The need for better focus on primary and secondary prevention of cardiovascular disease.

Wing Cheuk Chan, Dean Papaconstantinou – June 2020

COUNTIES MANUKAU HEALTH

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By Counties Manukau Health
Private Bag 93311
Otahuhu
Auckland 1640
New Zealand

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Summary of findings from existing literature with a number of new analyses

1. National and regional reports[1,2] have indicated there was limited improvement in the use of highly cost-effective pharmaceutical treatment for primary and secondary prevention of cardiovascular disease (CVD) over the past few years in New Zealand. Significant improvement opportunities remain.
2. Some of the variations by DHB in secondary prevention of CVD can be partially explained by lower levels of discharge medications post 'acute coronary syndrome' (ACS) at some DHBs.[3]
3. While the national and regional reports[1,2] provide a reasonable range of indicators that demonstrate a high level overview for selected groups of people with CVD, these reports do not provide full population coverage of all people with CVD in New Zealand.
4. The more robust the measure is for medication adherence; the wider the unexplained treatment gaps are likely to be uncovered. We suggest using the measure of a dispensing gap of an indicated medicine in the latest 4-month period as being the most likely to provide a timely reminder for the responsible clinician to be proactive to ensure continuity of care.
5. People with CVD have a very high PHO enrolment rate (99.2%) and contact rate with primary health care (96.9%) in New Zealand in 2019, which is an excellent platform to support both opportunistic and proactive care.
6. Prognosis-limiting morbidities, for example conditions such as metastatic cancer, dementia, cirrhosis, end stage renal failure receiving dialysis, and/or a palliative code on discharge, were associated with lower use of triple therapy (33%). However, these selected conditions do not fully explain the treatment gaps in secondary prevention of CVD at a population level.
7. After excluding these five prognosis-limiting conditions, 56% of the remaining people with prior CVD events were on triple therapy, and 95% were on at least one of the three groups of medicines. This observation along with high level of PHO attendance and contact, suggest the lack of patients' attendance at health services is not the main reason for the possible shortfall of triple therapy for cardiovascular disease.
8. Intolerance to CVD medications were infrequently recorded in the selected groups of people discharged from hospitals with acute coronary syndrome (ACS) in New Zealand.[3] For example, only 1-3% of patients discharged post ACS between July 2019 and December 2019 had a statin intolerance recorded. Nevertheless, the high uptake of anti-platelet agents (>92%) and statin (>93%) at discharge post ACS may provide a real-world reference point as an aspirational goal to be maintained in the community for people without contraindications.
9. The observed unexplained treatment gaps are likely to be associated with a number of amenable factors including:
    a. prior cardiovascular hospitalisation events not being recorded correctly at the time of CVD risk assessment. This information gap has been associated with reductions in evidence-based medicine use.[4]
    b. a mobile population: as measured at both domicile location and changes in enrolled practice.[5]
    c. nocebo effects, particularly with the use of statins (reporting adverse or negative events unrelated to the drug of interest, or reporting negative effect to an inert placebo substance).[6]
    d. and/or clinical inertia.
10. We examined people who had a hospital diagnosis of atrial fibrillation in New Zealand in the past 10 years. In the last 4 months of 2019, 44.6% were on anticoagulation with an additional 20.4% on antiplatelet medicine without anticoagulant. The uptake of anticoagulation is marginally higher in people with prior hospital diagnosis of heart failure in addition to atrial fibrillation at 50.3%.

Recommendations

To optimise population health gain and equity in a sustainable manner, one should consider:

1. Setting national standards and clinical guidelines that:
    a. package up all relevant metabolic risk factor assessment and management to better align with clinical workflow and people's care journey,
    b. support the design of new models of primary health care that include comprehensive diabetes care, macro-cardiovascular AND micro-vascular risk management,
    c. align **active recommendations** for pharmaceutical treatment thresholds for primary CVD prevention with international guidelines, as well as being clinically consistent with current hospital invasive intervention threshold in secondary care, (e.g. active recommendation to use statin at 5% CVD risk in 5 years unless contraindicated),
    d. incorporate newer agents with glycaemic, CVD and renal benefits into the combined guidelines in a way to optimise population health,
    e. promote shared decision making (that includes an active recommendation as appropriate) taking place regardless of cardiovascular risk,
    f. provide guidance to support the practicalities of everyday practice, e.g. management in context of common multi-morbidities, and pragmatic instructions on dose titration, etc.
2. A long term condition population 'register' with the provision of clinically actionable information at all points of care, supporting continuity of care, care pathway guidance, and follow up. This population register needs to access whole of system information, and will likely require information technology development to support the clinical pathway and information flows.
3. Strengthen clinical leadership to deliver optimal care by embedding care pathways into routine care systems, challenging clinical inertia, and nocebo effects, and support regular audits to reduce unexplained treatment gaps etc.
4. Better focus on improvement of discharge medications for patients with CVD at some DHBs

Introduction

A number of regional and national reports have indicated there has been limited improvement in the use of medicines for primary and secondary prevention of cardiovascular disease for a number of years in New Zealand (including Northern region DHBs).[2]

Table 1: % of people with CVD on various cardiovascular medicines from 2017 to 2019 in New Zealand (source: Northern Regional Alliance (NRA) national report)[1,7]

	% in Dec 2017	% in Dec 2019
On statins	68.2	68.5
On anti-hypertensive therapy	76.1	74.4
On anti-platelet/ anti coagulation	77.1	76.6
On all 3 "triple therapy"	58.3	57.5

Table 2: % of people with CVD on triple therapy from 2017 to 2019 in New Zealand by ethnicity (source: NRA national report) [1,7]

On all 3	% in Dec 2017	% in Dec 2019
Maaori	53.0	51.7
Pacific	59.8	61.1
Asian	56.1	57.2
Indian	67.1	68.2
European/ other	58.9	57.5

Table 3: % of people with CVD on various cardiovascular medicines from March 2016 to Dec 2019 in Northern region (source: NRA national report)[1,7]

On statins	% in March 2016	% Dec 2019
Northland DHB	64.5	62.8
WDHB	68.1	67.5
ADHB	66.6	66.9
CMDHB	70.1	71.9

On anti-hypertensive therapy	% in March 2016	% Dec 2019
Northland DHB	73.5	73.1
WDHB	74.9	73.6
ADHB	72.3	72.3
CMDHB	74.8	75.9

On anti-platelet/ anti coagulation	% in March 2016	% Dec 2019
Northland DHB	73.8	73.6
WDHB	74.5	75.6
ADHB	71.8	73.9
CMDHB	74.7	76.8

The available national reports have also highlighted variations by DHB in the use of preventive medications for people with pre-existing cardiovascular disease.[1,7] The DHB variations in community dispensing at least may partially be explained by lower levels of post ACS discharge medications in some DHBs.[3] For example, Northland and Wanganui DHBs have lower levels of secondary prevention medication prescribed post ACS, as well as lower level of triple therapy dispensing for people with existing CVD in the community.[2]

Primary care key performance indicator as reported by NRA

Table 4: Primary care CVD indicators for the Northern region as reported by NRA

Indicator	% in Dec 2017	% in Sep 2019
% of CVD 5 year risk 15 to 20% on dual therapy	27.6	29.0
% of CVD 5 year risk >20% on dual therapy	43.9	45.4
% of prior CVD patients on triple therapy	52.5	53.0

Table 5: % of people on dual therapy (statin and antihypertensive) by CVD risk (primary prevention)

CVD risk 15 to 20%	Dec 2017	Sep 2019
Northland DHB	20.7	21.9
WDHB	27.2	28.1
ADHB	27.9	28.8
CMDHB	31.2	33.7

CVD risk >20%	Dec 2017	Sep 2019
Northland DHB	36.3	36.7
WDHB	41.6	42.3
ADHB	41.6	44.3
CMDHB	49.6	51.7

Pharmaceutical treatment for people with 5 year CVD risk between 5% and 15% are not routinely reported, despite a number of major international guidelines making an active recommendation for these groups to be treated on a statin,[8,9] based on cost effectiveness and balance between benefit and harms from treatment.[A] There would be value in reporting treatment at these levels, even if they are not yet part of New Zealand national guidance.

Measures

The more robust the measurement of medication supply is, the wider the apparent treatment gaps are demonstrated (Table 6), e.g. the use medication dispensing/ possession ratio instead of using at least 3 out of 4 quarters receiving a dispensing, had a wider unexplained treatment gap than demonstrated by routine reporting.[10] Furthermore, while the use of medication dispensing ratio or the measuring dispensing in the 4 quarters over a year provide a helpful overview of adequacy of medication supply over a longer period, these indicators are not particularly timely for clinicians to assess treatment rates – perforce having more than a year lag. A measure such as going 4 months without a dispensing may provide a timelier alert for clinicians to deliver opportunistic and proactive care to enable continuity of care. The additional analyses from this report are based on whether a person is dispensed with a medication of interest within a 4-month period.

[A] Nice Guideline in UK (updated 2016) recommends atorvastatin 20 mg for the primary prevention of CVD to people who have a 10% or greater 10-year risk of developing CVD.

US Preventive Services Task Force recommends initiating use of low- to moderate-dose statins in adults aged 40 to 75 years without a history of CVD who have 1 or more CVD risk factors (dyslipidaemia, diabetes, hypertension, or smoking) and a calculated 10-year CVD event risk of 10% or greater (B recommendation). The USPSTF recommends that clinicians selectively offer low- to moderate-dose statins to adults aged 40 to 75 years without a history of CVD who have 1 or more CVD risk factors and a calculated 10-year CVD event risk of 7.5% to 10% (C recommendation)

Table 6: Examples of possible measures of medication adherence.

Possible measures of adherence (ranked from the more general to the more robust)	Possible use	Weaknesses
A prescription in a year	• Indicates a patient had contact with a prescriber at least once in a year. • Supports indication	• Does not accurately measure adequate supply throughout the year • Small discrepancy between prescription and dispensing of meds for long term conditions
A dispensing in a year	• Indicates a patient had contact with a prescriber and a pharmacy at least once in a year • Supports indication	• Does not accurately measure adequate supply throughout the year
Dispensing in 3 quarters out of 4 in a year	• Provides helpful high level population overview of adherence	• Many dispensings have fewer than 90 day supply • Not a timely indicator for clinician to act
Prolonged dispensing gap (e.g. ≥ 4 months)	• Correlates with dispensing in 3 quarters out of 4 • Potentially provides a timely alert for clinician	• Many dispensings have fewer than 90 day supply
Medication dispensing / possession ratio	• Calculates adequacy of medication supply over a defined period of time • Accounts for duration of medication supply from each dispensing • Correlates with other more robust measures of adherence	• Having an adequate supply does not necessarily mean the medicine is actually consumed
Pill counters	• Correlates with dispensing	• Does not necessarily mean the medicine is actually consumed
Biochemical or physiological measures (e.g. digoxin level)	• Ensure drug is in therapeutic range	• Resource intensive, requires patients to have to examination and testing • Clinical responses vary from individual to individual • Not all drug levels can be tested
Direct observed therapy	• Ensure patient receives medicine	• Resource intensive

In the context of increasing access of invasive coronary intervention for people with coronary heart disease,[11] there should be a corresponding increase in focus for CVD primary and secondary prevention of cardiovascular disease to ensure the optimal mix of services to further advance population health and equity.

The following analyses are based on the national collections sourced from the Ministry of Health and aims to provides further insights in secondary prevention of CVD and anticoagulation for people with stroke. While most of the analyses are predominately focus in secondary prevention, it is likely much of the insights are likely to apply in the context of primary prevention as well. Detailed methods are available under document called "Long term conditions categories and definitions".

Additional Analyses

Which population groups are currently not reported by the current national and regional report?

Age Restriction

The NRA reports currently provide a reasonable high level overview of the current state in primary and secondary prevention. However, these reports do not necessarily provide a comprehensive population coverage of people with pre-existing 'hard' CVD outcomes.[B] People under the age of 30, and those 80 or over are not reported. The long term condition analyses undertaken by CMDHB revealed that about 26% of all people with prior CVD hospitalisation were aged 80 or above in New Zealand. Increasing proportions of people with coronary heart disease in the older age groups are being offered invasive coronary intervention. In 2016, more than 50% of the 70-79 year olds and more than 20% of the 80% year olds admitted with acute coronary syndrome were offered invasive coronary angiogram.[11] This seems discordant with primary and secondary prevention policies and guidelines. Primary and secondary prevention for people aged 75 or more could be reviewed to ensure a better balance between prevention and active hospital invasive treatment of coronary heart disease.

Missing Cases

Data from the long term condition analyses undertaken by CMDHB were compared with the NRA reports. Differences in the number of people with prior CVD captured with the various approaches are noted in Table 7. The national NRA report had about 75% of the people with hard CVD hospital diagnosis in the past (aged 30 to 79) compared with the CMDHB analyses. The discrepancy is likely to be related to how the health service utilisation population is defined, and the look back time period for cardiovascular disease diagnoses. While NRA reported roughly about 54% of all people with prior CVD hospital events overall (with no age restriction), the % of CVD medication coverage/ use are generally reflective of the overall population.

[B] Softer CVD diagnoses were excluded such as all types of angina, and transient ischaemic attacks, etc, and the same age restriction (30 to 79) was applied as per the national and regional NRA reports. Patients were recorded at least once in the health data sets in 2019, and had not died in 2019

Table 7: Comparing number of people with CVD (aged 30 to 80) by DHB from various data sources

DHB	Number of people with hard CVD outcomes in the past 15 years from NMDS linkage	Number of people with CVD from National NRA report	Estimated % of reported NRA coverage	NRA primary care regional report (based on primary health care data). Number of people with CVD	Estimated coverage of people of CVD in primary care regional report
Northland	6,869	5,040	73.4%	6,215	90.5%
Waitemata	14,519	10,596	73.0%	13,218	91.0%
Auckland	9,479	6,934	73.2%	8,223	86.7%
Counties Manukau	13,298	10,057	75.6%	10,263	77.2%
Waikato	11,136	8,270	74.3%		
Lakes	3,233	2,573	79.6%		
Bay of Plenty	7,070	5,393	76.3%		
Tairawhiti	1,417	1,091	77.0%		
Taranaki	3,670	2,445	66.6%		
Hawkes Bay	5,354	3,928	73.4%		
MidCentral	5,240	3,878	74.0%		
Whanganui	2,193	1,712	78.1%		
Capital & Coast	6,051	4,637	76.6%		
Hutt Valley	3,916	2,969	75.8%		
Wairarapa	1,450	1,101	75.9%		
Nelson Marlborough	4,703	3,516	74.8%		
West Coast	1,171	936	79.9%		
Canterbury	14,518	10,740	74.0%		
South Canterbury	1,854	1,372	74.0%		
Southern	8,962	6,973	77.8%		
New Zealand	**126,103**	**94,161**	**74.7%**		

History of Past Cardiovascular Hospitalisation Events May Not Be Recorded Correctly at the Time of Cardiovascular Risk Assessment

A previous published individual level comparison study in New Zealand found 39% of people with prior CVD hospitalisations were not recorded as having prior CVD when their CVD risk was first assessed in general practice.[4] The information gap at the point of care was associated with lower levels of evidence based risk management.

The Role of Direct Feedback and Alert System to Ensure Continuity of Care

All relevant clinical information for an individual is not always readily available at the point of care. New Zealand has a very mobile population; people may seek care in different locations at different points in time; and people can freely change primary health care practices if they wish. Furthermore, considering many cardiovascular risk factors are asymptomatic, the presenting complaints to primary health care may not be related to cardiovascular risk factor management. Therefore, there is value in providing opportunistic care at the time of clinic attendance.
On average, more than half of New Zealanders change address within a 5-year period, roughly averaging about 10% "churn" per year. A similar rate of patients' movement was also seen with PHO enrolment at a practice level, acknowledging that some people may change home address without changing GP practice enrolment, and some people may change GP enrolment without changing home addresses. Therefore, having an accurate clinical record of individuals that can provide proactive clinically actionable alerts for both providers and patients to ensure continuity of care would be of value.

Percentage of People with CVD in 2019 Dispensed with the Selected CVD Medications Within the Last 4 months in 2019 in New Zealand

As shown in Table 8, there were 173,864 people with CVD in New Zealand in 2019, as identified by the discharge diagnosis codes from publicly funded hospital events. The triple therapy rate was 54% nationally, with DHBs ranging from 48% to 59% with Counties Manukau having the highest rate at a modest level of 59%.

Nationally, about 76%, 78%, and 68% of people with CVD has a dispensing of antiplatelet/ anticoagulant, anti-hypertensive meds, and statin respectively in the last 4 months in 2019. While 54% of people with CVD were on triple therapy, 89% of people with CVD were dispensed with at least one of the three groups of medications. This means that vast majority (89%) of people with CVD had engaged with a clinician enough to be prescribed and dispensed at least one of the selected CVD medications in the 4-month period. For example, out of people with CVD who did not have a dispensing of statin in the last 4 months in 2019, 47% had at least one dispensing of antiplatelet and/or anticoagulant during that time. On the other hand, out of people with CVD who did not have a dispensing of antiplatelet and/or anticoagulant in the last 4 months, only 30% of them had a dispensing of statin.

Out of the selected group of people at discharge post ACS between July and December 2019, >92% were on anti-platelet and >93% were on statin[3], these are possible aspirational treatment rates to maintain in the community for people with CVD without contraindications. However, only selected patients were reported to All of New Zealand Acute Coronary Syndrome – Quality Improvement Registry (ANZACS QI).[12] In 2018, 55.5% (n=8,738) of all ACS hospitalisations in New Zealand (N=15,740) were captured in ANZACS-QI. Coverage is higher among people who had ST-elevation myocardial infarction at 78.4% and young people aged <70 year olds at 70.6%. Therefore, the high level of treatment rates may not be feasible for a wider group of people with CVD.

Therefore, the unexplained treatment gaps in the coverage of triple therapy are likely to be related to one of the following factors:

1. Perceived intolerance, including nocebo (reporting adverse or negative events unrelated to the drug of interest, or reporting negative effect to an inert placebo substance).
2. Contraindications,
3. Lack of clear indications (as in some cases may not have clear indications for blood pressure meds),
4. And/or clinical inertia.

Table 8: Percentage of people with CVD in NZ who had received the selected CVD medication dispensing in the last 4 months in 2019.

DHB	Antiplatelet/ anticoagulant	Anti-hypertensive meds	Statin	Antiplatelet or anticoagulants and statin	Triple therapy	At least one of 3 groups of CVD meds	Number of people with CVD
011 Northland	74%	78%	63%	56%	50%	88%	9,119
021 Waitemata	74%	76%	67%	60%	53%	88%	20,280
022 Auckland	73%	76%	67%	59%	52%	87%	13,145
023 Counties Manukau	75%	79%	72%	64%	59%	88%	17,101
031 Waikato	77%	79%	68%	61%	55%	89%	15,264
042 Lakes	75%	75%	66%	59%	52%	87%	4,271
047 Bay of Plenty	77%	77%	68%	61%	54%	89%	10,032
051 Tairawhiti	76%	81%	70%	62%	57%	89%	1,858
061 Taranaki	76%	79%	69%	62%	55%	90%	5,054
071 Hawkes Bay	76%	75%	65%	58%	51%	88%	7,501
081 MidCentral	75%	81%	67%	58%	53%	91%	7,370
082 Whanganui	74%	79%	60%	53%	48%	89%	3,033
091 Capital & Coast	74%	74%	66%	59%	51%	87%	8,482
092 Hutt Valley	76%	79%	70%	62%	56%	90%	5,190
093 Wairarapa	77%	79%	68%	61%	55%	90%	1,990
101 Nelson Marlborough	78%	79%	68%	62%	55%	90%	6,568
111 West Coast	76%	80%	67%	61%	56%	89%	1,523
120 Canterbury	80%	77%	69%	63%	56%	90%	20,617
123 South Canterbury	79%	80%	67%	61%	55%	91%	2,629
160 Southern	79%	81%	72%	65%	58%	91%	12,837
NZ overall	76%	78%	68%	61%	54%	89%	173,864

Existing literature suggests that statin-related events are reported at much higher frequency in observational studies compared to the adverse events attributable to statins reported in blinded randomised controlled trials. These statin-related events often result in discontinuation. It is important for clinicians to be aware that many of the statin-related events are not causally related to the drug, and that the nocebo effect related to the use of statin has been observed in the blinded period of a randomised controlled trial. The Ascot-LLA trial demonstrated the nocebo effect related to a statin.[6] In the blinded phase of the trial, atorvastatin is not associated with an increase in muscle related adverse events. However, in the non-blinded non randomised phase, muscle related adverse events were reported at a significantly higher rate for people on statins. A Boston study demonstrated the restarting statins is often possible if statins were discontinued because of a statin-related event.[13] Out of the 11,124 people who had statin discontinued in the study, 59.1% were re-challenged with a statin 12 months after then statin-related event. The study reported that vast majority of people (92.2%) who were re-challenged were still taking a statin 12 months after the statin-related event.

While not everyone with CVD has a clear indication for blood pressure lowering medications, antiplatelet medicine and statins are almost universally indicated. Table 8 demonstrated there are substantial unexplained treatment gaps in antiplatelet and statin use among people with CVD across all DHBs in New Zealand. Prescribing at discharge post ACS indicator is now more refined in use of blood pressure lowering medications.[3]

The reported figures in Table 8 were similar to the NRA national report looking at a subgroup of people with CVD and adherence of CVD meds based on the presence of dispensing the selected CVD meds in 3 out of 4 quarter in 2019. The national NRA reported 77% of selected group of CVD were on antiplatelet/ anticoagulant, 74% on antihypertensive, 69% on statin and 58% on triple therapy overall. While these analyses are consistent at an aggregated level (for reporting purposes), at an individual level there will be some differences. These indicators are to be used interchangeably as clinical alerts (dispensings in 3 out of 4 quarters in a year, and a dispensing in the last 4 months), As previously noted an indicator of having dispensings in 3 out of 4 quarters would not be most useful to inform clinical action at the current time, as the indicator will have a significant number of false positive (e.g. people who missed a dispensing in first quarter and has been adherent since) and false negatives (people who had 3 dispensing in first 3 quarters, but had a prolonged dispensing gap that need to be followed up). Therefore, a prolonged dispensing gap based on the latest time period is most helpful.

PHO Enrolment and Contact With Primary Health Care

People with CVD have a very high PHO enrolment and contact rate with primary health care as shown in Table 9. The high population coverage of people with CVD who had at least one primary health care consult (96.9%) in 2019 and exceptionally high level of PHO enrolment (99.2%) provide an excellent platform for opportunistic preventive care as well as proactive care/ alerts for people with CVD who did not access primary health care in a timely way for secondary prevention management.

Table 9: Percentage of people with CVD in 2019 who had at least one primary care consult in 2019 and/or were currently enrolled in Jan 2020 in a PHO.

DHB	Had primary health care consult in 2019	Enrolled in a PHO in Jan 2020	Enrolled or had contact in 2019 with primary health care
011 Northland	97.4%	99.4%	99.5%
021 Waitemata	95.3%	98.7%	98.9%
022 Auckland	94.4%	98.8%	99.0%
023 Counties Manukau	95.5%	98.9%	99.1%
031 Waikato	97.5%	99.4%	99.6%
042 Lakes	98.2%	99.3%	99.5%
047 Bay of Plenty	95.8%	98.8%	98.9%
051 Tairawhiti	98.2%	99.7%	99.7%
061 Taranaki	97.1%	98.6%	98.8%
071 Hawkes Bay	96.5%	98.6%	98.7%
081 MidCentral	98.1%	99.5%	99.6%
082 Whanganui	98.1%	99.5%	99.6%
091 Capital & Coast	97.2%	99.0%	99.2%
092 Hutt Valley	97.2%	98.9%	99.1%
093 Wairarapa	97.9%	99.8%	99.9%
101 Nelson Marlborough	98.4%	99.6%	99.7%
111 West Coast	98.7%	99.5%	99.6%
120 Canterbury	98.1%	99.6%	99.7%
123 South Canterbury	98.4%	99.8%	99.9%
160 Southern	98.4%	99.7%	99.8%
NZ overall	96.9%	99.2%	99.3%

Prognosis-Limiting Morbidities

With population level survival is improving faster than the reduction in morbidity, populations are living longer in healthy life years as well as unhealthy life years as demonstrated consistently by the Global Burden of Disease Study.[14] Effectively, prevalence of multi-morbidity in the population is increasing over time. Therefore, a significant number of people with CVD may have other prognosis-limiting comorbidities that may not merit aggressive secondary prevention of CVD. Five selected groups were included as relative contraindications as part of analyses to test this:

1. People who had received a palliative care code
2. People with metastatic cancer
3. People with dementia
4. People on dialysis
5. People with cirrhosis

Table 10: Percentage of people with CVD in New Zealand in 2019 with one of the selected 5 selected prognostic limiting conditions by age and by ethnicity

Age	Māori	Pacific	Indian	Chinese	Other Asian	European/Other	Overall	Number of people the selected 5 "conditions"
<30	5%	7%	5%	6%	5%	4%	5%	108
30-34	7%	10%	3%	0%	0%	3%	5%	41
35-39	7%	10%	7%	3%	0%	4%	6%	64
40-44	6%	11%	3%	2%	1%	3%	5%	107
45-49	6%	7%	2%	2%	3%	2%	4%	174
50-54	5%	7%	3%	4%	1%	2%	4%	302
55-59	6%	8%	2%	5%	3%	2%	4%	506
60-64	7%	8%	3%	2%	2%	3%	4%	744
65-69	7%	9%	5%	5%	4%	3%	4%	948
70-74	8%	11%	4%	6%	6%	5%	5%	1,464
75-79	10%	11%	7%	7%	11%	7%	7%	1,915
80-84	14%	17%	12%	10%	13%	10%	10%	2,251
85+	19%	21%	11%	12%	19%	15%	15%	3,602
Overall (crude %)	7.8%	9.7%	4.9%	6.6%	5.2%	6.9%	7.0%	12,226

While these morbidities are not absolute contraindications for secondary prevention for CVD, these subgroups are less likely to fully benefit from secondary prevention of CVD. The intent of the analyses is to exclude these groups from audits to investigate unexplained treatment gaps at a live NHI linked data level. Pacific and Maaori people with CVD have the highest prevalence of prognosis-limiting morbidities among the selected ethnic groups. Indeed, between the ages 30 and 74, Pacific people have consistently more than twice the age specific prevalence of prognosis-limiting morbidities compared to New Zealand Europeans and other group in 2019 in New Zealand (Table 10).

Interestingly, while the uptake of CVD preventive medication was lower among people with the selected prognosis limiting morbidities, the prognosis-limiting morbidities do not appear to be a major factor in explaining possible treatment gap of secondary prevention of CVD at a population level. Despite antiplatelet agents and anticoagulants often not having direct symptomatic benefit, their use remains relatively high among people (69%) with the selected prognosis-limiting morbidities (Table 11). Overall, 86% of people with CVD and prognosis-limiting comorbidities remained on one of the three groups of CVD medications.

Table 11: The uptake of CVD medications among people with CVD and at least one of the 5 selected prognosis-limiting comorbidities in 2019 in New Zealand (based on medication dispensing in the last 4 months in 2019)

Age	Antiplatelet/ anticoagulant	Anti-hypertensive meds	Statin	Antiplatelet or anticoagulants and statin	Triple therapy	At least one of 3 groups of CVD meds	Number of people with CVD and with the selected prognosis-limiting comorbidities
<30	39%	37%	6%	5%	4%	56%	108
30-34	34%	56%	15%	7%	7%	68%	41
35-39	59%	53%	23%	19%	16%	75%	64
40-44	62%	71%	33%	27%	25%	83%	107
45-49	61%	63%	37%	30%	28%	78%	174
50-54	70%	65%	57%	51%	43%	82%	302
55-59	70%	67%	55%	47%	40%	84%	506
60-64	71%	70%	58%	50%	42%	87%	744
65-69	74%	74%	61%	52%	44%	91%	948
70-74	74%	73%	64%	55%	46%	90%	1,464
75-79	73%	73%	58%	50%	43%	89%	1,915
80-84	72%	71%	48%	41%	34%	88%	2,251
85+	63%	62%	27%	23%	19%	81%	3,602
Overall	69%	68%	46%	40%	33%	86%	12,226

Cardiovascular Medication Dispensing Coverage Among People with Cardiovascular Disease by Age and Ethnicity in New Zealand in 2019

After excluding the 5 selected prognosis limiting conditions, Indian people with CVD have the highest uptake of triple therapy among all ethnic groups. Māori and Pacific rates are similar to European and other rates at each age level, with Pacific tending to be higher.

Table 12: Percentage of people with CVD without the 5 selected prognosis-limiting conditions in 2019 on triple therapy by age and ethnicity

Age	Māori	Pacific	Indian	Chinese	Other Asian	European /Other	Overall	Number of people with CVD
<30	2%	0%	3%	4%	2%	1%	1%	2,122
30-34	11%	21%	26%	33%	14%	8%	12%	774
35-39	17%	36%	32%	18%	38%	18%	22%	1,068
40-44	33%	43%	51%	60%	53%	31%	36%	2,062
45-49	41%	50%	65%	33%	50%	42%	44%	4,537
50-54	49%	60%	69%	50%	54%	51%	53%	8,296
55-59	56%	64%	72%	55%	61%	56%	57%	13,616
60-64	61%	67%	74%	58%	63%	60%	61%	18,226
65-69	63%	67%	73%	58%	63%	63%	63%	21,831
70-74	64%	68%	78%	61%	67%	64%	64%	25,673
75-79	60%	64%	72%	58%	64%	62%	62%	23,755
80-84	55%	53%	58%	54%	53%	57%	56%	19,308
85+	34%	32%	52%	43%	45%	39%	39%	20,370
Crude coverage	53%	59%	69%	54%	57%	56%	56%	161,638

NZ European and others with CVD are more likely to have at least one of the three groups of CVD medications compared other ethnic groups in New Zealand. This may be partly related to the NZ Europeans with CVD have an older age structure compared to the other ethnicities. Again for Māori and Pacific there appears to be good access to primary care.

Table 13: Percentage of people with CVD without the 5 selected prognosis limiting conditions in 2019 on at least one of the three groups of CVD medications by age and ethnicity

Age	Māori	Pacific	Indian	Chinese	Other Asian	European /Other	Overall	Number of people with CVD
<30	18%	22%	26%	23%	21%	21%	20%	2,122
30-34	37%	50%	53%	58%	32%	35%	39%	774
35-39	46%	63%	52%	44%	69%	47%	50%	1,068
40-44	64%	75%	78%	95%	78%	60%	65%	2,062
45-49	70%	76%	85%	65%	75%	73%	73%	4,537
50-54	75%	82%	89%	79%	85%	80%	80%	8,296
55-59	82%	85%	89%	85%	86%	85%	84%	13,616
60-64	87%	89%	92%	84%	89%	89%	89%	18,226
65-69	91%	91%	93%	85%	89%	92%	92%	21,831
70-74	93%	91%	92%	87%	92%	94%	94%	25,673
75-79	94%	92%	92%	89%	93%	95%	95%	23,755
80-84	93%	90%	90%	88%	91%	95%	95%	19,308
85+	92%	81%	91%	88%	91%	93%	93%	20,370
Crude coverage/ total	83%	84%	89%	85%	85%	91%	89%	161,638

Maori with CVD have the lower uptake of statin overall in New Zealand. The lower uptake is not fully explained by the younger age structure of Maori population.

Table 14: Percentage of people with CVD without the 5 selected prognosis limiting conditions has a statin dispensing in the last 4 months of 2019 by age and ethnicity

Age	Māori	Pacific	Indian	Chinese	Other Asian	European /Other	Overall	Number of people with CVD
<30	3%	2%	6%	8%	2%	2%	2%	2,122
30-34	16%	26%	42%	42%	14%	13%	17%	774
35-39	23%	44%	39%	29%	57%	28%	31%	1,068
40-44	42%	55%	66%	75%	64%	41%	46%	2,062
45-49	53%	63%	75%	51%	61%	55%	57%	4,537
50-54	62%	72%	83%	68%	69%	66%	67%	8,296
55-59	69%	76%	82%	70%	73%	70%	71%	13,616
60-64	75%	80%	84%	74%	79%	74%	75%	18,226
65-69	76%	81%	84%	75%	79%	77%	77%	21,831
70-74	78%	81%	85%	75%	82%	78%	78%	25,673
75-79	76%	78%	83%	76%	78%	76%	76%	23,755
80-84	71%	71%	74%	73%	70%	72%	72%	19,308
85+	50%	47%	68%	61%	60%	53%	53%	20,370
Crude coverage/ total	66%	71%	80%	71%	72%	70%	70%	161,638

People with Cardiovascular Disease Often have Other Morbidity

People with cardiovascular disease often have other risk factors, and/or morbidity. A selected set of 24 long term conditions or risk factors[C] were chosen to illustrate that the management of CVD will often require considerations of common risk factors and multi-morbidities. Pacific people consistently have the higher age specific prevalence of one of the 24 risk factors or long term conditions.

Table 15: Percentage of people with CVD in New Zealand with one of the 24 selected risk factors or long term conditions in 2019 by age and ethnicity

Age	Māori	Pacific	Indian	Chinese	Other Asian	European /Other	Overall	Number of people with CVD
<30	54%	61%	51%	51%	52%	42%	49%	2,122
30-34	59%	60%	54%	58%	64%	47%	53%	774
35-39	64%	69%	61%	57%	50%	47%	56%	1,068
40-44	66%	75%	52%	51%	57%	47%	56%	2,062
45-49	67%	75%	63%	46%	54%	47%	56%	4,537
50-54	69%	78%	64%	61%	61%	47%	56%	8,296
55-59	72%	81%	67%	60%	60%	50%	58%	13,616
60-64	76%	85%	77%	57%	66%	54%	61%	18,226
65-69	80%	87%	80%	62%	76%	59%	65%	21,831
70-74	84%	89%	79%	68%	77%	64%	67%	25,673
75-79	85%	92%	84%	68%	80%	68%	71%	23,755
80-84	88%	90%	85%	72%	77%	73%	74%	19,308
85+	86%	89%	79%	75%	83%	76%	76%	20,370
Crude coverage/ total	76%	83%	75%	66%	69%	64%	67%	161,638

[C] 24 selected long term conditions are diabetes, atrial fibrillation, asthma, bronchiectasis, recently treated cancer, cirrhosis, chronic kidney disease and end stage renal failure on dialysis, chronic obstructive pulmonary disease, cystic fibrosis, dementia, gout, haematological cancer, heart failure, immunosuppressed, other chronic pulmonary disease, primary pulmonary hypertension, sleep apnoea and obesity related hypoventilation, splenectomy, Parkinson disease, multiple sclerosis, epilepsy, other neurological condition with disability, haemorrhagic stroke, and mechanical heart valves.

The Value of Providing Packaged Care in View of Multi-Morbidity Among People with Cardiovascular Disease

Two of the common comorbidities of cardiovascular disease are atrial fibrillation/flutter and heart failure. The following prevalence estimates for atrial fibrillation and heart failure are based on historical hospital discharge diagnoses and/or based on medication for heart failure that require special authority application. Therefore, prevalence of these conditions is likely to be an underestimate.

Table 16: Estimated prevalence of atrial fibrillation/ flutter among people with CVD by age and ethnicity in New Zealand in 2019

Age	Māori	Pacific	Indian	Chinese	Other Asian	European /Other	Overall	Number of people with CVD and AF
<30	3%	3%	1%	2%	0%	1%	2%	36
30-34	7%	6%	5%	0%	0%	3%	5%	38
35-39	10%	8%	0%	3%	5%	4%	6%	65
40-44	10%	9%	2%	7%	1%	4%	6%	135
45-49	11%	11%	3%	2%	4%	4%	7%	316
50-54	14%	12%	3%	6%	5%	6%	8%	711
55-59	18%	14%	2%	6%	5%	8%	10%	1,426
60-64	21%	18%	8%	9%	8%	12%	13%	2,549
65-69	29%	24%	9%	10%	13%	15%	17%	3,910
70-74	31%	26%	10%	16%	11%	20%	21%	5,606
75-79	36%	30%	14%	18%	15%	24%	25%	6,387
80-84	40%	34%	23%	24%	18%	30%	30%	6,457
85+	44%	34%	17%	22%	22%	34%	34%	8,049
Crude prevalence	24%	20%	9%	15%	10%	21%	21%	35,685

Māori followed by Pacific people consistently have the highest age specific prevalence of atrial fibrillation/ flutter among people with CVD (Table 16).

Between the ages 30 and 64, Maori and Pacific people with CVD almost had 3 times higher age specific heart failure prevalence compared to the NZ European and other group in 2019 (Table 17).

Table 17: Estimated prevalence of heart failure among people with CVD by age and ethnicity in New Zealand in 2019

Age	Māori	Pacific	Indian	Chinese	Other Asian	European /Other	Overall	Number of people with CVD and CHF
<30	8%	6%	4%	8%	7%	4%	6%	127
30-34	13%	16%	5%	0%	14%	4%	8%	69
35-39	10%	14%	3%	3%	5%	4%	7%	77
40-44	14%	11%	8%	7%	5%	4%	8%	173
45-49	15%	15%	7%	4%	2%	4%	8%	378
50-54	14%	14%	4%	4%	6%	4%	8%	648
55-59	15%	15%	6%	6%	7%	5%	8%	1,141
60-64	18%	17%	10%	3%	5%	6%	9%	1,694
65-69	21%	18%	11%	5%	8%	8%	10%	2,308
70-74	22%	20%	12%	6%	13%	10%	11%	3,029
75-79	24%	24%	20%	7%	15%	12%	13%	3,450
80-84	26%	26%	23%	10%	14%	16%	17%	3,586
85+	29%	27%	28%	16%	21%	23%	23%	5,460
Crude prevalence	19%	18%	12%	8%	9%	12%	13%	22,140

The indications of cardiovascular medications vary by other related morbidities. For example, for people with atrial fibrillation/flutter (AF), since the co-existence of heart failure and/or cardiovascular disease increase the stroke risk significantly, the indications for anticoagulation is stronger. People with cancer treated in hospital, or having had chemotherapy in the past year, or haematological cancer diagnosed in inpatient hospital in the last 5 years may have relative contraindication to anticoagulation. Additional analyses can be done on these and many other subsets – for example as below.

As the risk of stroke increases with age, the uptake of anticoagulation generally increases with age up to 70 year old (Table 18). Those with co-existing CVD and atrial fibrillation have an increased uptake of anticoagulation up to 64 years of age. People with heart failure and atrial fibrillation are more likely to be on anticoagulation. The number of people with recently treated cancer, or received chemotherapy in the past year and/ or haematological cancer in the past 5 years only account for a small proportion of the overall AF population and excluding them does not substantially increase the uptake of age specific anticoagulation rates.

The use of anticoagulation among people with atrial fibrillation, heart failure, and cardiovascular disease appears low particularly in age groups from around 50 to 69.

Table 18: The use of anticoagulation for people with atrial fibrillation and associated conditions by age in 2019

Age	AF + CVD	AF + CHF	AF+ CVD+ CHF	AF overall	AF excluding cancer, chemo, haematology	AF + CHF exclude cancer, chemo, haematology
<30	8.8%	20.4%	18.2%	5.9%	5.9%	20.4%
30-34	28.6%	33.3%	35.3%	11.0%	10.9%	33.3%
35-39	35.6%	35.2%	42.9%	14.8%	14.9%	35.6%
40-44	35.0%	45.2%	45.2%	20.8%	20.8%	45.2%
45-49	36.5%	55.6%	47.1%	26.1%	26.1%	55.6%
50-54	39.4%	56.9%	54.6%	31.6%	31.8%	57.4%
55-59	40.9%	56.0%	54.1%	35.3%	35.4%	56.6%
60-64	44.6%	57.4%	52.6%	40.4%	40.5%	57.4%
65-69	46.1%	57.8%	50.5%	48.4%	48.6%	57.8%
70-74	47.7%	55.7%	49.8%	52.2%	52.3%	55.8%
75-79	48.4%	52.9%	48.0%	52.6%	52.8%	53.0%
80-84	46.6%	50.6%	46.8%	49.9%	50.1%	50.6%
85+	38.3%	38.6%	34.5%	40.2%	40.5%	38.9%
Crude coverage	44.5%	50.3%	45.3%	44.6%	44.7%	50.5%

CVD is an indication for anti-platelet medication, but anticoagulation is usually not required unless indicated by other comorbidities, such as atrial fibrillation. Anti-platelet medication is much less effective in reducing AF related stroke compared to anticoagulant. They may be acceptable for young people who are at very low risk of stroke, or older people with significant contraindications to anticoagulants. About 20% of people with AF overall were not on an anticoagulant but were on anti-platelet medication only.

People with cardiovascular disease and congestive heart failure had a higher uptake of antiplatelet and anticoagulant medication than people with CVD overall, in the age groups 69 or younger. The opposite pattern is seen in the age groups aged 70 and over. This is understandable given the older people with heart failure and CVD are also more likely to have contraindications to anticoagulation.

Table 19: the uptake of anti-platelet and/or anticoagulant medication by selected combinations of conditions by age (based on last 4 months of dispensing), 2019

Age	CVD+ CHF	CVD + AF	CVD with no AF, or CHF	CVD overall	AF +CHF	CVD+AF+CHF	AF overall	AF exclude cancer, chemo, haematology	AF + CHF exclude cancer, chemo, haematology
<30	19%	35%	14%	15%	35%	36%	10%	10%	35%
30-34	54%	57%	25%	28%	51%	59%	17%	17%	51%
35-39	61%	59%	39%	41%	45%	57%	21%	21%	46%
40-44	60%	68%	52%	53%	60%	71%	30%	30%	60%
45-49	71%	68%	61%	62%	66%	68%	36%	36%	66%
50-54	74%	75%	68%	69%	68%	75%	47%	47%	68%
55-59	79%	79%	73%	74%	72%	78%	54%	54%	73%
60-64	81%	79%	78%	78%	74%	76%	62%	62%	74%
65-69	82%	80%	81%	81%	75%	77%	69%	69%	75%
70-74	80%	82%	83%	83%	74%	77%	74%	74%	74%
75-79	79%	80%	83%	82%	73%	76%	74%	74%	73%
80-84	76%	76%	82%	80%	70%	73%	71%	71%	70%
85+	70%	69%	77%	74%	62%	66%	64%	64%	62%
Crude coverage	76%	77%	76%	77%	69%	73%	65%	65%	70%

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