.

TABLE 1A: CLAIMS FOR PREPARATION OF GPMP/TCA AMONG 45 AND UP PARTICIPANTS RESIDENT IN CES STRATIFIED BY DEMOGRAPHIC CHARACTERISTICS, SOCIOECONOMIC STATUS, AND HEALTH STATUS (N=26,429)

Characteristic	Preparation of GPMP/TCA			
	Yes		No	
	n	%	n	%
<b>Gender</b>				
Male	2,026	16.2	10,471	83.8
Female	2,266	16.3	11,666	83.7
<b>Age group</b>				
45-59 years	1,123	8.9	11,532	91.1
60-74 years	1,644	19.4	6,819	80.6
>=75 years	1,525	28.7	3,786	71.3
<b>Country of birth</b>				
Australia	3,123	14.3	18,649	85.7
Overseas	1,169	25.1	3,488	74.9
<b>Educational attainment</b>				
Year 10 or less	649	30.6	1,474	69.4
School certificate	1,459	19.5	6,044	80.6
Trade Certificate or Diploma	1,173	16.0	6,171	84.0
University	903	10.0	8,119	90.0
<b>Household income</b>				
0-<\$20,000	1,342	32.8	2,745	67.2
\$20,000-\$39,999	685	20.0	2,734	80.0
\$40,000-\$69,999	530	12.3	3,792	87.7
>=\$70,000	588	6.6	8,329	93.4
<b>Number of health conditions reported</b>				
No conditions	1,820	12.4	12,833	87.6
1 condition	1,393	18.8	6,017	81.2
2 conditions	730	23.4	2,385	76.6
3 or more conditions	349	27.9	902	72.1
<b>SF36 (level of physical limitation scale)</b>				
No limitation (100)	736	8.3	8,113	91.7
Minor limitation (90-99)	788	11.9	5,813	88.1
Moderate limitation (60-89)	1,151	21.9	4,116	78.2
Severe limitations (0-59)	1,094	33.9	2,133	66.1
<b>Kessler – 10 (level of psychological distress)</b>				
Low (10-15)	2,510	13.7	15,829	86.3
Moderate (16-21)	633	17.5	2,986	82.5
High (21-29)	294	23.4	963	76.6
Very high (30-50)	147	29.0	360	71.0
<b>Frailty Index</b>				
Very fit (0.00 – 0.10)	150	14.7	873	85.3

Fit (0.11 – 0.14)	459	8.8	4,748	91.2
Vulnerable (0.15 - 0.24)	960	10.9	7,882	89.1
Frail (0.25 or more)	2,723	24.0	8,634	76.0

TABLE 1B: CLAIMS FOR REVIEW OF GPMP/TCA AMONG 45 AND UP PARTICIPANTS RESIDENT IN CES STRATIFIED BY DEMOGRAPHIC CHARACTERISTICS, SOCIOECONOMIC STATUS, AND HEALTH STATUS (N=26,429)

Characteristic	Review of GPMP/TCA			
	Yes		No	
	n	%	n	%
<b>Gender</b>				
Male	773	6.2	11,724	93.8
Female	883	6.3	13,049	93.7
<b>Age group</b>				
45-59 years	401	3.2	12,254	96.8
60-74 years	630	7.4	7,833	92.6
>=75 years	625	11.8	4,686	88.2
<b>Country and LOTE</b>				
Australia	1,275	5.9	20,497	94.1
Overseas	381	8.2	4,276	91.8
<b>Educational attainment</b>				
Year 10 or less	237	11.2	1,886	88.8
School certificate	589	7.9	6,914	92.2
Trade Certificate or Diploma	466	6.4	6,878	93.7
University	322	3.6	8,700	96.4
<b>Household income</b>				
0-<\$20,000	512	12.5	3,575	87.5
\$20,000-\$39,999	264	7.7	3,155	92.3
\$40,000-\$69,999	207	4.8	4,115	95.2
>=\$70,000	244	2.7	8,673	97.3
<b>Number of health conditions reported</b>				
No conditions	707	4.8	13,946	95.2
1 condition	517	7.0	6,893	93.0
2 conditions	291	9.3	2,824	90.7
3 or more conditions	141	11.3	1,110	88.7
<b>SF36 (level of physical limitation scale)</b>				
No limitation (100)	267	3.0	8,582	97.0
Minor limitation (90-99)	312	4.7	6,289	95.3
Moderate limitation (60-89)	473	9.0	4,794	91.0
Severe limitations (0-59)	406	12.6	2,821	87.4
<b>Kessler – 10 (level of psychological distress)</b>				
Low (10-15)	972	5.3	17,367	94.7
Moderate (16-21)	233	6.4	3,386	93.6
High (21-29)	110	8.8	1,147	91.3
Very high (30-50)	49	9.7	458	90.3
<b>Frailty score</b>				

Very fit (0.00 – 0.10)	49	4.8	974	95.2
Fit (0.11 – 0.14)	146	2.8	5,061	97.2
Vulnerable (0.15 - 0.24)	367	4.2	8,475	95.9
Frail (0.25 or more)	1,094	9.6	10,263	90.4

Continuity of care was present in 9,530 participants (36.1%). Table 1c summarises the associations between continuity of care and individual participant characteristic. Continuity of care improved with increasing age, being born overseas and physical limitation and psychological distress or frailty, and decreased with higher educational attainment and household income.

TABLE 1C: CONTINUITY OF CARE AMONG 45 AND UP PARTICIPANTS RESIDENT IN CES STRATIFIED BY DEMOGRAPHIC CHARACTERISTICS, SOCIOECONOMIC STATUS, AND HEALTH STATUS (N=26,429)

Characteristic	Continuity of care			
	Yes		No	
	n	%	n	%
<b>Gender</b>				
Male	4,631	37.1	7,866	62.9
Female	4,899	35.2	9,033	64.8
<b>Age group</b>				
45-59 years	2,837	22.4	9,818	77.6
60-74 years	3,483	41.2	4,980	58.8
>=75 years	3,210	60.4	2,101	39.6
<b>Country of birth</b>				
Australia	7,546	34.7	14,226	65.3
Overseas	1,984	42.6	2,673	57.4
<b>Educational attainment</b>				
Year 10 or less	1,115	52.5	1,008	47.5
School certificate	3,137	41.8	4,366	58.2
Trade Certificate or Diploma	2,655	36.2	4,689	63.9
University	2,415	26.8	6,607	73.2
<b>Household income</b>				
0-<\$20,000	2,202	53.9	1,885	46.1
\$20,000-\$39,999	1,479	43.3	1,940	56.7
\$40,000-\$69,999	1,413	32.7	2,909	67.3
>=\$70,000	2,013	22.6	6,904	77.4
<b>Number of health conditions reported</b>				
No conditions	4,579	31.3	10,074	68.8
1 condition	3,053	41.2	4,357	58.8
2 conditions	1,306	41.9	1,809	58.1
3 or more conditions	592	47.3	659	52.7
<b>SF36 (level of physical limitation scale)</b>				
No limitation (100)	2,114	23.9	6,735	76.1
Minor limitation (90-99)	2,180	33.0	4,421	67.0
Moderate limitation (60-89)	2,437	46.3	2,830	53.7
Severe limitations (0-59)	1,798	55.7	1,429	44.3
<b>Kessler – 10 (level of psychological distress)</b>				
Low (10-15)	6,253	34.1	12,086	65.9
Moderate (16-21)	1,273	35.2	2,346	64.8
High (21-29)	461	36.7	796	63.3
Very high (30-50)	204	40.2	303	59.8
<b>Frailty score</b>				
Very fit (0.00 – 0.10)	336	32.8	687	67.2
Fit (0.11 – 0.14)	1,176	22.6	4,031	77.4
Vulnerable (0.15 - 0.24)	2,682	30.3	6,160	69.7

Frail (0.25 or more)	5,336	47.0	6,021	53.0
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Health Assessments were claimed for 2,996 (11.3%) of participants. Table 1d summarises association between health assessment and participant characteristics. Claims for health assessment were less frequent with higher educational attainment and household income but more frequent with increasing age, number of conditions and physical limitation.

TABLE 1D: CLAIMS FOR HEALTH ASSESSMENTS AMONG 45 AND UP PARTICIPANTS RESIDENT IN CES STRATIFIED BY DEMOGRAPHIC CHARACTERISTICS, SOCIOECONOMIC STATUS, AND HEALTH STATUS (N=26,429)

Characteristics	Health Assessment			
	Yes		No	
	n	%	n	%
<b>Gender</b>				
Male	1,428	11.4	11,069	88.6
Female	1,568	11.3	12,364	88.8
<b>Age group</b>				
45-59 years	775	6.1	11,880	93.9
60-74 years	25	0.3	8,438	99.7
>=75 years	2,196	41.4	3,115	58.7
<b>Country of birth</b>				
Australia	2,391	11.0	19,381	89.0
Overseas	605	13.0	4,052	87.0
<b>Educational attainment</b>				
Year 10 or less	403	19.0	1,720	81.0
School certificate	1,006	13.4	6,497	86.6
Trade Certificate or Diploma	850	11.6	6,494	88.4
University	646	7.2	8,376	92.8
<b>Household income</b>				
0-<\$20,000	845	20.7	3,242	79.3
\$20,000-\$39,999	478	14.0	2,941	86.0
\$40,000-\$69,999	318	7.4	4,004	92.6
>=\$70,000	494	5.5	8,423	94.5
<b>Number of health conditions reported</b>				
No conditions	1,403	9.6	13,250	90.4
1 condition	909	12.3	6,501	87.7
2 conditions	466	15.0	2,649	85.0
3 or more conditions	218	17.4	1,033	82.6
<b>SF36 (level of physical limitation scale)</b>				
No limitation (100)	582	6.6	8,267	93.4
Minor limitation (90-99)	509	7.7	6,092	92.3
Moderate limitation (60-89)	742	14.1	4,525	85.9
Severe limitations (0-59)	780	24.2	2,447	75.8
<b>Kessler – 10 (level of psychological distress)</b>				
Low (10-15)	1,772	9.7	16,567	90.3
Moderate (16-21)	371	10.3	3,248	89.8
High (21-29)	169	13.4	1,088	86.6
Very high (30-50)	55	10.9	452	89.2
<b>Frailty score</b>				
Very fit (0.00 – 0.10)	134	13.1	889	86.9
Fit (0.11 – 0.14)	431	8.3	4,776	91.7



Vulnerable (0.15 - 0.24)	705	8.0	8,137	92.0
Frail (0.25 or more)	1,726	15.2	9,631	84.8

Nursing and allied health claims were made for 1,927 participants (7.3%). Table 1e summarises association between nursing and allied health claims and participant characteristics. These were more frequent in females, older participants and those who were born overseas, those who reported more conditions, physical limitation, psychological distress or frailty but were less frequent in those participants with higher educational attainment or income.

TABLE 1E: CLAIMS FOR HEALTH CARE BY NURSE OR ALLIED HEALTH PROFESSIONAL AMONG 45 AND UP PARTICIPANTS RESIDENT IN CES STRATIFIED BY DEMOGRAPHIC CHARACTERISTICS, SOCIOECONOMIC STATUS, AND HEALTH STATUS (N=26,429)

Characteristics	Nursing and Allied Health			
	Yes		No	
	n	%	n	%
<b>Gender</b>				
Male	719	5.8	11,778	94.3
Female	1,208	8.7	12,724	91.3
<b>Age group</b>				
45-59 years	423	3.3	12,232	96.7
60-74 years	728	8.6	7,735	91.4
>=75 years	776	14.6	4,535	85.4
<b>Country of birth</b>				
Australia	1,455	6.7	20,317	93.3
Overseas	472	10.1	4,185	89.9
<b>Educational attainment</b>				
Year 10 or less	323	15.2	1,800	84.8
School certificate	713	9.5	6,790	90.5
Trade Certificate or Diploma	499	6.8	6,845	93.2
University	341	3.8	8,681	96.2
<b>Household income</b>				
0-<\$20,000	651	15.9	3,436	84.1
\$20,000-\$39,999	330	9.7	3,089	90.4
\$40,000-\$69,999	210	4.9	4,112	95.1
>=\$70,000	186	2.1	8,731	97.9
<b>Number of health conditions reported</b>				
No conditions	760	5.2	13,893	94.8
1 condition	620	8.4	6,790	91.6
2 conditions	350	11.2	2,765	88.8
3 or more conditions	197	15.8	1,054	84.3
<b>SF36 (level of physical limitation scale)</b>				
No limitation (100)	243	2.8	8,606	97.3
Minor limitation (90-99)	275	4.2	6,326	95.8
Moderate limitation (60-89)	558	10.6	4,709	89.4
Severe limitations (0-59)	606	18.8	2,621	81.2
<b>Kessler – 10 (level of psychological distress)</b>				
Low (10-15)	1,080	5.9	17,259	94.1
Moderate (16-21)	291	8.0	3,328	92.0
High (21-29)	144	11.5	1,113	88.5
Very high (30-50)	68	13.4	439	86.6
<b>Frailty score</b>				
Very fit (0.00 – 0.10)	61	6.0	962	94.0

Fit (0.11 – 0.14)	147	2.8	5,060	97.2
Vulnerable (0.15 - 0.24)	372	4.2	8,470	95.8
Frail (0.25 or more)	1,347	11.9	10,010	88.1

7,235 (27.4%) patients had one or more hospitalisations in the first 12 months following recruitment to the study. Table 2 shows that having care plans, reviews of care plans, continuity of care, health assessments and nursing or allied health care were all associated with an increased risk of hospitalisation.

TABLE 2: HOSPITALISATION IN 12 MONTHS FOLLOWING RECRUITMENT AMONG 45 AND UP PARTICIPANTS RESIDENT IN CES STRATIFIED BY PRESENCE OF A CLAIM FOR PROCESSES OF CARE (N=26,429)

Characteristics	Hospitalisation in the 12 months			
	Yes		No	
	n	%	n	%
<b>GPMP/TCA preparation</b>				
No	5,652	25.5	16,485	74.5
Yes	1,583	36.9	2,709	63.1
<b>GPMP/TCA Review</b>				
No	6,648	26.8	18,125	73.2
Yes	587	35.5	1,069	64.6
<b>Continuity of Care</b>				
No	3,944	23.3	12,955	76.7
Yes	3,291	34.5	6,239	65.5
<b>Health assessment</b>				
No	6,157	26.3	17,276	73.7
Yes	1,078	36.0	1,918	64.0
<b>Nursing and Allied health care</b>				
No	6,466	26.4	18,036	73.6
Yes	769	39.9	1,158	60.1

**NOTE:** PROCESSES OF CARE FOR MBS CLAIM ITEMS WERE EXTRACTED FOR 8 MONTHS BEFORE AND 7 MONTHS AFTER. NURSING AND ALLIED HEALTH ITEMS: 10950-10970, GPMP ITEMS: 721, TCA ITEMS: 723, GPMP/TCA REVIEW ITEMS: 725, 727, 732;

Table 3 in Appendix 1 describes the multivariate analysis of the association between hospital admission and both patient characteristics and the GP processes of care. Using a multivariate logistic regression model, three models were explored with model 1 adjusting only for demographic and socioeconomic characteristics, model 2 including physical limitations and psychological distress, and model 3 including number of conditions, frailty and need for help with daily living activities as measures of health status. In these data females were less likely to be admitted than male; hospital admission increased with age and with Australian birth; and the probability of hospitalisation was not associated with income or education. The probability of hospitalisation increased with increased poor health as measured by number of health conditions reported, frailty, physical limitations, and psychological distress. When these variables were included in the full model (model 3) not having continuity of care, not having a

GPMP or TCA prepared and not having a claim for access to allied health or a nurse were all significantly associated with increased hospitalisation. The associations between hospital admission and review of GPMP/TCA and with health assessments were not statistically significant in the fully adjusted model.

## DISCUSSION

The GP processes of care (care plan, review of care plan, continuity of care, health assessments and nurse/allied health services) were all provided more frequently to patients on the basis of need as defined by their age, country of birth, education, income, number of conditions, physical limitation, mental distress and frailty. However the review of care plans, health assessments and nurse/allied health services were less frequent than was their intent especially in patients with or at risk of chronic conditions.

The association between processes of care hospitalisation in the first 12 months was consistent with patients who received these services being at greater risk of hospitalisation and readmission. Patients who were readmitted were very likely to have received a visit from the GP prior to readmission - an indication that GP care was being appropriately targeted towards those most at risk. In the multivariate analysis having continuity of care, a care plan and a claim for nursing/allied health decreased the likelihood of admission. This is consistent with other research which demonstrated that review of a care plan, continuity of care and multidisciplinary care for patients with diabetes were associated with a decreased likelihood of admission[5].

All this suggests that at risk patients are being appropriately targeted in general practice. However simply doing a care plan and following patients up in general practice post discharge is not enough to prevent readmission. They need to be linked to the practice so that they can receive better continuity of care, reviews of care plans and greater access to nursing and allied health care. Such a model of care has been proposed to the Primary Health Advisory Group.

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Appendix 1

TABLE 3: PROCESSES OF CARE AND HOSPITAL ADMISSION IN ONE YEAR FOLLOWING RECRUITMENT AMONG 45 AND UP PARTICIPANTS LIVING IN LOCAL HEALTH DISTRICTS (N=26,429)

Characteristics	Yes		Hospital admission recorded				Model 3 <sup>3</sup>	
	N	%	Model 1 <sup>1</sup> Odds Ratio	95%CI	Model 2 <sup>2</sup> Odds Ratio	95%CI	Odds Ratio	95%CI
<b>Gender</b>								
Male	3,706	29.7	1		-		-	
Female	3,529	25.3	0.83	0.79-0.88	-		-	
<b>Age group</b>								
45-59 years	2,385	18.9	1		-		-	
60-74 years	2,544	30.1	1.86	1.73-1.99	-		-	
>=75 years	2,306	43.4	3.23	2.98-3.51	-		-	
<b>Country of birth</b>								
Australia	4,835	28.9	1		-		-	
Overseas	2,400	24.7	0.77	0.73-0.82	-		-	
<b>Educational attainment</b>								
Year 10 or less	683	32.2	1.04	0.93-1.16	-		-	
School certificate	2,191	29.2	1.05	0.97-1.13	-		-	
Trade Certificate or Diploma	2,046	27.9	1.04	0.97-1.12	-		-	
University	2,160	23.9	1		-		-	
<b>Household income</b>								
0-<\$20,000	1,384	33.9	1.01	0.91-1.11	-		-	
\$20,000-\$39,999	987	28.9	0.90	0.82-1.00	-		-	
\$40,000-\$69,999	1,086	25.1	0.92	0.84-1.01	-		-	

Characteristics	Hospital admission recorded								
	Yes		Model 1 <sup>1</sup>		Model 2 <sup>2</sup>		Model 3 <sup>3</sup>		
	N	%	Odds Ratio	95%CI	Odds Ratio	95%CI	Odds Ratio	95%CI	
>=\$70,000	2,056	23.1	1		-		-		
<b>Frailty score</b>									
Very fit (0.00 – 0.10)	228	22.3	1		1		1		
Fit (0.11 – 0.14)	970	18.6	0.91	0.77-1.07	1.05	0.88-1.25	0.97	0.81-1.16	
Vulnerable (0.15 - 0.24)	2,024	22.9	1.08	0.92-1.26	1.21	1.02-1.43	1.03	0.86-1.24	
Frail (0.25 or more)	4,013	35.3	1.65	1.41-1.93	1.71	1.46-2.01	1.17	0.97-1.42	
<b>Help with daily living activities required</b>									
No	6,269	26.3	1		1		1		
Yes	558	45.2	1.75	1.55-1.98	1.53	1.35-1.73	1.23	1.07-1.40	
<b>Number of health conditions reported</b>									
No conditions	3,266	22.3	1		1		1		
1 condition	2,320	31.3	1.40	1.31-1.49	1.37	1.29-1.47	1.28	1.20-1.37	
2 conditions	1,119	35.9	1.67	1.53-1.82	1.61	1.48-1.76	1.43	1.30-1.57	
3 or more conditions	530	42.4	2.07	1.83-2.35	1.95	1.72-2.21	1.63	1.43-1.87	
<b>SF36 (level of physical limitation scale)</b>									
No limitation (100)	1,715	19.4	1		1		1		
Minor limitation (90-99)	1,645	24.9	1.20	1.11-1.30	1.20	1.11-1.30	1.10	1.01-1.20	
Moderate limitation (60-89)	1,772	33.6	1.64	1.51-1.78	1.63	1.50-1.77	1.37	1.24-1.52	
Severe limitations (0-59)	1,405	43.5	2.30	2.08-2.54	2.26	2.04-2.50	1.70	1.50-1.93	
<b>Kessler – 10 (level of psychological distress)</b>									
Low (10-15)	4,812	26.2	1		1		1		
Moderate (16-21)	995	27.5	1.19	1.10-1.29	1.08	0.99-1.17	1.00	0.92-1.09	
High (21-29)	336	26.7	1.18	1.04-1.35	1.00	0.87-1.14	0.88	0.76-1.01	
Very high (30-50)	159	31.4	1.46	1.20-1.78	1.16	0.95-1.42	0.95	0.77-1.17	
<b>Continuity of Care</b>									

Characteristics	Yes		Hospital admission recorded						
			Model 1 <sup>1</sup>		Model 2 <sup>2</sup>		Model 3 <sup>3</sup>		
	N	%	Odds Ratio	95%CI	Odds Ratio	95%CI	Odds Ratio	95%CI	
	No	3,944	23.3	1.35	1.27-1.43	1.29	1.22-1.37	1.27	1.19-1.35
	Yes	3,291	34.5	1		1	1	1	
<b>GPMPTCA preparation</b>									
	No	5,652	25.5	1.39	1.29-1.50	1.29	1.20-1.39	1.25	1.16-1.35
	Yes	1,583	36.9	1		1		1	
<b>GPMPTCA Review</b>									
	No	6,648	26.8	1.18	1.06-1.31	1.11	0.99-1.23	1.07	0.96-1.20
	Yes	587	35.5	1		1		1	
<b>Health assessment</b>									
	No	6,157	26.3	0.94	0.85-1.03	0.93	0.85-1.03	0.93	0.85-1.03
	Yes	1,078	36.0	1		1		1	
<b>Allied Health</b>									
	No	6,466	26.4	1.47	1.33-1.63	1.33	1.20-1.48	1.29	1.16-1.43
	Yes	769	39.9	1		1		1	

Note: **1:** adjusted individually with age, gender, country of birth, educational attainment and household income; **2:** adjusted individually with age, gender, country, education, household income, SF-36 and K-10; **3:** adjusted individually with age, gender, country, education and household income, frailty, need help, number of health conditions, SF-36 and K-10