Commonwealth Department of Health

Initial Evaluation of Sixth Community Pharmacy Agreement Medication Management Programs: MedsCheck Programmes

Final Evaluation Report

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Abbreviations

ABS	Australian Bureau of Statistics
ACF	Aged care facility
ADE	Adverse drug events
AIHW	Australian Institute of Health and Welfare
ATSI	Aboriginal and Torres Strait Islander
BMQ	Beliefs about Medicines Questionnaire
CABG	Coronary artery bypass graft
CALD	Culturally and linguistically diverse people
CBA	Cost benefit analysis
CE	Cost-effective
CHD	Coronary heart disease
CI	Confidence interval
CIs	Clinical Interventions
CPA	Community Pharmacy Agreement
CUA	Cost-utility analysis
DAA	Dose Administration Aid
DPPR	Daily Polypharmacy Possession Ratio
DRP	Drug-related problem
DVA	Department of Veterans' Affairs
ED	Emergency department
EI	Extended Intervention
FRID	Fall risk-increasing drugs
GP	General practitioner
HMR	Home Medicines Review
HTA	Health technology assessment
ICER	Incremental cost-effectiveness ratio
MBS	Medicare Benefits Schedule
MI	Myocardial infarction

MLHFQ	Minnesota Living with Heart Failure questionnaire
MMP	Medication Management Program
MPR	Medication Possession Ratio
MRF	Medication review with follow-up
MSAC	Medical Services Advisory Committee
MTM	Medication therapy management
NHS	National Health Service
NR	Not reported
NSF	National Service Framework
NYHA	New York Heart Association
OR	Odds ratio
OTC	Over-the-counter
PBS	Pharmaceutical Benefits Scheme
PPI	Pharmacy Practice Incentives
PSA	Pharmaceutical Society of Australia
PSG	Programme Specific Guidelines
PTCA	Percutaneous transluminal coronary angioplasty
PwC	Pricewaterhouse Coopers
QALY	Quality-adjusted life year
QoL	Quality of life
RCT	Randomised controlled trial
RMMR	Residential Medication Management Review
RR	Relative risk
SS	Statistically significant
TRP	Treatment-related problem
UK	United Kingdom
USA	United States of America

Executive Summary

On the 27th October 2016, the Department of Health engaged HealthConsult to undertake an evaluation to determine the clinical/cost-effectiveness of four Medication Management Programs (MMPs) funded under the Sixth Community Pharmacy Agreement (6CPA): Home Medicines Review (HMR); Residential Medication Management Review (RMMR); MedsCheck; and Diabetes MedsCheck. This report presents the initial combined evaluation of the MedsCheck and Diabetes MedsCheck programs, which has involved:

- a literature review to identify data to inform the comparative clinical and cost-effectiveness of the MedsCheck and Diabetes MedsCheck programs and 'like' programs internationally; and
- an examination of the available Australian utilisation data from the MedsCheck and Diabetes MedsCheck programs going back to its start under earlier Community Pharmacy Agreements (CPAs).

ES 1 BACKGROUND

The MedsCheck programme, comprising of the MedsCheck and Diabetes MedsCheck services, was designed to provide for in-pharmacy medication reviews between pharmacists and consumers to enhance quality use of medicines and reduce adverse events and associated hospital admissions or medical presentations.

MedsCheck is an in-pharmacy, patient-centred service that includes a review of a patient's medicines, focusing on education and self-management.

Diabetes MedsCheck is an in-pharmacy, patient-centred service that provides a review of medications with a focus on the patient's type 2 diabetes medicines management, monitoring devices, education and self-management. The service is targeted at patients who are unable to gain timely access to other diabetes education or health services in their community.

The MedsCheck service aims to enhance quality use of medicines and reduce the number of adverse events by:

- identifying problems that the patient may be experiencing with their medicines;
- helping the patient learn more about their medicines including medicines affect medical conditions;
- improving the effective use of medicines by patients; and
- educating patients about how to best use and store their medicines.

The Diabetes MedsCheck service aims to reduce adverse events and associated hospital admissions or medical presentations by:

- optimising a patient's effective use of medicine through improving understanding of, and compliance with, their diabetes medication therapy;
- improving a patient's effective use of blood glucose monitoring devices through training and education;
- improving blood glucose control; and
- reducing the risk of the patient developing complications associated with type 2 diabetes.

To participate in the MedsCheck and Diabetes MedsCheck programs there are pharmacy, service provider and patient eligibility criteria that need to be met. A pharmacy approved to provide MedsCheck services, where the patient eligibility criteria has been met, will be paid the set service fee

for each MedsCheck and Diabetes MedsCheck service. The fees for each service are indexed each year to 30th June 2015. The current fees[1] for services conducted on or after the 1st July 2016 are $63.81, per MedsCheck service and $95.71 per Diabetes MedsCheck service.

One MedsCheck/Diabetes MedsCheck service can be conducted per eligible patient per 12 months. In addition, the eligible patient must not have received a HMR or RMMR in the preceding 12 months.

ES 2 METHODOLOGY

This section summarises the methodology used to identify the published as well as grey literature considered in this initial evaluation of the MedsCheck and Diabetes MedsCheck program.

ES 2.1 Literature search

A systematic literature review was undertaken in December 2016 to identify studies that provide evidence relating to the safety, effectiveness, cost and cost-effectiveness of MedsCheck, Diabetes MedsCheck or similar programs provided by community pharmacists (in pharmacies) to individuals living in the community. The grey literature was also searched, as were the reference lists of included studies. Table ES.1 presents the evidence selection criteria for MedsCheck and Table ES.2 presents the evidence selection criteria for Diabetes MedsCheck.

Table ES.1: Selection criteria for evidence relating to MedsCheck services provided by community pharmacists

Criteria	Description
Population	Community patients that are at risk of medication mismanagement and: • are taking five or more prescription medicines, or • have had a recent significant medical event (a recent event or new diagnosis that has the potential to impact on the consumer's medication adherence or knowledge of their medicine regime and may increase the risk of medication misadventure). *Individuals with type 2 diabetes are excluded as these are covered by Diabetes MedsCheck services (see Table ES.2).*
Intervention	A 'medicines use review' or a similar service performed by a pharmacist at a community pharmacy, and focusing on education and self-management by: • identifying problems that the patient may be experiencing with their medicines; • providing education and guidance on correct use of medication/monitoring devices; or • attempting to resolve any drug-related problems. *Interventions specifying multiple scheduled visits within a 12-month period will be excluded.* *Interventions provided to individuals with type 2 diabetes are excluded as these are covered by Diabetes MedsCheck services (see Table ES.2).*
Comparator	Community patients who did not access medicine use review services.
Outcomes	Outcomes include: • changes in adherence/compliance/concordance with prescribed dose schedule (e.g. pill count, self-report); • changes in clinical outcomes (e.g. BP in patients with hypertension); • rates of adverse drug event/reactions and medication-related problems; • changes in disability indices; • health care resource use (ED attendance, hospitalisation, GP visits, specialist visits); • patient acceptance/satisfaction; • health-related quality of life; • cost of the service; • cost-effectiveness.
Study design	Comparative studies (randomised or non-randomised controlled trials, comparative cohort studies, case control studies, before/after studies) or systematic reviews of comparative studies. Applicability to the Australian context will be considered.
Publication type	Full English-language publications or reports. Conference abstracts will be excluded.

Abbreviations: BP, blood pressure; ED, emergency department; GP, general practitioner

[1] Claiming and payment [Internet]. 2015. [cited 2017 Feb 15]. Available from: http://6cpa.com.au/medication-management-programmes/medscheck-diabetes-medscheck/

Table ES.2 presents the selection criteria for evidence assessing the effectiveness and cost-effectiveness of medicines use review services provided to individuals with diabetes (Diabetes MedsCheck).

Table ES.2: Selection criteria for evidence relating to Diabetes MedsCheck services provided by community pharmacists

Criteria	Description
Population	Community patients that are at risk of medication mismanagement and have been diagnosed with type 2 diabetes within the past 12 months or their type 2 diabetes is less than ideally controlled.
Intervention	A 'medicines use review' or similar service performed by a pharmacist at a community pharmacy and focusing on the patient's type 2 diabetes medicines management, monitoring devices, education and self-management by: • identifying problems that the patient may be experiencing with their medicines; • providing education and guidance on correct use of medication/monitoring devices; or • attempting to resolve any drug-related problems. *Interventions specifying multiple scheduled visits within a 12-month period will be excluded.*
Comparator	Community patients with type 2 diabetes who did not access medicines use review services.
Outcomes	Outcomes include: • changes in adherence/compliance/concordance with prescribed dose schedule (e.g. pill count, self-report); • changes in clinical outcomes (e.g. blood glucose levels, glycated HbA_{1c}); • rates of adverse drug event/reactions and medication-related problems; • mortality rates; • health care resource use (ED attendance, hospitalisation, GP visits, specialist visits); • patient acceptance/satisfaction; • health-related quality of life; • cost of the service; • cost-effectiveness.
Study design	Comparative studies (randomised or non-randomised controlled trials, comparative cohort studies, case control studies, before/after studies) or systematic reviews of comparative studies. Applicability to the Australian context will be considered.
Publication type	Full English-language publications or reports. Conference abstracts will be excluded.

Abbreviations: ED, emergency department; GP, general practitioner; HBA_{1c}, glycated haemoglobin.

The literature search identified a number of systematic reviews that did not focus on MedsCheck or Diabetes MedsCheck conducted by a pharmacist, but on medication reviews in any setting or medication review within a multidisciplinary model or a disease management/care plan, or medication reviews that were delivered by any health professional. Therefore, findings from these systematic reviews cannot be extrapolated to the evaluation of the MedsCheck/Diabetes MedsCheck service. For this reason, only evidence from studies that evaluated MedsCheck/Diabetes MedsCheck principally delivered by a pharmacist, and independent of any other intervention aiming at optimising drug regimens and patient outcomes is presented in the systematic literature review.

A total of 13 primary studies were identified that examined community pharmacy based medication review similar to the MedsCheck performed by a pharmacist, that involved checking and optimising the patients' drug regimens through the identification of drug-related problems (DRPs) and providing recommendations for GPs, as well as increasing patients' knowledge and/or adherence. The studies were mixed in design and included 10 randomised controlled trials (RCTs), one observational study with pre- post-design and one retrospective sub-analysis of a cluster RCT. An additional study evaluated the cost-effectiveness of a community pharmacy based medication review using a cost-utility analysis. None of the studies were Australian, but were mostly conducted in the USA and Europe. Only one study that evaluated a community pharmacy based medication review targeting patients with type 2 diabetes was identified.

The search also identified two previous evaluations of the MedsCheck/Diabetes Check initiative funded under the 3CPA (Deloitte Access Economics) and 5CPA (PricewaterhouseCoopers (PwC). These studies did not meet the inclusion criteria for the systematic review, they were non-comparative and largely took a program evaluation approach. As commented on by some of the authors, the studies

provide low level evidence of the impact of MedsChecks. Nonetheless, given the importance of these studies from a policy perspective and the fact that they specifically address the program being reviewed, they have been summarised in Chapter 4 of this report, and their findings have been included and referenced when drawing conclusions in this Executive Summary.

ES 2.2 Utilisation analysis

The data available for inclusion in the utilisation analysis were claims payment data held by the Department of Health and the Pharmacy Guild. These data have been analysed primarily on inter-record and longitudinal relationships within the claims system extracts and also in the context of 'remoteness' inferred from the patient postcode. Data attributes and remoteness were used to assess whether participating pharmacies are implementing the MedsCheck and Diabetes MedsChecks scheme in line with guidance uniformly.

Key metrics in the analysis are the amount of claims paid, the number of patient MedsCheck and Diabetes MedsCheck services provided, the interval time between dates of service for patients who received more than one service, the number of prescription medicines the patient was taking, the number of chronic conditions that the patent has and summary information at patient level about the recommendations from their MedsChecks. MedsCheck and Diabetes MedsChecks were analysed and presented separately.

ES 3 RESULTS OF THE LITERATURE REVIEW

This section presents a summary of the findings drawn from the systematic literature review and review of the grey literature (which, in a departure from our usual practice for assessment reports prepared for the Medical Services Advisory Committee (MSAC)), and where relevant, the low level evidence derived from the program evaluations conducted on the MedsChecks programs funded under prior CPAs.

ES 3.1 Clinical outcomes

Evidence from one RCT showed that a community pharmacy based medication review can lead to significant improvements in clinical outcomes, including blood pressure, glucose levels, and triglyceride levels. However, this RCT was conducted in a different health care system than Australia (i.e. in Jordan), where most patients with a health ailment prefer to visit the community pharmacy first rather than a physician to save the time and cost of a doctor. Further, most medications were dispensed by a pharmacist without a medical prescription, thus leading to major implications for the safety and effectiveness of the pharmacotherapy used in this country. Therefore, positive findings from this study may not necessarily translate to Australia's health care system, and should be considered with caution.

ES 3.2 Hospital admissions

Evidence is conflicting to draw conclusions about the effect of community pharmacy based medication review on reducing the number of hospitalisations. Three RCTs found no effect on number of hospital admissions (with one RCT reported no significant effect on reducing Emergency Department (ED) visits). On the other hand, evidence from a sub-analysis of a cluster RCT and another with a pre-post-design suggest that community pharmacy based medication review results in a significant reduction in hospital admissions. A major limitation of pharmacist-led interventions studies is their relatively small sample size and hence, they are not sufficiently powered to detect differences in health care use. Importantly, there is a lack of a cause and effect analysis in most of the included studies, and whether any observed reduction in hospitalisation was drug-related, thus restricting the generalisation of the results. Another limitation is the relatively short duration of follow-up in the included studies. It is likely that a study follow-up period of less than one year is too short to realise longer-term reduction

in health care use. Therefore, the evidence of the impact of medication review performed at the pharmacy on hospital admissions remains uncertain.

ES 3.3 Health care resource costs

There is a paucity of evidence on the effect of a community pharmacy based medication review on reducing health care costs. Evidence from one retrospective sub-analysis of one RCT showed that medication-related hospital costs were significantly lower for patients receiving a community pharmacy based medication. However, these results should be interpreted with caution due to the poor quality of retrospective studies.

ES 3.4 Drug burden

Evidence from two RCTs that evaluated the effect of community pharmacy based medication review on reducing the number of medications associated with falling (i.e. fall risk increasing drugs) were contradictory, with one showing a significant reduction in medications associated with increased falling and the other showing no effect. Evidence from one observational study showed that community pharmacy based medication review has a positive effect in reducing the number of medicines, thus leading to a decrease in the percentage of polypharmacy patients. However, there is no evidence showing that a decreased drug burden improves any patients' health outcomes, such as decrease in DRPs, adverse drug events or reduction in falls, and consequently a reduction in health care costs.

ES 3.5 Falls

Two RCTs evaluated the effect of a community pharmacy based medication review on the reduction of falls in the elderly. Evidence from two RCTs suggests that a community pharmacy based medication review has no effect on reducing falls in high-risk older adults. However, both RCTs were of small sample size; hence more research is needed to evaluate the community pharmacy based medication review using a larger sample size that provides greater power to detect clinically meaningful effects of reduction in the use of high-risk medications on preventing or reducing falls in high-risk populations.

ES 3.6 Mortality

Evidence from two RCTs did not demonstrate a significant effect on mortality in patients with heart disease.

ES 3.7 Adverse drug events

Evidence for an effect of a community pharmacy based medication review on adverse drug events (ADEs) is inconclusive. One RCT that was statistically powered to detect a meaningful difference in ADEs found no effect of a community pharmacy based medication review on reducing ADEs. Another RCT reported a significant reduction in DRPs but without translating this effect into reductions in ADEs. A third RCT and one small observational study showed high acceptance of the pharmacist's recommendations by physicians, leading to the resolution, improvement, or prevention of identified medication-related problems and DRPs. Findings from these two studies may suggest that community pharmacy based medication review can assist patients achieve a safe and effective pharmacotherapy, however, there is no evidence to suggest that a reduction in DRPs or medication-related problems lead to reduction in ADEs or improvements in any other patient health outcome. Therefore, further research is needed to identify the link between DRPs and ADEs, and aspects of medication review that are particularly effective at improving other patients' health outcomes, such as mortality, health-related QoL, hospital admissions and use of health services.

ES 3.8 Prescribing appropriateness

Evidence from one large RCT suggests that a community pharmacy based medication review has no positive effect on improving appropriateness of medication prescribing.

ES 3.9 Adherence

The evidence for an effect of community pharmacy based medication review on adherence was mixed. Results from three RCTs showed that a community pharmacy based medication review did not have a positive effect on improving patients' adherence to medication. However, one small RCT reported improvement in medication compliance in patients with moderate to severe heart failure.

The 5CPA MedsCheck program evaluation reported on consumers' self-reported level of medication adherence and found that complete adherence was highest among participants who viewed their general health status to be excellent, decreasing with health status; and there were no large differences in complete or partial medication adherence between people consuming a small number (e.g. one) of medicines compared to people consuming a higher number of medicines (e.g. 10+).

ES 3.10 Health-related quality of life

The evidence for an effect of community pharmacy based medication review on quality of life was conflicting, with one observational study reporting an improvement in QoL, and four RCTs showing no significant effect on QoL. The inability of the pharmacy-led intervention to significantly affect health-related QoL in the elderly may partially be due to a greater disease burden experienced by the elderly and thus, the intervention may only have a nonsignificant effect on QoL. More research is necessary in order to define the effect of a clinical medication review on patient QoL.

ES 3.11 Patient acceptance/satisfaction

Evidence from two RCTs suggests that community pharmacy based medication review has a positive effect on patient satisfaction, especially in relation to treatment and symptom control as a result of the medication review.

Findings from the evaluation of the MedsCheck pilot program found that majority of patients were satisfied with the service provided and would recommend the MedsCheck or Diabetes MedsCheck service to others. Patient benefits were reported to be realised through acquiring an increased understanding of their medicines relating to indication, dosing, side effects, interactions and storage.

ES 3.12 Evidence relating specifically to Diabetes MedsCheck

There is insufficient evidence evaluating the effect of a community pharmacy based medication review targeting patients with type 2 diabetes on patients' outcomes. A single small RCT found no significant effect on blood glucose levels, hospital admissions, general practitioner visits, drug burden, or quality of life. However, a significant improvement in blood pressure was demonstrated.

ES 3.13 Cost-effectiveness

The economic evaluation of MedsCheck included a cost-utility analysis (CUA). The RCT upon which the economic evaluation was based was conducted in Spain between 2011 and 2013, involving medication review with 6-month follow-up versus usual care. By the end of the follow-up period, patients in both groups had reduced the mean number of prescribed medications they took (the primary outcome for the study), and this reduction was greater in the intervention group than in the control group. A between-group comparison for the mean number of prescribed medications favoured the intervention group and was reported as 0.21 ± 0.06 drugs (95 % CI 0.092 – 0.335). Patients in the

intervention group saw their QoL improved; in contrast, the control group experienced a slight reduction in their quality of life. A between-group comparison for QoL favoured the intervention group, and was reported as 0.0550 ± 0.01 in the utility score (95 % CI 0.0306–0.0794).

To estimate the incremental cost-effectiveness ratio (ICER), the costs (adjusted for baseline medications) and QALYs (adjusted for baseline utility score) were used, resulting in a mean incremental total cost of –€250.51 and a mean incremental QALY of 0.0156. The CUA shows that the medication review service is the dominant strategy. The acceptability curve shows that if the willingness-to-pay is between €30,000/QALY and €45,000/QALY, the probability of the medication review service being cost effective is 100%. The authors concluded that 'the medication review with follow-up service is an effective intervention for optimising prescribed medication and improving QoL in older adults with polypharmacy in community pharmacies. The results from the CUA suggest that the medication review with follow-up (MRF) service is cost effective.'

It should be noted that the intervention and control groups were not balanced at baseline with respect to mean number of prescribed medications or mobility problems as measured by EQ-5D. There are other concerns with this study in terms of the intervention and the study design: the intervention is poorly described and the cluster RCT study design could allow for bias in favour of the intervention.

Another RCT performed a cost-minimisation analysis using data on National Health Service (NHS) and patient costs (based on 2015 UK prices). The analysis found that the difference at follow-up in total NHS-related cost (accounting for the cost of the pharmacy intervention) was statistically significant due to the cost of providing pharmacist training. The pharmacist-led service was found to be more expensive than standard care.

ES 4 RESULTS OF THE UTILISATION ANALYSIS

The available data show that active enforcement of claims guidelines and the introduction of a MedsChecks and Diabetes MedsChecks claims caps (i.e. a combined total of 10 MedsCheck or Diabetes MedsCheck services per month, per pharmacy) in early 2014 was effective in reducing the burgeoning number of patients receiving MedsChecks. The effect on MedsChecks was particularly pronounced. The policy changes were also effective in promoting greater adherence to MedsChecks scheme guidelines (especially those relating to frequency).

The uncapped schemes attracted rapid and unexpected uptake by pharmacies (especially the MedsChecks scheme) and was servicing a substantial number of patients that mostly received a one-time MedsCheck and Diabetes MedsChecks service between mid-2012 and mid-2014. For patients receiving multiple MedsChecks and Diabetes MedsChecks services between mid-2012 and mid-2014 a considerable proportion were occurring more frequently than stipulated in schemes' guidelines.

Between mid-2014 and mid-2016 (i.e. after the introduction of the caps), both MedsChecks and Diabetes MedsChecks patient and service volumes declined rapidly before resuming a more stable growth pattern from a considerably lower base. Importantly, alignment with frequency guidelines improved markedly, and better alignment with expectations around patient age distribution and patterns of multiple prescription medicines and multiple chronic conditions. Some of the behaviour change can be attributed to the simple economics of introducing capped service levels. Some of the more qualitative improvements like better guideline adherence may also have been influenced by the signalling effect of policy changes and expectation of greater stringency in claims policies and in guideline enforcement.

ES 5 CONCLUSIONS

Taken together, the systematic literature review and the lower level evidence in evaluations funded as part of successive CPAs does not allow a conclusive determination to be made with regard to the clinical and cost-effectiveness of MedsChecks or Diabetes MedsChecks performed by pharmacists.

The evidence for an effect of MedsCheck on patient outcomes was mixed, with some studies showing benefit in certain populations, whereas others reported no positive effect. No studies address the ultimate clinical outcomes of a MedsCheck/Diabetes Check. However, several included studies addressed the effects of a MedsCheck intervention on intermediate outcomes such as reduction in DRPs as a result of pharmacist's recommendations; however, improvements in this outcome did not translate to a meaningful reduction in ADEs or improvements in any other patient health outcome. In relation to cost-effectiveness, a single study with a cost-utility analysis concluded that medication review was cost-effective. However, when comparing input costs using a cost-minimisation analysis from another study, the medication review service was found to be more expensive than standard care.

Thus, it is concluded that to make a robust assessment of the clinical and cost-effectiveness of MedsChecks and Diabetes MedsCheck, further research is required. The nature of that research is difficult to specify, as MedsChecks and Diabetes MedsCheck have become an accepted part of pharmacy practice. It is considered that some progress could be made by identifying the characteristics of patients that experience adverse medication events and targeting research towards determining whether MedsChecks and/or Diabetes MedsCheck by a pharmacist can prevent those problems occurring. The alternative may be to direct research towards developing a more targeted approach where patients using specific medicine that are associated with a high risk of adverse events (e.g. warfarin, amiodarone, tramadol, digoxin, lithium, etc.) are the target population for MedsChecks.

1 Introduction

On the 27th October 2016, the Department of Health engaged HealthConsult to undertake an evaluation to determine the clinical and cost-effectiveness of four Medication Management Programs (MMPs) funded under the Sixth Community Pharmacy Agreement (6CPA): Home Medicines Review (HMR); Residential Medication Management Review (RMMR); MedsCheck; and Diabetes MedsCheck. This report presents the initial combined evaluation of the MedsCheck and Diabetes MedsCheck programs, which has involved:

- a literature review to identify data to inform the comparative clinical and cost-effectiveness of the MedsCheck and Diabetes MedsCheck programs and 'like' programs internationally; and
- an examination of the available Australian utilisation data from the MedsCheck and Diabetes MedsCheck programs going back to its start under earlier Community Pharmacy Agreements (CPAs).

1.1 SIXTH COMMUNITY PHARMACY AGREEMENT

In May 2015, the Australian Government and Pharmacy Guild of Australia entered into the 6CPA, which provides around $18.9 billion in remuneration for community pharmacy, as well as support to the pharmaceutical supply chain (with a further $372 million provided for chemotherapy compounding fees). Up to $1.26 billion in funding is available under the 6CPA for evidence-based, patient-focused professional pharmacy programs and services. This consists of:

- $613 million for the continuation of a number of programs and services from 5CPA;
- $50 million for a new pharmacy trial program; and
- up to $600 million for new and expanded community pharmacy programs.

The 6CPA includes three key funding elements:

- community pharmacy remuneration;
- ensuring that all Australians have timely access to the Pharmaceutical Benefits Scheme (PBS) medicines they require regardless of the cost of the medicine or where they live; and
- community pharmacy programs directed at improving consumer management of their medications and delivering primary healthcare services through community pharmacy.

1.2 CONTINUING CPA PROGRAMS

As part of the 6CPA, there are several continuing Programs directed at improving medication compliance through community pharmacies in Australia. The continuing programs include:

- Medication Adherence Programs (MAPs):
  - Dose Administration Aids (DAAs);
  - Clinical Interventions (CIs); and
  - Staged Supply (SS).
- Medication Management Programs (MMPs):
  - Home Medicines Reviews (HMR);
  - Residential Medication Management Reviews (RMMR); and

  - MedsCheck and Diabetes MedsCheck.
- Rural Support Programs:
  - Rural Pharmacy Workforce Program; and
  - Rural Pharmacy Maintenance Allowance.
- Aboriginal and Torres Strait Islander (ATSI) Programs:
  - Quality Use of Medicines Maximised for ATSI People (QUMAX);
  - S100 Pharmacy Support Allowance; and
  - ATSI Workforce Program (Pharmacy Assistant Traineeship Scheme and Pharmacy Scholarships Scheme).
- eHealth:
  - Electronic Prescription Fee.

Under 6CPA, all programs and services need to be reviewed by the Medical Services Advisory Committee (MSAC) for clinical and cost-effectiveness and the health benefits they offer to the community. This process is being used to ensure pharmacy programs and services are assessed against the same standards of evidence as for other health professions. It supports a consistent approach to informing investment that delivers the greatest benefit to consumers.

2
Overview of the MedsCheck Programmes

This Chapter briefly describes the MedsCheck programmes, as described in the Programme Specific Guidelines (PSG), which falls under the MMP within 6CPA.

2.1 MEDSCHECK AND DIABETES MEDSCHECK PROGRAMS

The MedsCheck programme, comprising of the MedsCheck and Diabetes MedsCheck services, was designed to provide for in-pharmacy medication reviews between pharmacists and consumers to enhance quality use of medicines and reduce the number of adverse medicine events.

MedsCheck is an in-pharmacy, patient-centred service that includes a review of a patient's medicines, focusing on education and self-management.

Diabetes MedsCheck is an in-pharmacy, patient-centred service that provides a review of medications with a focus on the patient's type 2 diabetes medicines management, monitoring devices, education and self-management. The service is targeted at patients who are unable to gain timely access to other diabetes education or health services in their community.

The MedsCheck programme is part of the suite of MMPs funded under the 6CPA to support quality use of medicines services that are designed to reduce adverse events and associated hospital admissions or medical presentations.

2.2 OBJECTIVES OF THE MEDSCHECKS SERVICES

The MedsChecks programme is part of an initiative to expand the role of community pharmacy, beyond medication dispensing to an increased primary healthcare contribution.

The MedsCheck service aims to:

- identify problems that the patient may be experiencing with their medicines;
- help the patient learn more about their medicines including medicines affect medical conditions;
- improve the effective use of medicines by patients; and
- educate patients about how to best use and store their medicines.

The Diabetes MedsCheck service aims to:

- optimise a patient's effective use of medicine through improving understanding of, and compliance with, their diabetes medication therapy;
- improve a patient's effective use of blood glucose monitoring devices through training and education;
- improve blood glucose control; and
- reduce the risk of the patient developing complications associated with type 2 diabetes.

2.3 PARTICIPATION IN THE MEDSCHECKS PROGRAMME

To be eligible to participate in the MedsCheck programme a pharmacy must:

- be approved to dispense PBS medicines as part of the National Health Scheme defined in Section 90 of the National Health Act 1953 (Cth) (Section 90 pharmacy); and
- have access to the services of a Registered Pharmacist through employment of service contract relationships.

An approved MedsCheck service provider must comply with the following requirements for ongoing participation in the MedsCheck and Diabetes Check:

(1) abide by the 6CPA General Terms and Conditions;

(2) undertake to provide MedsCheck services in accordance with the PSG; and

(3) ensure that MedsCheck services are carried out by a Registered Pharmacist face-to-face with the patient in an area of the community pharmacy approved premises that is physically separated from the retail trading floor so that the privacy and confidentiality of patients is protected.

The area must meet the following requirements:

- be appropriately furnished with facilities to allow the patient and the pharmacist to sit down together;
- be of sufficient size and appropriate layout to accommodate efficient workflow, including adequate room for the patient, their carer and the pharmacist as well as all the consumables, equipment and documentation required for the service;
- allow the patient and the pharmacist to talk at normal speaking volumes without being overheard by any other person (including pharmacy staff);
- be clearly sign posted as a private consultation area; and
- script in an out counters (including those with privacy screens) do not meet the consultation area requirements.

(4) Ensure the Registered Pharmacist conducting the MedsCheck or Diabetes MedsCheck services is not responsible for dispensing or undertaking other professional duties at the time of MedsCheck or Diabetes MedsCheck consultation.

(5) When a Community Pharmacy is closed to members of the Public, MedsCheck services can be carried out in a public area of the pharmacy as long as the conversation between the Registered Pharmacist and the patient cannot be overheard by any other person (including pharmacy staff).

(6) Understand that no more than 10 MedsCheck and Diabetes MedsCheck services in total per service provider per calendar month will be remunerated. The threshold applies per service provider per calendar month, regardless of the number of registered pharmacists that may provide MedsCheck and Diabetes MedsCheck services on the service provider's behalf.

The patient eligibility criteria for MedsCheck includes:

- is a Medicare and/or Department of Veterans' Affairs (DVA) cardholder;
- has not received a MedsCheck, Diabetes MedsCheck, HMR or RMMR in the previous 12 months;
- is living at home in a community setting;
- is taking five or more prescription medicines; or
- has had a recent significant medical event. A significant medical event can be defined as a recent event or new diagnosis that has the potential to impact on the consumer's medication adherence or knowledge of their medicine regime and may increase the risk of medication misadventure. MedsCheck services are not available to in patients of public or private hospitals, day hospital facilities, transitional care facilities, or to residents of an aged care facility (ACF).

The patient eligibility criteria for Diabetes MedsCheck includes:

- is a Medicare and/or DVA cardholder;
- has not received a MedsCheck, Diabetes MedsCheck, HMR or RMMR in the previous 12 months;
- is living at home in a community setting;
- has recently been diagnosed with type 2 diabetes (in the last 12 months); ***or*** has less than ideally controlled type 2 diabetes; **and**
- is unable to gain timely access to existing diabetes education /health services in their community.

Barriers to 'timely access' should be determined by the Registered Pharmacist based on the patient's specific needs and may include:

- appointment availability is not suitable to address the patient's immediate needs; or
- distance to be travelled to the nearest diabetes education/health service is impractical for the patient;
- there is a lack of accessibility to transport.

Diabetes MedsCheck services are not available to admitted patients of public or private hospitals, day hospital facilities, transitional care facilities, or to residents of an ACF.

The patient must be present at the MedsCheck or Diabetes MedsCheck consultation. The patient's carer may also attend the MedsCheck or Diabetes MedsCheck consultation.

A patient accessing the DVA's Dose Administration Aid (DAA) Service is eligible for a MedsCheck or Diabetes MedsCheck.

A pharmacy approved to provide MedsCheck services, where the patient eligibility criteria has been met, will be paid the set service fee for each MedsCheck and Diabetes MedsCheck service. The fees for each service are indexed each year to 30th June 2015. The current fees[2] for services conducted on or after the 1st July 2016 are $63.81, per MedsCheck service and $95.71 per Diabetes MedsCheck service.

2.4 FREQUENCY OF SERVICE

One MedsCheck/Diabetes MedsCheck service can be conducted per eligible patient per 12 months. In addition, the eligible patient must not have received a HMR or RMMR in the preceding 12 months.

2.5 IDENTIFYING A PATIENT

Patients who have an identifiable need and may benefit from a MedsCheck or Diabetes MedsCheck may be identified through the following:

- Pharmacist (or pharmacy staff) identifies a patients who may benefit from a MedsCheck or Diabetes MedsCheck service based on the eligibility criteria; or
- The pharmacy receives a recommendation for a MedsCheck or Diabetes MedsCheck service from the patient's general practitioner (GP) or other healthcare provider; or
- The pharmacy receives a request from the patient or patient's carer for a MedsCheck or Diabetes MedsCheck service.

[2] Claiming and payment [Internet]. 2015. [cited 2017 Feb 15]. Available from: http://6cpa.com.au/medication-management-programmes/medscheck-diabetes-medscheck/

3
Review Methodology

This Chapter describes the methodology used to identify and assess the evidence relating to MedsCheck/Diabetes MedsCheck or similar pharmacist-led programs. The evaluation encompasses a systematic literature review of Australian and international evidence for the effectiveness and cost-effectiveness of pharmacist-delivered MedsCheck and Diabetes MedsCheck services provided to consumers who live at home in the community but the service is provided at the pharmacy; and an analysis of available data on the utilisation of the service provided.

3.1 SYSTEMATIC LITERATURE REVIEW

This section presents the selection criteria, the search strategy use to identify studies the relevant evidence and a summary of the process used to include and/or exclude identified evidence to assess the safety, effectiveness and cost-effectiveness of MedsCheck and Diabetes MedsCheck services.

3.1.1 PICO criteria

Table 3.1 presents the selection criteria for evidence assessing the safety, effectiveness and cost-effectiveness of MedsCheck services.

Table 3.1: Selection criteria for evidence relating to MedsCheck services provided by community pharmacists

Criteria	Description
Population	Community patients that are at risk of medication mismanagement and: • are taking five or more prescription medicines, or • have had a recent significant medical event (a recent event or new diagnosis that has the potential to impact on the consumer's medication adherence or knowledge of their medicine regime and may increase the risk of medication misadventure). *Individuals with type 2 diabetes are excluded as these are covered by Diabetes MedsCheck services (see Table 3.2*Abbreviations: BP, blood pressure; ED, emergency department; GP, general practitioner Table 3.2 presents the selection criteria for evidence assessing the effectiveness and cost-effectiveness of medicines use review services provided to individuals with diabetes (Diabetes MedsCheck). *).*
Intervention	A 'medicines use review' or a similar service performed by a pharmacist at a community pharmacy, and focusing on education and self-management by: • identifying problems that the patient may be experiencing with their medicines; • providing education and guidance on correct use of medication/monitoring devices; or • attempting to resolve any drug-related problems. *Interventions specifying multiple scheduled visits within a 12-month period will be excluded.* *Interventions provided to individuals with type 2 diabetes are excluded as these are covered by Diabetes MedsCheck services (see Table 3.2).*
Comparator	Community patients who did not access medicines use review services.

Criteria	Description
Outcomes	Outcomes include: • changes in adherence/compliance/concordance with prescribed dose schedule (e.g. pill count, self-report); • changes in clinical outcomes (e.g. BP in patients with hypertension); • rates of adverse drug event/reactions and medication-related problems; • changes in disability indices; • health care resource use (ED attendance, hospitalisation, GP visits, specialist visits); • patient acceptance/satisfaction; • health-related quality of life; • cost of the service; • cost-effectiveness.
Study design	Comparative studies (randomised or non-randomised controlled trials, comparative cohort studies, case control studies, before/after studies) or systematic reviews of comparative studies. Applicability to the Australian context will be considered.
Publication type	Full English-language publications or reports. Conference abstracts will be excluded.

Abbreviations: BP, blood pressure; ED, emergency department; GP, general practitioner

Table 3.2 presents the selection criteria for evidence assessing the effectiveness and cost-effectiveness of medicines use review services provided to individuals with diabetes (Diabetes MedsCheck).

Table 3.2: Selection criteria for evidence relating to Diabetes MedsCheck services provided by community pharmacists

Criteria	Description
Population	Community patients that are at risk of medication mismanagement and have been diagnosed with type 2 diabetes within the past 12 months or their type 2 diabetes is less than ideally controlled.
Intervention	A 'medicines use review' or similar service performed by a pharmacist at a community pharmacy and focusing on the patient's type 2 diabetes medicines management, monitoring devices, education and self-management by: • identifying problems that the patient may be experiencing with their medicines; • providing education and guidance on correct use of medication/monitoring devices; or • attempting to resolve any drug-related problems. *Interventions specifying multiple scheduled visits within a 12-month period will be excluded.*
Comparator	Community patients with type 2 diabetes who did not access medicines use review services.
Outcomes	Outcomes include: • changes in adherence/compliance/concordance with prescribed dose schedule (e.g. pill count, self-report); • changes in clinical outcomes (e.g. blood glucose levels, glycated HbA_{1c}); • rates of adverse drug event/reactions and medication-related problems; • mortality rates; • health care resource use (ED attendance, hospitalisation, GP visits, specialist visits); • patient acceptance/satisfaction; • health-related quality of life; • cost of the service; • cost-effectiveness.
Study design	Comparative studies (randomised or non-randomised controlled trials, comparative cohort studies, case control studies, before/after studies) or systematic reviews of comparative studies. Applicability to the Australian context will be considered.
Publication type	Full English-language publications or reports. Conference abstracts will be excluded.

Abbreviations: ED, emergency department; GP, general practitioner;HBA_{1c}, glycated haemoglobin.

A comprehensive search of peer-reviewed scientific literature was conducted in December 2016 to identify studies that provide evidence relating to the effectiveness and cost-effectiveness of MedsCheck/Diabetes MedsCheck or similar community pharmacy based programs provided by pharmacists to individuals living in the community.

Three electronic databases were searched for original research papers describing relevant systematic reviews, meta-analyses or comparative studies; Embase (OVID), Medline (OVID) and the Cochrane Library of Systematic Reviews (Cochrane Database of Systematic Reviews; Database of Abstracts of

Reviews of Effects; Cochrane Central Register of Controlled Trials; Health Technology Assessments Database; NHS Economic Evaluation Database). The search was conducted on 19th December 2016, and the publication date was unrestricted. A search of the Health Systems Evidence database, and the websites of health technology assessment (HTA) agencies was also conducted.

The specific search terms used to identify relevant literature are outlined in B. The search strategy was designed to identify articles relevant to the evaluation of HMR, RMMR and also the MedsCheck and Diabetes MedsCheck programs. While the screening for evidence pertinent to each of these programs was conducted simultaneously, the evaluation of HMR, RMMR, MedsCheck and Diabetes MedsCheck is reported separately.

3.1.2 Selection of relevant evidence

The literature search outlined above identified 5,282 records from Embase, Medline and the Cochrane Library (3,670 unique citations; Table 3.3) and 373 records in the Health Systems Evidence database. The following exclusion criteria were applied:

- wrong publication or study type– excludes narrative reviews, conference abstracts and editorials, and non-comparative studies (i.e. single arm, descriptive studies);
- wrong population – excludes services for patients not living in the community (e.g. hospital inpatients, patients attending clinics, residents of aged care facilities);
- wrong intervention – excludes studies of interventions that do not align with MedsCheck/Diabetes MedsCheck services as described in Section 3.1.1 (e.g. provided by a health professional other than a pharmacist, multidisciplinary models, or interventions that involve other services in addition to medication review);
- wrong comparator – excludes studies that do not include a comparator group of patients for whom the service was not provided;
- wrong outcomes – excludes studies that do not assess one of the outcomes outlined in Section 3.1.1 (studies that assessed intermediate outcomes such as prescribing appropriateness and drug burden were included);
- not in English – excludes studies not published in English language or those that do not include at least some information (e.g. a summary) in English.

The exclusion of citations during screening of these records is presented in Table 3.3. The Health Systems Evidence search yielded an additional 32 systematic reviews or economic analyses, of which six were eligible for inclusion and 26 did not meet the inclusion criteria (e.g. focus of review too broad, including out-of-scope studies), but were checked for included studies that did meet our inclusion criteria. A further 17 citations were identified by hand searching reference lists of these and other studies, and two records were identified in targeted HTA website searches and the grey literature.

Table 3.3: Summary of the process used to identify studies and reports relevant to the evaluation of MedsCheck and Diabetes MedsCheck services

Description	Embase	Medline	Cochrane Library
Records retrieved	3,131	1,507	644
Total number of citations	5,282		
Duplicates within and across sets removed	1612		
Total number of citations screened	3670		

Description	Embase	Medline	Cochrane Library
Excluded at title/abstract review:			
Wrong publication type		238	
Wrong population		360	
Wrong intervention		2,144	
Wrong comparator		10	
Wrong outcome		81	
Not English		90	
Total citations excluded at title/abstract review		2,923	
Citations screened at full text review		747	
Excluded at full text review:			
Wrong publication type		26	
Wrong population		45	
Wrong intervention		649	
Wrong comparator		3	
Wrong outcome		11	
Total citations excluded at full text review		*734*	
Total included studies or reports from Embase/Medline/Cochrane		13	
Included from Health Systems Evidence database		0	
Included from HTA websites		0	
Included from hand searching reference lists		1	
Total included studies or reports:		14	
Relevant to MedsCheck		13	
Relevant to Diabetes MedsCheck		1	

Abbreviations; HTA, health technology assessment.

3.1.3 Previous evaluations of the MedsChecks program

The targeted search of the websites of relevant pharmacy organisations and the Commonwealth Department of Health identified two program evaluations of the MedsCheck programs that were funded under prior CPAs. The citations are provided in Table 3.4. A summary of the findings and conclusions of the prior evaluation are reported in Chapter 4.

Table 3.4: Citation details of program evaluations of the HMR program

Study ID	Citation
Deloitte (2012)	Deloitte – Evaluation of the MedsCheck and Diabetes MedsCheck Pilot Program; 2012
PwC (2015)	PwC – Combined Review of Fifth Community Pharmacy Agreement Medication Management Programmes: Final Report; 2015.

3.1.4 Systematic reviews

The literature search identified a number of systematic reviews and narrative reviews that did not focus on MedsCheck/Diabetes MedsCheck conducted by a pharmacist but on medication reviews in any setting, or medication review within a multidisciplinary model or a disease management plan, or medication reviews that were delivered by any health professional. Systematic reviews that presented analysis (or meta-analysis) from pharmacy interventions that included services other than the MedsCheck/Diabetes MedsCheck specifically performed by a pharmacist were excluded. A list of these reviews is presented in Appendix C. The reference lists of each of the excluded systematic reviews were hand-searched to identify any relevant studies not identified elsewhere.

3.1.5 Primary studies

The systematic literature search for primary studies of MedsCheck identified 13 eligible publications that investigated the effect of community pharmacy based medication review, similar to the Australian MedsCheck service, on a number of patient outcomes. Only one study was identified that evaluated a community pharmacy based medication review targeting patients with type 2 diabetes. Table 3.5 presents the list of included studies.

Table 3.5: Citation details for included studies of MedsCheck/Diabetes MedsCheck

Study ID	Citation
MedsCheck	
Messerli (2016)	Messerli, M., E. Blozik, et al. (2016). Impact of a community pharmacist-led medication review on medicines use in patients on polypharmacy--a prospective randomised controlled trial. BMC health services research 16: 145.
Mott (2016)	Mott, D. A., B. Martin, et al. (2016). Impact of a medication therapy management intervention targeting medications associated with falling: Results of a pilot study. Journal of the American Pharmacists Association 56(1): 22-28.
Basheti (2016)	Basheti, I. A., Tadros, O. K. I. and Aburuz, S. (2016). Value of a Community-Based Medication Management Review Service in Jordan: A Prospective Randomized Controlled Study.Pharmacotherapy 36(10): 1075-1086.
Malet-Larrea (2016)	Malet-Larrea, A., E. Goyenechea, et al. (2016). The impact of a medication review with follow-up service on hospital admissions in aged polypharmacy patients. British Journal of Clinical Pharmacology: 831-838.
Ocampo (2015)	Ocampo, C. C., V. Garcia-Cardenas, et al. (2015). Implementation of medication review with follow-up in a Spanish community pharmacy and its achieved outcomes. International Journal of Clinical Pharmacy 37(5): 931-940.
Jodar-Sanchez (2015)	Jodar-Sanchez F, Malet-Larrea A, Martin JJ et al. Cost-utility analysis of a medication review with follow-up service for older adults with polypharmacy in community pharmacies in Spain: the conSIGUE program. Pharmacoeconomics, 2015;33:599–610.
Geurts (2015)	Geurts MM, Stewart RE, Brouwers JR, Graeff PA, Gier JJ. Patient beliefs about medicines and quality of life after a clinical medication review and follow-up by a pharmaceutical care plan: a study in elderly polypharmacy patients with a cardiovascular disorder. J Pharm Health Serv Res, 2015; 6:171–176.
Touchette (2012)	Touchette, D. R., Masica, A. L., Dolor, R. J., Schumock, G. T., Choi, Y. K., Kim, Y. and Smith, S. R. (2012). Safety-focused medication therapy management: A randomized controlled trial. Journal of the American Pharmacists Association 52(5): 603-612.
Blalock (2010)	Blalock SJ, Casteel C, Roth MT, Ferreri S; Karen B. Demby KB, and Shankar V. (2010). Impact of enhanced pharmacologic care on the prevention of falls: A randomized controlled trial. Am Journal of Geriatric Pharmacotherapy Am J Geriatr Pharmacother. 8(5):428-40.
Vinks (SMOG, 2009)	Vinks TH et al. Pharmacist based medication review reduces potential drug-related problems in the elderly. The SMOG controlled trial. Drug Aging 2009; 26: 123- 33.
Bond (MEDMAN, 2007)	Bond, C. (2007). The MEDMAN study: A randomized controlled trial of community pharmacy-led medicines management for patients with coronary heart disease. Family Practice 24(2): 189-200.
Bouvy (2003)	Bouvy ML, Heerdink ER, Urquhart J, et al. Effect of a pharmacist-led intervention on diuretic compliance in heart failure patients: A randomized controlled study. Journal of Cardiac Failure. 2003; 9:404–411.
Bernsten (2001)	Bernsten C, Björkman I, Caramona M, Crealey G, Frøkjaer B, Grundberger E, et al. Improving the well-being of elderly patients via community pharmacy-based provision of pharmaceutical care: a multicentre study in seven European countries. Drugs Aging 2001; 18: 63–77.
Diabetes MedsCheck	
Kjeldsen (2015)	Kjeldsen, L. J., Bjerrum, L., Dam, P., Larsen, B. O., Rossing, C., Sondergaard, B. and Herborg, H. (2015). Safe and effective use of medicines for patients with type 2 diabetes - A randomized controlled trial of two interventions delivered by local pharmacies. Research in social & administrative pharmacy: RSAP 11(1): 47-62.

Appendix C presents a list of other primary studies of medication reviews that were identified through the literature search and the reasons for their exclusion. Studies that examined MedsCheck or Diabetes

MedsCheck as part of a more comprehensive pharmacy care program or were part of a multidisciplinary model were excluded. Studies that evaluated MedsCheck/Diabetes MedsCheck performed by a healthcare professional other than a pharmacist were also excluded.

3.2 UTILISATION ANALYSIS

Utilisation of MedsCheck services was analysed using the claims payment data extracted from DHS systems for years 2012/13 and 2013/14 and Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16. The analysis is restricted to claims paid for date of service between 1st July, 2012 and 30th June, 2016 (records that do not have valid dates or have unrealistic dates were excluded from the datasets). The encryption of some key identifying fields in the DHS datasets placed some limitations on the analysis. These limitations have been noted, where relevant.

MedsCheck claims payment data have been analysed with the emphasis on inter-record and longitudinal relationships within the claims system extracts, especially with regard to the frequency of service stipulations (outlined in Section 2.4).

MedsCheck claims payment data have also been analysed to assess 'remoteness'[3], as inferred from the postcode of each ACF (where that information is available). Facility postcodes were provided in a separate file and relate to Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16. DHS claims systems extracts were generally not able to be categorised in this way. Postcodes were mapped to remoteness area using the Australian Bureau of Statistics (ABS) mapping table.

[3] ABS postcode to remoteness.xls available from http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.006July%202011?OpenDocument (accessed 5th October, 2016)

4
Previous evaluations of the MedsChecks programmes

This Chapter summarises the findings of program evaluations of the MedsCheck programmes funded under prior CPA. There were two program evaluations identified: one by Deloitte Access Economics and the other by PricewaterhouseCoopers (PwC). The intention of these summaries is to provide MSAC with an understanding of the approaches taken to evaluate the MedsCheck programmes in Australia, as well as a high level overview of the findings of previous evaluations in relation to effectiveness and cost-effectiveness of the services.

4.1 EVALUATION OF THE MEDSCHECK PROGRAMME

The pilot program of the MedsCheck programme was evaluated by Deloitte Access Economics to provide recommendations to assist the then Department of Health and Ageing (the Department) with the 2012 national roll-out of these services. The evaluation reviewed data from the first seven months of the pilot program (25th August 2011 to 31st March 2012). The objectives of the evaluation were to:

- test the proposed eligibility criteria and adjust the criteria based on demand and resourcing availability to focus on those most in need;
- identify the likely numbers of patients who qualify for the service; and
- assess the usefulness of the content within the Assessment Tool (SmartForm).

The Department also requested an examination of the relationship between the MedsCheck programme and other Fifth Community Pharmacy Agreement Services (5CPA), specifically, the Home Medicines Review program (HMR) and the Clinical Intervention program.

The evaluation methodology was agreed with the Department in August 2011, but adjusted four months later in response to early findings that pharmacies were providing services at a much lower rate than initially anticipated and a majority of pharmacies had not yet claimed for a single service provided. Another evaluation objective was added at this time as follows:

- To explore the main reasons for less than expected MedsCheck and Diabetes MedsCheck service delivery and the low program implementation rate.

The evaluation framework provided for a mixed methods approach using primary and secondary data sources (e.g. SmartForm data reports). The main sources were monthly SmartForm data reports, an online survey of 75 pharmacists, a survey of 97 patients who received services, and interviews with pharmacists, patients (n=8), the Pharmacy Guild of Australia, the Pharmaceutical Society of Australia (PSA) and the Rural Pharmacy Special Interest Group. PBS, HMR, CIs, Medicare, ABS and Australian Institute of Health and Welfare (AIHW) data were also reviewed.

The following sections describe the high level program evaluation findings specific to the PICO criteria, where present (as outlined in Section 3.1.1), followed by a summary of the limitations of the study and their overall conclusions.

4.1.1 General findings of the evaluation

Table 4.1 provides a summary of the main findings of the evaluation. Note findings that relate to the PICO criteria are described in detail in the following sections.

Table 4.1: Main findings of the evaluation, outside the PICO criteria

Program area	Key findings
Benefits to patients reported by pharmacists	Respondents to the online pharmacist survey were generally of the opinion that the MedsCheck and Diabetes MedsCheck had positive outcomes for patients. Improved understanding of medicines and potential interactions were the two most cited beneficial outcomes of the program.
Eligibility criteria	While some participants in the pilot and organisations suggested modifications to the eligibility criteria, at this stage, the evaluators concluded that adjustments to the eligibility criteria were not considered necessary to ensure sustainability of the program.
Number of patients who will use the service	During the first seven months of the pilot program, less than a third (31%) of the 286 pharmacies that registered to deliver services successfully claimed for a service and only about 2% of the expected volume of services were delivered (844 in total, with 695 MedsCheck and 149 Diabetes MedsCheck). Therefore the evaluators reported that "it is difficult to develop an accurate estimate of future service usage". The population eligible for MedsCheck was estimated to be 1.16 million in 2012, and for Diabetes MedsCheck, 580,000. The evaluators stated that the "eligible populations have been crudely estimated to increase to 1.4 million and 638,000 respectively in 2015".
Usefulness of the assessment tool (SmartForm)	At the end of the MedsCheck or Diabetes MedsCheck consultation, an individualised report (SmartForm) with a medication list and recommendations is created for each patient and distributed to their healthcare professional as needed. Most patients surveyed considered the SmartForm patient report to be useful. However, most patients interviewed had not viewed the patient report and did not have suggested changes. Pharmacists believed the report was useful for patients and had various suggested changes to make it more user friendly. The evaluation team suggested changes to streamline data collection from the Tool and make the data more meaningful. The Department decided not to use the pilot program SmartForm during the national roll-out of services.
Reasons for slower than expected program take-up	The evaluation identified that an inability to integrate MedsCheck and Diabetes MedsCheck service delivery into the daily pharmacist's workflow was the primary barrier to service provision. The time taken to deliver the services was considered prohibitive, although this may have been influenced by either IT issues or the requirement to use a SmartForm Assessment Tool. The SmartForm design itself was also considered a barrier to providing services. On the basis of feedback received during the pilot, a decision was taken by the Department to not require the SmartForm to be used in the national program.
Relationship with the HMR and Clinical Intervention program:	The other 5CPA programs were seen as facilitators to service delivery. The CIs program had a much greater uptake than the MedsCheck and Diabetes MedsCheck pilot program due to its ease of integration into pharmacists' workflow. The evaluators found that the pilot had an insignificant impact on the HMR program, although analysis was limited due to the availability of data.

Source: Evaluation of the MedsCheck and Diabetes MedsCheck Pilot Program by Deloitte Access Economics 2012
Abbreviations: The Department, Department of Health and Ageing; IT, Information Technology; 5CPA, Fifth Community Pharmacy Agreement; HMR, Home Medication Review.

The evaluation also reported on the characteristics of patients who had received MedsCheck or Diabetes MedsCheck services in the pilot period. They found that of the 844 patients who received MedsCheck or Diabetes MedsCheck services, 334 (40%) had a previous diagnosis of type 2 diabetes and 149 of these patients received a Diabetes MedsCheck.

- 117 patients who received a Diabetes MedsCheck were eligible for this service because they had less than ideally controlled type 2 diabetes and did not have timely access to a diabetes educator or health service to talk about their condition.
- Seven patients had been recently diagnosed with type 2 diabetes and had similar difficulties accessing a diabetes educator.
- 23 patients had both less than ideally controlled type 2 diabetes and were recently diagnosed with type 2 diabetes and had difficulties accessing a diabetes educator.
- Two patients had a diagnosis of type 2 diabetes but did not meet eligibility criteria but appear to have received a Diabetes MedsCheck in any case.
- One patient with no pre-existing diagnosis of type 2 diabetes received a Diabetes MedsCheck.
- 118 of the 149 patients who received a Diabetes MedsCheck were self-monitoring their blood sugar levels and 138 were on five medicines or more.

Of the remaining 186 patients with type 2 diabetes who received a MedsCheck but were not eligible for a Diabetes MedsCheck, 77 did not qualify as they had timely access to a diabetes educator or health

service. Sixty-seven of these patients had diabetes that was less than ideally controlled, eight had also been recently diagnosed with type 2 diabetes and 21 had experienced a recent change in medicines. An additional ten patients were recently diagnosed with type 2 diabetes. One hundred and nine out of the 186 patients with type 2 diabetes did not receive a Diabetes MedsCheck because they had not been recently diagnosed and had well controlled diabetes.

4.1.2 Adverse drug events/reactions and medication-related problems

The evaluation found that:

- 7,465 medicines were used by 844 patients or, on average, close to nine medicines per patient;
- one patient took all their medicines incorrectly;
- 843 patients were using one or more medicines as prescribed. However, of these, 209 patients (or 25%) were also taking one or more medicines incorrectly;
- on average, this latter group was taking slightly more medicines (9.3 medicines per person) than those who were taking all medicines as prescribed (8.7 medicines per person), and was on average younger.

The evaluators stated that these findings were broadly similar to those from the patient survey, which found that:

- 84% of patients reported that they were taking their medicine(s) as prescribed by their doctor before their MedsCheck or Diabetes MedsCheck service, indicating that a further 16% of patients had a known or suspected issue with adherence, and
- 20% of patients reported that their pharmacist recommended they have a HMR[4].

Analysis of SmartForm data revealed that 32% of patients provided with a MedsCheck or Diabetes MedsCheck service were taking a medicine associated with a high risk of adverse events. The evaluators identified that the pharmacists were provided with little guidance as to what a 'high-risk' medicine constituted and suggested that it may be worth considering providing further clarification around this. After reviewing literature relating to 'high-risk' medicines, the evaluators suggested that an easy way (easier for pharmacists) to ensure patients taking high-risk medicine are captured within the MedsCheck criteria would be to lower the limit for receipt of a MedsCheck service to three or more (rather than five or more) medicines.

4.1.3 Changes in clinical outcomes

The evaluation did not provide specific findings for changes in clinical outcomes resulting from implementation of the pilot program. However, the following commentary on the perceived impact of the patient report, developed as part of the service, was provided:

According to analysis of SmartForm data from the pilot period:

- 579 reports (69% of total reports) were forwarded onto the patient's GP with:
  - 152 reports (18%) requesting that the GP consider the recommendations made; and
  - 427 reports (51%) stating they were for the GP's information only with no actions required.
- Close to one-half (49%) of reports requested that either the patient or the GP take action or both.

[4] It is possible that there was some bias in the patient survey results because respondents to the Patient Survey were more likely to be healthier as sick people may have been less likely to respond to the survey. This cohort may therefore have included individuals who were more compliant with their medication.

- Five hundred and eighty-six (69%) reports were for the patient's information only with no action required on behalf of the patient.
- Of the remaining 258 reports distributed to patients:
  - 211 (25%) requested that the patient take action as agreed in the action plan; and
  - 110 (13%) requested that patients note the recommendations made to their health care professional (e.g. GP).
- Sixty-three reports distributed to patients requested that they both take action as agreed in the action plan and that they note the recommendations made to their health care professional.
- A total of 551 reports (65% of all reports) *did not* require action by the patient or GP and appear to be purely for informational purposes and the remainder (35%) *did* require action or consideration.

The evaluation did not assess the rate with which GPs actioned pharmacists' recommendations, effecting changes in medication regimens and potentially changes in clinical outcomes, as stated in the patient's individualised report. However, the evaluation did find that the services provided valuable education to patients, as assessed via patient survey, but did not necessarily change behaviour.

- 24 patients (26%) indicated that they had made changes to the way they managed their medicines (i.e. taken action);
- nine patients reported approaching another health care professional and only six more intended to, as recommended by the pharmacist;
- 69% of respondents to the patient survey reported that the pharmacist was happy with how they managed their medicines and no changes were necessary, and
- 76% of respondents reported that they had not approached another health care provider as their pharmacist had not recommended it.

Consistent with this finding, the patient survey data (n=96) indicated that prior to their MedsCheck or Diabetes MedsCheck service:

- 84% of patients reported that they were taking their medicine(s) correctly as prescribed by their doctor;
- 20% of patients sometimes became confused about when to take their medicine(s) or sometimes forgot to take their medicine(s) (8% of patients reported that they were both taking their medicine(s) correctly and that they sometimes became confused about when to take their medicine(s) or forgot to take their medicines);
- 8% of patients were unsure if they were taking their medicine(s) correctly; and
- 3% were unsure if they were using their puffer correctly.

This theme was further explored during patient interviews. Seven of the eight patients interviewed did not have any issues or concerns with managing their medicines prior to their MedsCheck or Diabetes MedsCheck service. One patient reported being concerned about the side effects of her medicines and potential interactions between her medicines. Seven patients appeared to be adherent with their medicines with six stating that they had some kind of system in place to manage their medicines such as a pre-packed dosette box or morning and evening containers. One patient stated that they occasionally forgot to take their medicines when visiting friends but this was not frequent.

Further reinforcing that the service was used mainly for the transfer of information, seven of the eight patients interviewed stated that the pharmacist did not suggest they make any changes to the way they manage their medicines or that they visit another health care professional. One patient interviewed reported visiting their GP and making changes to their medicines directly as a result of the service.

4.1.4 Health care resource use

Between 25th August 2011 and 31st March 2012, the evaluators found that 31% of recruited pharmacies delivered at least one service, that is, 89 pharmacies delivered 695 MedsCheck services and approximately 149 Diabetes MedsCheck services. In other words:

- approximately 13 MedsCheck services were delivered per pharmacy per year; and
- three Diabetes MedsCheck services were delivered per pharmacy per year.

The evaluators identified that if all pharmacies across Australia[5], during the national roll-out, provided services at the rate calculated above then 67,977 MedsCheck services and 15,687 Diabetes MedsCheck services would be provided in any 12 month period. The evaluators recognised that this was significantly below the number of services for which funding was allocated.

4.1.5 Patient acceptance/satisfaction

Ninety-eight percent of patients responding to the relevant questions in the patient survey agreed or strongly agreed that the information provided by the pharmacist during the MedsCheck or Diabetes MedsCheck consultation was useful.

In addition, 97% reported that they were satisfied with the service provided and 96% would recommend the MedsCheck or Diabetes MedsCheck service to others.

Almost all patients agreed or strongly agreed that they benefited in the following ways:

- increased confidence in the way they manage their medicines;
- better understanding of the conditions their medicines treat;
- better understanding about the side effects of their medicines;
- better understanding about which medicines/other health products/foods to avoid with their medicines;
- better understanding of medicines storage in the home; and
- overall feeling that the service benefited them.

4.1.6 Cost of the service

For the national roll-out of the MedsCheck and Diabetes MedsCheck program, the 5CPA provides for funding across Australia of $29.6 million for MedsCheck service provision and $12.2 million for Diabetes MedsCheck service provision. This is sufficient funding for approximately 120,000 MedsCheck services per year and 33,750 Diabetes MedsCheck services per year over the next four years of the agreement.

The cost of services incurred within the pilot period were not reported in the evaluation report. A cost-effectiveness analysis was also not conducted as part of the evaluation.

The evaluators identified that given that the MedsCheck programme is still in its pilot stage, pharmacists may not have invested in permanent infrastructure and estimates of infrastructure costs associated with services may therefore understate the potential set up costs associated with provision of the services. According to the evaluators, The Guild stated that with the national roll-out, there may be a number of fixed costs that pharmacies would possibly incur, including, software upgrades, purchase of hardware such as an additional laptop, and creation of a space in which the service would be provided.

[5] There were 5,229 pharmacies in Australia on 4 November 2011 with Section 90 approval numbers, data supplied by the Department.

4.1.7 Conclusion

The evaluation found that, broadly consistent with the original objectives of the program, patient benefits were realised through acquiring an increased understanding of their medicines relating to indication, dosing, side effects, interactions and storage. Patient benefit was the main reason that pharmacists who had provided the service would deliver services in future, as well as positive patient response and use of their professional knowledge and skills.

The following recommendations were made for the national roll-out of the MedsCheck programs:

- eligibility criteria for the program should remain the same;
- monitoring of the program should be undertaken to determine whether, on the basis of low service uptake, modifications should be made in the future;
- educational materials should be developed, to assist in uptake of the program;
- for future programs, consideration should be given to the format, interoperability and functionality of software used prior to programs being rolled out; and
- definitions of 'significant medical events' should be provided to program participants to enable consistent eligibility checking and categorisation of medical events.

4.2 5CPA PROGRAM COMBINED REVIEW BY PRICEWATERHOUSECOOPERS 2015

The MedsCheck programme was evaluated as part of the 5CPA review of the MMPs performed by PwC in 2015[6]. The overall aim of the evaluation was to better inform how the 5CPA MMPs contribute to improving consumer health outcomes, in order to better inform future investment by the Australian Government in pharmacy programs and services.

PwC evaluated the three priority areas in the MMP: MedsCheck/Diabetes MedsCheck, RMMR and HMR. The evaluation methodology involved an analysis of the program data in order to assess the uptake and volume of services delivered over the duration of the 5CPA (between 2011 and 2014), stakeholder consultations (41 consultations undertaken, with over 50 individuals), consumer focus groups (6 focus groups conducted with 44 participants), practitioner focus groups (11 focus groups conducted with 67 participants), a practitioner survey (n=767, with 80% of respondents involved in HMR) and a consumer survey (n=502 (i.e. 260 participants identifying having received HMR services, 232 received MedsCheck/Diabetes MedsCheck services and 10 received a DAA), response rate = 7.5%).

This section presents the program evaluation findings against the PICO criteria (Section 3.1.1) for MedsChecks programme only, where they exist, followed by thematic analysis of practitioner views and the limitations of the study and the gathered data.

4.2.1 General findings of the evaluation

Table 4.2 summarises the main findings of the evaluation in regards to the MedsCheck programmes. Briefly, a total of 767 primary health care practitioners, with the majority being pharmacists (94%), responded to the practitioner survey. About half (46%) were involved in the MedsCheck programme. Additionally, of the 502 participants who completed the consumer survey, 232 identified having received a MedsCheck/Diabetes MedsCheck.

6-PricewaterhouseCoopers. Combined Review of Fifth Community Pharmacy Agreement Medication Management Programmes: Final Report; 2015.

Table 4.2: Main findings of the 2015 5CPA combined review, 2011-2014

Measure/domain	Key findings
Program results	
Total expenditure on MedsCheck/Diabetes MedsCheck initiative	Records for expenditure specifically paid out for MedsCheck/Diabetes MedsCheck services were not made available to the evaluators.
Consumer focus group themes raised	
Awareness	Most consumers, particularly Aboriginal and Torres Strait Islander consumers, noted that there was very low awareness in the community that these programmes and services are available, how to access them and the value they provide.
Communication	There were mixed responses as to whether GPs and other health professionals communicate with pharmacists to manage consumers' health, however the majority of consumers felt this was a very important (some noted essential) factor when managing medicines, especially for those with complex health conditions. All Aboriginal and Torres Strait Islander consumers noted the importance of good communication with their health professionals/carers and the importance of a trusting relationship between pharmacist and consumer.
Consumer survey results	
Participants	Overall, the majority of survey participants were located in three States: Victoria (33%); New South Wales (31%); and Queensland (21%). The majority of participants were aged 50 years or older. Less than 1% of participants were aged 18-24. More than half (57%) of all survey participants were female.
General health status	The majority of survey participants (65%) perceived their health to range between good to excellent. Only 10% of participants perceived their health to be poor.
Relationship with pharmacist	Approximately 97% of survey participants reported that they visited the same pharmacy either all of the time or most of the time.
Knowledge of medication	Overall, more than 90% of survey participants either strongly agreed or agreed that they were knowledgeable about the medicines they were taking and what they were for. Differences in knowledge of medicine did not differ by age, general health status or by the number of medicines taken.
Practitioner focus group themes raised	
Addressing consumer need	There were mixed views on the MedsCheck/Diabetes MedsCheck program, some participants noted that, when performed well, there was value by providing a medication management service to those that did not require a full review along with improving consumers' knowledge and education, while others expressed their concerns regarding the lack of quality of the reviews as well as the lack of collaboration with consumers' GP. It was commonly noted that MedsCheck/Diabetes MedsCheck services were a good screening service for an HMR, but not a holistic view of medication management. Participants did not consider this to be an alternative for HMRs.
Eligibility criteria and targeting	There were no specific marketing strategies or recruitment activities directed at those most in need.
Program implementation	Many participants felt that a multidisciplinary, collaborative approach to programs/services would aid in the implementation of the programs and benefit the impacts and outcomes for consumers. It was suggested that funding should be allocated to support implementation to prevent inconsistencies in the way that the programs are delivered. It was generally noted that there was potential for investment in implementation activities to yield faster and more complete uptake of Programmes, as well as more consistency in the quality of delivery of Programmes. This could be interpreted to mean more resourcing, better targeted resourcing, or both. The targets might be improvement to the payment and claiming system, other administrative systems or targeting awareness of the Programmes. It was suggested that the focus should be optimising uptake of various programmes and services.
Policy and strategy	Participants agreed that generally the 5CPA programs/services added value and should be part of the overall preventative strategy for consumers. Some stakeholders indicated there is opportunity for the MMPs to better support primary care services by being more widely accessible to consumers.
Unintended consequences	The majority of participants commented that MMPs, unintentionally foster business models that rely on quantity rather than quality.
Interaction between programs	The majority of participants commented that there was little interaction and that there was not a clear flow between MMPs, each program/service was seen as fulfilling a specific purpose and do not necessarily form part of a continuum.
Areas for improvement – funding arrangements	Funding arrangements could readjust to better facilitate programme objectives: funding could be moved out of CPA into MBS, enabling similar audit procedures; appropriate funding should be allocated to each health professional to incentivise collaboration for the benefit of the consumer.
Practitioners/providers survey results	
Interaction between programs	Less than half of survey respondents agreed or strongly agreed that the linkages/pathways between

Measure/domain	Key findings
	the programs/services were clearly identified. More than half agreed there were gaps in the services provided, resulting in unmet needs of the consumer.
Factors influencing clinical decision making (asked of pharmacists and GPs)	Among Accredited Pharmacists, the most common aspects of consumers' needs influencing clinical judgement to provide MedsCheck/Diabetes MedsCheck services were: being able to address the consumers' needs right away; consumer needs educating about medicines/health conditions; and consumer may require a less intensive medicines review.
Screening/diagnostic/intervention tools	Overall, MedsCheck/Diabetes MedsCheck services were not viewed as screening and diagnostic tools. Rather, they were viewed as either predominantly medication management intervention tools or medication risk prevention tools.
Provider satisfaction	Just over half of those involved in MedsCheck/Diabetes MedsCheck reported being satisfied or very satisfied. The majority of those who noted being dissatisfied or very dissatisfied with their involvement attributed this to regular policy changes, particularly the recent capping, and expressed discontent at the limited peak body representation. The majority reported being satisfied with the benefit their consumers received through the MedsCheck/Diabetes MedsCheck program.
Collaboration	GPs reported communicating with pharmacists after the service somewhat more commonly than pharmacists reported communicating with the GP. A breakdown was not available by specific program.

Source: PricewaterhouseCoopers Combined Review of 5CPA Medication Management Programmes (2015)
Abbreviations: 5CPA, Fifth Community Pharmacy Agreement; GP, general practitioner; HMR, Home Medication Review; MBS, Medicare Benefits Schedule; MMPs, Medication Management Programmes..

4.2.2 Changes in adherence/compliance/concordance with prescribed dose schedule

All stakeholders consulted commented that consistent perceived benefits of the MMPs included educating consumers about correct medication adherence; and improving consumers' confidence/compliance in taking medicines.

The consumer survey[7] evaluated consumers' self-reported level of medication adherence and found that:

- Overall, the majority of participants were partially non-adherent (53%) to their medication while just under half of all participants were completely adherent (44%) to their medication. The level of complete medication adherence appears to increase with age from 35 years.
- Complete adherence was highest (57%) among participants who viewed their general health status to be excellent, decreasing with health status.
- There were no large differences in complete or partial medication adherence between people consuming a small number (e.g. one) of medicines compared to people consuming a higher number of medicines (e.g. 10+).

4.2.3 Changes in clinical outcomes

All stakeholders consulted commented that MMPs were contributing to improving consumer health outcomes and consistent perceived benefits were cited as: improving consumer health and reducing hospital admissions due to medication misadventures. However the majority of stakeholders also commented that impacts and outcomes of the services needed to be reviewed regularly to ensure that the budget was being well spent and cost effective. "Due to the programmes and reviews being undertaken in isolation to other initiatives within primary health care, it is often difficult to attribute health outcomes to having received a MMP".

Pharmacists reported that the main outcomes and recommendations recorded for their MedsCheck/Diabetes MedsCheck service were:

- patient was educated on how to best use their medicines and or device (42%);

7-The distribution of participants who received HMR and MedsCheck/Diabetes MedsCheck services in the consumer survey was comparable to the distribution of participants who received similar services in our analyses of programme data. Further, responses of participants who accessed HMR or MedsCheck were nearly identical in their distribution; therefore, the results discussed in this chapter refer to the aggregated or overall result for all participants (unless stated otherwise).

- information provided on medicine and or disease state-no further action required (37%);
- referred patient to prescriber (9%);
- DAAs were recommended for 34,603 (6%) of consumers; and
- HMRs were recommended for 2,149 (<1%).

Consumer perspectives of changes in clinical outcomes resulting from receiving a MedsCheck/Diabetes MedsCheck were ascertained via consumer survey. The consumers survey found that:

- the majority of participants, regardless of age group, either completely agreed or partially agreed that receiving a MedsCheck/Diabetes MedsCheck had a perceived impact on their health, confidence, side effects experienced and/or understanding of medicines;
- a higher percentage of participants who perceived their health status to be excellent, completely agreed that receiving a receiving a MedsCheck/Diabetes MedsCheck had a perceived impact on their health, confidence, side effects experienced and/or understanding of medicines; and
- a higher percentage of participants on fewer medicines completely agreed that receiving a MedsCheck/Diabetes MedsCheck had a perceived impact on their health, confidence, side effects experienced and/or understanding of medicines.

4.2.4 Health care resource use

Utilisation analysis showed that there were a total of 5,162 pharmacies participated in delivering MedsCheck/Diabetes MedsCheck services between 1st July 2010 and 28th February 2014. For this period, a total of 601,174 MedsCheck/Diabetes MedsCheck services were conducted, with a median number of 53 MedsCheck/Diabetes MedsCheck services provided per pharmacy, and 50% of pharmacies conducting between 7 and 86 MedsCheck services each.[8] The median number of MedsCheck/Diabetes MedsCheck services provided per pharmacist was 24. Approximately 12% (69,914), of total MedsCheck/Diabetes MedsCheck services were Diabetes MedsCheck services. MedsCheck services were most common among CALD consumers.

A total of 77,231 claims for MedsCheck/Diabetes MedsCheck services were rejected. The most common reasons for rejection were; patient receiving HMR/Medication Use Review (MUR)/RMMR service within a 12 month period (38%), patient record not found (18%), pharmacists was not working for the provider on the service date (16%).

4.2.5 Patient acceptance/satisfaction

The evaluators found that the majority of participants (95%), as ascertained via the consumer survey, were either very satisfied or satisfied with the service their pharmacist provided. Similarly, the majority of participants (89%) who received MedsCheck/Diabetes MedsCheck programmes completely agreed or agreed that they were satisfied with the programmes and services delivered by their pharmacist.

The level of satisfaction for programmes and services delivered by pharmacists did not differ by age, general health status or by number of medicines.

Many consumers commented[9], that while MedsCheck/Diabetes MedsCheck services were valuable, in order for them to be done effectively, pharmacies needed to have a private consultation space.

The evaluators stated that more consumers could benefit from MedsCheck/Diabetes MedsCheck services if they were appropriately advertised and awareness was raised.

[8] Note: The analysis is conducted using claims and accepted data and excludes rejected data.
[9] 15 consumers participated in the MedsCheck consumer focus groups.

4.2.6 Limitations of the evaluation

The evaluators reported that a cost benefit analysis (CBA) was not performed in the review, thus direct and indirect benefits resulting from delivering discrete MMPs could not be inferred. The evaluators recommended that a baseline benefits analysis be conducted in a future review of the Program to inform the health, social and economic benefits that result from these program implemented as part of the 6CPA and evaluate the cost-benefits as a result of the 6CPA investment. "A reliable CBA would require a more sophisticated approach towards collection of data, linking program data (multiple datasets, including at consumer level) combined with regular auditing and reporting requirements to enable consumer health outcomes to be more effectively monitored and measured over time".

There were also a number of limitations reported in relation to program data analysis:

- Data collected as part of the claims process provided limited insight on uptake and volume of programs and services since multiple services could be submitted under one claim. The evaluators presented service level data where possible, merging accepted, rejected and claims datasets to conduct more accurate analyses.
- Consumer level data was de-identified and not linked to other data sources (e.g. Medicare or hospital data); therefore, it was not possible to determine the impact of participating in specific programs on consumer outcomes, outside of that particular episode of care.
- Consumer demographic data, such as age and gender, was only available for HMR, RMMR and MedsCheck/Diabetes MedsCheck, therefore data was not able to be linked across all six datasets. Postcode was not captured at the consumer level within any program/service dataset, therefore analysis of the data could not be performed for socioeconomic indicator (SEIFA) or remoteness (ARIA).
- The number of medicines and health conditions of consumers was not captured in the PPI Program dataset, resulting in the inability to analyse trends over time and potential investment value, including impact, for other programs and services.
- Analysis of program data beyond 28th February 2014 was not performed, resulting in failure to capture the effects of administrative changes to programs and services implemented on 1st March 2014 on the uptake and volume of programs and services.

4.2.7 Conclusion

Overall, practitioners reported being reasonably satisfied with their involvement in the MMPs and services. They also reported being satisfied with the benefit their consumers received through MMPs and services, and they saw clear benefit in the suite of MMPs and services as contributing towards improving the health outcomes of consumers.

However, stakeholders and practitioners indicated that 5CPA programs were difficult to access for consumers due to low consumer awareness, information on programs not being readily available to consumers, and low GP engagement and awareness to refer consumers to the relevant programs, particularly for ATSI and CALD peoples.

5
Evidence for the effectiveness of the MedsChecks programs

This Chapter presents evidence of the effectiveness and safety from primary studies that evaluated MedsCheck/Diabetes MedsCheck or similar community pharmacy based medication reviews principally delivered by a pharmacist, and independent of any other intervention aiming at optimising drug regimens and patient outcomes. The evidence is presented in relation to the PICO criteria outlined in Section 3.1.1. It does not include evidence reported in previous evaluations of the RMMR program, which was summarised in Chapter 4.

In reviewing this Chapter, it should be noted that 22 systematic reviews were assessed for inclusion using the eligibility criteria for studies to be included in this review against the characteristics of each previous reviews. It appeared that the identified systematic reviews included studies (RCT- and non-RCT evidence) that evaluated the effects of medication reviews in any setting, including the home, residential aged care facility, community pharmacy, as well as hospital, outpatient clinic, and medical centre. Further, the systematic reviews included studies that evaluated medication reviews as part of a multidisciplinary model or multifaceted pharmacy-led intervention, or medication reviews delivered by combinations of health professionals (e.g. physicians, nurses) where the pharmacist was only partly involved. Therefore, findings from these systematic reviews cannot be extrapolated to the evaluation of the MedsCheck/Diabetes MedsCheck services, and thus will not be discussed further.

5.1 EVIDENCE FROM PRIMARY STUDIES-MEDSCHECK

The systematic literature review identified 12 studies with mixed design, and included 10 RCTs, one observational study with pre- post-design, and one retrospective sub-analysis of a cluster RCT. None of the studies were Australian, but were mostly conducted in the USA and Europe. An additional study was identified that evaluated the cost-effectiveness of a community pharmacy based medication review, discussed in Chapter 6 of this Report.

The studies evaluated a community pharmacy based medication review similar to the MedsCheck performed by a pharmacist, aimed at checking and optimising the patients' drug regimens (i.e. ability to make recommendations on altering the regimen) through the identification of drug-related problems (DRPs) and providing recommendations for GPs, as well as increasing patients' knowledge and/or adherence. Study participants were older people (mean age >65 years) and were living in the community. There was considerable variability in the outcomes measured, with a focus on hospitalisation, adverse drug events and adherence. Intermediate outcomes such as drug burden and prescription appropriateness were also investigated. A major limitation of the evidence was the diversity of outcome measures and the fact that they differed in the way they were defined (if at all), collected and analysed. Due to the heterogeneity of the included studies, meta-analysis to determine the effect of MedsCheck on any outcome was not performed

The characteristics and results of the 12 identified studies are presented in Table 5.1 and Table 5.2, respectively.

Table 5.1: Characteristics of the included studies-MedsCheck performed by a pharmacist

Study ID Country	Study design/total study duration	Mean age	Population	Intervention	Control	Outcomes
Messerli (2016) Switzerland	RCT N=450 (54 community pharmacies) 28 weeks	67.2	Patients used ≥4 prescribed medicines over >3 months. (n=218 intervention / 232 control)	Polymedication Check, a pharmacist-led medication review, at study start (T-0) and after 28 weeks (T-28)	Received a PMC at T-28 (end of the study)	Primary outcome • objective adherence (measured using Medication Possession Ratio (MPR) and Daily Polypharmacy Possession Ratio (DPPR)a) Secondary outcome • subjective adherence (measured by self-report questionnaire and two telephone interviews carried out at 2 and 16 weeks post-intervention)
Mott (2016) USA	Cluster RCT N=80 (1 pharmacy) 6 months	74.9	Patients ≥65 years, who had fallen in the past 12 months or had a fear of falling (n = 39 intervention / 41 control)	Community pharmacy based medication review, with patients receiving a face-to-face interview, followed by a pharmaceutical action plan with recommendations to modify FRID use. Recommendations were discussed with the patient and prescriber as necessary	No medication review-patients received a mailed pamphlet describing medication use and falls	Primary outcome • rate of discontinuing FRIDs • number of falls Secondary outcome • acceptance rate of medication recommendations
Basheti (2016) Jordan	RCT N=160 (2 community pharmacies) 9 months (patients followed for average of 3.4 months)	53.4	Patients >18 years, with at least one chronic medical condition, and prescribed ≥3 Medications (n=82 intervention/78 control)	MedsCheck: the clinical pharmacist conducted a baseline assessment medication review to determine the prevalence and type of treatment-related problems (TRPs), recommendations were made regarding the identified TRPs that were submitted to the patients' physicians	GP care: patients receive a baseline assessment by the clinical pharmacist, however, TRPs are identified and corrected by physicians without any input from the clinical pharmacist	Primary outcome • recommendations acceptance rate by physicians Secondary outcomes • reduction in TRPs • clinical outcomes (e.g. blood glucose; blood pressure and triglyceride levels)
Ocampo (2015) Spain	Observational study, pre- post-design N=132 (1 pharmacy) 18 months	63.1	Patients prescribed at least one medicine	Medication review conducted by pharmacists at the pharmacy. The pharmacist identifies negative clinical outcomes related to medicines and DRPs, followed by an action plan agreed upon by the patient and the physician	-	• medication-related problems • number of medicines • hospitalisation • ED admissions • QoL (SF-36)

Study ID Country	Study design/total study duration	Mean age	Population	Intervention	Control	Outcomes
Malet-Larrea (2016) Spain	Retrospective sub-analysis of the conSIGUE cluster RCT by Martinez-Martinez et al (2015; Spanish)[a] N=42 medication-related hospitalisations 6-month follow-up	n.a.	Patients ≥65 years, using five or more medications for at least 6 months	Medication review conducted by pharmacists at the pharmacy. The pharmacist identifies negative clinical outcomes related to medicines and DRPs, followed by an action plan agreed upon by the patient and the physician	Usual care	Primary outcome • medication-related hospital admission Secondary outcome • hospital costs
Geurts (2015) The Netherlands	RCT N = 512 (12 community pharmacies) 12 months	72.5	Patients ≥60 years, prescribed at least 5 medicines for chronic conditions, with at least one of these medicines prescribed for a cardiovascular disorder (n = 178 intervention/ 334 control)	Community pharmacy based medication review followed up by a pharmaceutical care plan	Usual care	Primary outcomes • Quality of life (EQ-5 D) • Beliefs about medicines (BMQ)
Touchette (2012) USA	RCT N = 637 (3 US healthcare sites with community pharmacies) 6-month follow-up	74.5 (basic MTM) 74.8 (enhanced MTM)	Patients ≥65 years with 3 or more chronic illnesses, 6 or more prescription medications, and at risk for a DRP (n=429 intervention; 211 basic MTM & 218 enhanced MTM/ 208 control)	Community pharmacy based medication review performed at 0 and 3 months, and identifying and resolving DRPs through patient education and recommendations to physicians (different level of medication review intervention for the 2 streams): **Basic MTM**: comprehensive medication review and DRP assessment with no access to clinical information except what could be ascertained by patient interview. **Enhanced MTM**: comprehensive medication review and DRP assessment by patient interview, including access to medical records, and providing a two-page clinical synopsis	Usual care	Primary outcome • frequency of adverse drug events (ADEs) Secondary outcomes • number of DRPs • health care visits

Study ID Country	Study design/total study duration	Mean age	Population	Intervention	Control	Outcomes
Blalock (2010) USA	RCT N=186 (community pharmacy chain Kerr Drug) 24 months (1 year "look-back", 1 year follow-up)	75.5	Patients ≥65 years, had fallen at least once in year preceding randomisation and were taking medications associated with an increased risk of falling (n=93 intervention 93 control)	MedsCheck-a face-to-face medication consultation conducted by a community pharmacy resident at a Kerr Health Care Centre (a pharmacy chain in the USA) near their homes	Standard care	Primary outcome • reduction in incidents or falls Secondary outcome • reduction in medications that increase the risk of falling
Vinks (SMOG, 2009) The Netherlands	RCT N=174 (16 community pharmacies) 4 months	76.6	Patients ≥65 years using ≥6 drugs (n=87 intervention/ 87 control)	Community pharmacy based medication review aimed at identifying DRPs and providing recommendations that were discussed with GP. The pharmacist performed another review 4 months later and screened for potential DRPs	Usual care	Primary outcome • change in the number of DRPs Secondary outcome • number of medications used
Bond (MEDMAN, 2007) UK	RCT N=1,493 (70 community pharmacies) 12 months	68.7	Patients ≤65 with CHD (previous MI, angina, CABG and/or PTCA) (randomised 2:1 allocation ratio; n=980 intervention/ 513 control)	Community pharmacy based medication review, comprising an initial consultation with assessment of treatment, medication compliance, lifestyle, and social support. Recommendations were made by the pharmacists and were sent to the GP.	Usual GP care	Primary outcomes • prescribing appropriateness of cardiovascular medicines • QoL (SF-36, EQ-5D) • NHS cost Secondary outcomes • cardiovascular mortality • patient satisfaction • adherence (self-report)
Bouvy (2003) The Netherlands	RCT N=152 6 months	69.1	Patients with moderate to severe heart failure (New York Heart Association [NYHA] II and III), treated with loop diuretics (n=74 intervention / 78 control)	Community pharmacy based medication review focused on discussing medicine use and reasons for noncompliance (such as potential DRPs). A short report of the interview is forwarded to the GP and a 6-month follow-up on patients	Usual care	Primary outcome • adherence/medication compliance (via electronic monitoring) Secondary outcomes • number of rehospitalisation • mortality • quality of life (assessed with generic instrument (Dartmouth COOP Functional Assessment Charts/WONCA) and a specific heart failure instrument (MLHFQ))

Study ID Country	Study design/total study duration	Mean age	Population	Intervention	Control	Outcomes
Bernsten (2001) Multicentre (Europe)	RCT N=2,454 (190 community pharmacies) 18 months	74	Patients≥65 years taking at least 4 prescribed medications (n=1,290 intervention/1,164 control)	Community pharmacy based medication review aimed at identifying DRPs followed by development pharmaceutical care and monitoring plan for the patients that include: patient education, implementing compliance-improving strategies, modifying drug regimens as necessary and in collaboration with the GP	Standard care	Primary outcomes • quality of life (SF-36) • hospitalisation • cost savings • patients' satisfaction Secondary outcomes • adherence (self-reported questionnaire) • patient knowledge of medicines

Abbreviations: ADE, adverse drug events; BMQ, Beliefs about Medicines Questionnaire; CABG, coronary artery bypass graft; CHD, coronary heart disease; COOP, DPPR, Daily Polypharmacy Possession Ratio; DRP, drug-related problem; ED, emergency department; FRID, fall risk-increasing drug; GP, general practitioner; MLHFQ, Minnesota Living with Heart Failure questionnaire; MI, myocardial infarction; MPR, Medication Possession Ratio; MTM, medication therapy management; n.a., not-applicable; NHS, National Health Service; NYHA, New York Heart Association; PTCA, percutaneous transluminal coronary angioplasty; QoL, quality of life; RCT, randomised controlled trial; SF-36, short Form-36; TRP, treatment-related problem; USA, United States of America; vs, versus

a Medication possession ratio (MPR) was calculated by dividing the days' supply of a medication dispensed by the number of days in the time interval of interest, representing the adherence per each medicine. Daily Polypharmacy Possession Ratio (DPPR) the proportion of time a patient had medication available for use by considering the presence or absence of multiple medications on each day in the observation period, representing the adherence per patient with his chronic polypharmacy.

Table 5.2: Summary of results of the included studies

Study ID Country	Study design/ duration	Population	Relevant comparison	Effect	Authors' conclusions
Misserli (2016) Switzerland	RCT N=450 (54 community pharmacies) 28 weeks	Patients used ≥4 prescribed medicines over >3 months. (n=218 intervention/ 232 control)	Polymedication Check vs usual care	Objective adherence • MPR: 88.3±19.03 vs 87.5 ±20.75 (p = 0.811) • DPPR: 88.0±13.31 vs 87.5± 20.75 (p = 0.906) Subjective adherence • mean absolute change (between baseline and two weeks post-intervention): +1.03% vs −0.41 %; p = 0.058)	A community pharmacy based medication review had a positive effect on subjective adherence of more than ±5%. However, no changes were observed in objective adherence as this was high at baseline (87.5%), thus providing little potential for improvement
Mott (2016)	Cluster RCT N=80 (1 pharmacy) 6 months	Patients ≥65 years, who had fallen in the past 12 months or had a fear of falling (n= 39 intervention/41 control)	Community pharmacy based medication review vs pamphlet education	FRID use • 77% and 28%, respectively; p< 0.05 Falls • subjects who fell during the post-intervention period: 11/39 (28.2%) vs 10/41 (24.4%)	Medication reviews provided by a community pharmacist that focused on FRID use among older adults was effective in modifying FRID use. However, a decrease in the use of FRID did not result in a decrease in falls, likely because the cause of falls in the elderly is multifaceted and not entirely caused by FRID use

Study ID Country	Study design/ duration	Population	Relevant comparison	Effect	Authors' conclusions
Basheti (2016) Jordan	RCT N=160 (2 community pharmacies) 9 months (patients followed for average of 3.4 months)	Patients >18 years, with at least one chronic medical condition, and prescribed ≥3 Medications (n=82 intervention/78 control)	Community pharmacy based medication review vs GP care	TRPs • 70% resolved or improved compared with 2% in the control group (p<0.001) Glucose levels • 99.08 ± 9.66 vs 115.48 ± 17.34; p<0.001 Blood pressure • 110.36/81.55 ± 9.45/3.91 vs 125.0/88.73 ± 10.34/4.12: p<0.001 Triglyceride levels • 148.53 ± 15.98 vs 170.74 ± 6.26: p=0.001 Recommendations acceptance rate • 94% of pharmacists' recommendations were accepted by the physicians	MedsCheck resulted in a significantly lower number of TRPs and significantly improved clinical outcomes, and it was highly accepted by the physicians
Ocampo (2015) Spain	Observational study, pre- post-design N=132 (1 pharmacy) 18 months	Patients prescribed at least one medicine	Pre- vs post-medication review (baseline vs 18-month follow-up)	Medication-related problems • 66% (393/593) were resolved post-medication review Number of medicines • decreased from 6.1 (SD: 2.9) to 3.3 (SD: 2.2) (p value not reported Hospital admissions • 4 vs 12 (OR 0.31, 95 % CI 0.10–0.99; p=0.039) ED visits • 3 vs 17 (OR 0.16, 95% CI 0.05–0.55; p = 0.001) QoL • construct health transition: mean increase: 30.7 (SD: 25.4)) • bodily pain: mean increase: 22.3 (SD: 25.4) • general health: mean increase: 20.7 (SD: 23.7)	A community pharmacy based medication review with follow-up service delivered by a trained pharmacist resulted in reduction of the number of medicines, hospital and ED admissions and improved QoL
Malet-Larrea (2016) Spain	Retrospective sub-analysis of the conSIGUE cluster RCT by Martinez-Martinez et al (2015; Spanish)[a] N=42 medication-related hospitalisations	Patients ≥65 years, using five or more medications for at least 6 months	MedsCheck vs usual care	Medication-related hospitalisation • 11 vs 31, p= 0.042 • probability of being hospitalised was 3.7 times higher in the control group (OR 3.7, 95% CI 1.2–11.3, p= 0.021) Costs for a medicine-related hospitalisation • €94 (SD 917) vs €301 (SD 2102); 95% CI 35.9–378.0, p= 0.018	Medication review provided by community pharmacist resulted in a reduction of medication-related hospitalisations in aged patients using polypharmacy

Study ID Country	Study design/ duration	Population	Relevant comparison	Effect	Authors' conclusions
Geurts (2015) The Netherlands	RCT N = 512 (12 community pharamcies) 12 months	Patients aged ≥60 years, prescribed at least 5 medicines for chronic conditions, with at least one of these medicines prescribed for a cardiovascular disorder (n = 178 intervention/ 334 control)	Community pharmacy based medication review vs usual care	Beliefs about medicines (BMQ) • General Harm: mean score increased significantly from 3.297 at baseline to 3.423 at 12-month follow-up in the intervention group (mean 0.126; 95% CI −0.227 to −0.025; p= 0.014) • General Overuse: Intervention 3.387at baseline vs 3.416 at 12-month follow-up (p=0.541) QoL • not SS (Intervention 0.735 at baseline vs 0.741 at 12 month follow-up (p=0.706))	A community pharmacy based medication review followed by a pharmaceutical care plan resulted in a significant positive effect on patient beliefs about medicines, but had no significant effect on QoL in elderly patients suffering from cardiovascular diseases
Touchette (2012) USA	RCT N = 637 (3 US healthcare sites with community pharmacies) 6-month follow-up	Patients ≥65 years or older with three or more chronic illnesses, six or more prescription medications, and at risk for a DRP (n=429 intervention/ 208 control)	Community pharmacy based medication review vs usual care	ADEs and DRPs • DRPs declined in medication review group over time. However, no differences were observed in potential ADEs among the medication review and control groups. Hospital admissions • no statistically significant changes in the proportion of patients hospitalised over time ED visits • no differences were observed in ED visits Physicians acceptance of recommendations • 55%	Community pharmacy based medication reviews resulted in a decrease of DRPs over time; however, the reductions in DRPs did not translate into measurable differences in patients' health outcomes, particularly ADEs, hospitalisations, ED visits, or physician office visits
Blalock (2010) USA	RCT N=186 (community pharmacy chain Kerr Drug) 24 months (1 year "look-back", 1 year follow-up)	Patients ≥65 years, had fallen at least once in year preceding randomisation and were taking medications associated with an increased risk of falling (n=93 intervention 93 control)	Community pharmacy based medication review vs usual care	As-treated analysis Filling prescriptions for high-risk medications • RR 0.85; 95% CI, 0.72–1.03; p not significant Recurrent falls • RR 0.76; 95% CI, 0.53–1.09; p not significant Injurious falls • RR 0.67; 95% CI, 0.43–1.05; p not significant	Community pharmacy based medication reviews did not result in a significant reduction in the number of filling prescriptions of medications associated with falling in high-risk older adults. Further, there was no significant reduction in the rate of recurrent falls or injurious falls

Study ID Country	Study design/ duration	Population	Relevant comparison	Effect	Authors' conclusions
Bond (MEDMAN, 2007) UK	RCT N=1,493 (70 community pharmacies) 12 months	Patients ≤65 with CHD (previous MI, angina, CABG and/or PTCA) (randomised 2:1 allocation ratio, n=980 intervention/ 513 control	Community pharmacy based medication review vs usual care	Prescription appropriateness • no SS difference between groups (total score, mean 0.19, 95% CI –0.07 to 0.46; p=0.15) Cardiovascular mortality • no SS change in the future (5-year) risk of cardiovascular death QoL • EQ-4D: mean difference 0.04, 95% CI –0.05 to 0.13; p=0.37 • SF-36: no SS difference found between groups in any of the 8 domains Patient satisfaction • mean difference 4.0, 95% CI 1.7–6.3; p<0.01 Medication compliance/adherence • no SS change (mean difference 1.0, 95% CI 0.61 to 1.65; p=0.99)	Community pharmacy based medication review did not demonstrate any significant change in NSF recommended treatment for the secondary prevention of CHD, future risk of cardiovascular death, adherence, or quality of life. Patient satisfaction in the intervention group increased significantly compared with controls
Vinks (SMOG, 2009) The Netherlands	RCT N=174 (16 community pharmacies) 4 months	Patients ≥65 years using ≥6 drugs (n=87 intervention/ 87 control)	Community pharmacy based medication review vs usual care	Number of DRPs • mean difference -16.3%, 95% CI -24.3 to -8.3 • mean number of drugs/patient was not significantly reduced (mean difference -4.7%, 95% CI -9.6 to 0.2)	Community pharmacy based medication review has a positive effect on reducing potential DRPs in the elderly. However, no link was made to any patient health outcomes, such as quality of life, morbidity and mortality
Bouvy (2003) The Netherlands	RCT N=152 6 months	Patients with moderate to severe heart failure (NYHA] II and III), treated with loop diuretics (n=74 intervention / 78 control)	Community pharmacy based medication review vs usual care	Medication compliance • days without use of loop diuretics: 140/7656 intervention vs 337/6196 control (RR 0.33, 95% CI 0.24–0.38) • two consecutive days of non-dosing: 18/7656 intervention vs 46/6196 control (RR 0.32, 95% CI 0.19–0.55) Mortality • no SS difference between groups Rehospitalisation • no SS difference between groups QoL • no significant differences between groups	A pharmacy-led intervention can improve medication compliance in patients with moderate to severe heart failure, even in those with relatively high compliance. Future interventions should also focus at less compliant patients

Study ID Country	Study design/ duration	Population	Relevant comparison	Effect	Authors' conclusions
Bernsten (2001) Multicentre (Europe)	RCT N=2,454 (190 community pharmacies) 18 months	Patients≥65 years taking at least 4 prescribed medications, n=1,290 intervention/1,164 control	Community pharmacy based medication review vs usual care	QoL • no SS differences between groups Hospital admissions • 35.6% vs 40.4% (p>0.05) Patient satisfaction • at baseline: 66% intervention vs 68% control rated pharmacy services as excellent • 18-months follow-up: 74% intervention vs 65% control rated pharmacy services as excellent (p=0.018) Clinical signs and symptom control • intervention patients agreed they had better control of their medication during the study at 6, 12 & 18 months (73%, 71% & 75% - excludes the Netherlands cohort) Cost of healthcare • no SS difference between total costs for the control and intervention group in any country Adherence • no SS difference between groups	Community pharmacy based medication review had no significant effect on QoL, adherence, hospitalisation, or costs. However, it resulted in greater patient satisfaction and control of their symptoms

Abbreviations: CABG, coronary artery bypass graft; CHD, coronary heart disease; CI, confidence interval; DPPR, Daily Polypharmacy Possession Ratio; DRP, drug-related problem; FRID, fall risk-increasing drug; ED, emergency department; MI, myocardial infarction; MPR, Medication Possession Ratio; NSF, National Service Framework; NYHA, New York Heart Association; OR, odds ratio; PTCA percutaneous transluminal coronary angioplasty; QoL, quality of life; RCT, randomised controlled trial; RR, relative risk (risk ratio); SD, standard deviation; SS, statistically significant; TRP, treatment-related problem; UK, United Kingdom; USA, United States of America; vs, versus

a The main conSIGUE study was a cluster RCT carried out in 178 community pharmacies in four Spanish provinces aimed at assessing the clinical, economic and humanistic impact of the medication review performed in community pharmacy on aged polypharmacy patients. Citation: Martinez-Martinez F, Farragher T, Faus M, Garcia-Cardenas V, Gastelurrutia M, Jodar F. Clinical, economic and humanistic outcomes of medication review with follow-up in aged polypharmacy patients in the Spanish community pharmacy. Madrid: General Council of Spanish Pharmacists; 2014 (cited 2015 Feb 18) (ISBN: 9788487276835). http://www.pharmaceutical-care.org/archivos/992/V2-Resultados-Definitivos-Programa- Consigue-Impacto-2011 2014.pdf

The RCT by Misserli et al (2016) evaluated the impact of community pharmacy based medication review, Polymedication Check (PMC) on patients' adherence. It included 450 patients prescribed four or more medicines over >3 months. The intervention group (n= 218) received a PMC at study start (T-0) and after 28 weeks (T-28) while the control group (n=232) received only a PMC at T-28. Primary outcome measure was change in patients' objective adherence, calculated as Medication Possession Ratio (MPR) and Daily Polypharmacy Possession Ratio (DPPR), using refill data from the pharmacies and patient information of dosing. Subjective adherence was assessed as secondary outcome by self-report questionnaires (at T-0 and T-28) and telephone interviews (at T-2 and T-16), where participants estimated their overall adherence on a scale from 0–100 %. The study was powered to detect a 5 % increase in objective adherence (with a baseline at around 60 %). A major limitation of this study is its short duration of 28 weeks of follow-up, with only two refills to be considered for evaluation of adherence. Studies assessing long-term non-adherence require one- to two-year follow-up periods. Further, participants showed high baseline objective adherence of 87.5 % (perhaps due to the Hawthorne effect), thus providing little room for observing improvement in this primary outcome.

The cluster RCT by Mott et al (2016) examined the effects of a medication review (in the form of a medication therapy management (MTM) intervention) provided by a pharmacist on modifying fall risk-increasing drugs (FRIDs) and reduction of falls in the elderly. It included 81 older adults prescribed medications known to be associated with falls (e.g. antidepressants, anti-hypertensives, benzodiazepines, neuroleptics, sedatives, hypnotics and certain additional drugs with high anticholinergic properties) and who completed a fall prevention workshop. The intervention group (n=39) received a 60 minute face-to-face targeted medication review and direct feedback regarding their medication use from a community pharmacist in a private consultation room at the pharmacy and a follow-up telephone call three months post the medication review. The objective of the medication review was to identify and modify (i.e., stopping, lowering dose) FRID use. Based on the medication review findings, the community pharmacist developed a medication-related action plan that included recommendations to modify FRID use. The community pharmacist discussed the recommendations with the patients or prescriber as necessary, and followed up on all recommendations to determine whether they were accepted or rejected. The community pharmacist was paid for each medication review and a follow-up telephone call. The control group (n=42) received a mailed pamphlet describing medication use and fall. The main outcome measures were the rate of discontinuing FRIDs and the number of falls. Medication recommendations in the intervention group had a 75% acceptance rate by patients and prescribers. The pilot study was not powered to detect statistically significant differences between study groups in outcomes.

The RCT by Basheti et al (2016) evaluated the impact of medication management review service on treatment-related problems (TRPs) and certain clinical outcomes. A total of 160 people who visited the two community pharmacies, and were randomised to either receiving a medication review at the pharmacy (n=82) or cared for by their physicians (n=78). The most common medical conditions that the recruited patients had were hypertension, diabetes, hyperlipidaemia, cardiovascular diseases, and obesity. The intervention comprises a medication review at baseline conducted by the clinical pharmacist at baseline for both the intervention and control groups to determine the prevalence and type of TRPs; however, recommendations regarding the identified TRPs were only submitted to the physicians of patients in the intervention group. TRPs in the control group are identified and corrected by the physicians and without any input from the clinical pharmacist. Outcome measures included the rate of physicians' acceptance of the clinical pharmacist's recommendations, the number of TRPs resolved, blood pressure, blood glucose level, and triglyceride levels. None of the patients included in the study were lost to follow-up during the study period.

The sub-analysis of a cluster RCT by Malet-Larrea et al (2016) assessed the impact of a medication review with follow-up service provided in community pharmacy to aged polypharmacy patients on the number of medication-related hospital admissions and to estimate the effect on hospital costs. This

study was part of a nationwide research project called the 'conSIGUE Program' undertaken in Spain with the aim of assessing the economic, clinical and humanistic impact of a community pharmacy based medication review with follow-up service, provided to aged polypharmacy patients (Martinz-Martinez et al, 2015). It included a total of 1403 patients from 178 pharmacies. Pharmacies in the intervention group (n=688) provided a comprehensive medication review with a 6-month follow-up, whereas patients in the control group (n=715) received usual care. The intervention constituted a medication review aimed at detecting DRP in order to identify, prevent and solve negative clinical outcomes related to medicine. Due to the lack of a translated document for this RCT, only findings from the Malet-Larrea et al (2016) and Ocampo et al (2015) will be discussed in this Report.

An observation study with a pre- post-design by Ocampo et al (2015) evaluated the clinical, economic, and humanistic impact of a pharmacist-conducted medication review with follow-up following 18-month implementation. It included 132 patients prescribed at least one medicine, and that attended a single pharmacy on monthly basis and received the medication review with follow-up service. The medication review included a patient interview where the pharmacist collects information about the patients' health problems, medicines, and patient concerns and views of their diseases and medications. The pharmacist then identifies DRPs and develops a pharmaceutical action plan that is discussed and agreed with the patient or patient's physician as necessary. Main outcome measures included number of medicines, medication-related problems, hospital and emergency department (ED) admissions, and QoL. Limitations of this study include the longitudinal analysis of patients with no randomisation or control group, together with the presence of only one trained pharmacist delivering the service, thus limiting the extrapolation of the results.

The RCT by Geurts et al (2015) evaluated the effect of a community pharmacy based medication review on the beliefs about medicines and quality of life of older patients with polypharmacy and a cardiovascular disorder. It included 512 patients prescribed at least five medicines for chronic conditions, with at least one of these medicines prescribed for a cardiovascular disorder or cardiovascular risk factor. The intervention group (n=248) received a clinical medication review followed by a pharmaceutical care plan developed in cooperation between patients' pharmacist and GP, and agreed upon with the patient. The pharmaceutical plan documented possible DRPs and pharmaceutical care issues and interventions proposed in order to resolve them. The control group patients (n=264) received usual care. The primary outcome measures were patients' beliefs about medicines and quality of life. Amajor limitation of this study was the number of patients needed in order to determine the effect of a clinical medication review on patients' QoL was not attained.

The RCT by Touchette et al (2012) evaluated the effect of a community pharmacy based medication review on adverse drug events (ADEs), hospital and ED admissions, and DRPs. It included 637 patients aged 65 years or older with three or more chronic illnesses, prescribed six or more medications and at risk for a DRP. Patients were randomised to either receiving the medication review performed by a pharmacist at two time points (n=429) or usual care (n=208). Pharmacists conducted comprehensive medication reviews and screened for and resolved DRPs through patient education and recommendations to physicians. Potential ADEs were the primary study outcome where they were identified at 3 and 6 months via telephone interview by study personnel blinded to the study arm using a validated symptom survey. The RCT compared two types of medications reviews (basic and advanced) versus usual care. A major limitation of this study is the relatively low physician response (53% overall) and acceptance (30%) of pharmacists' recommendations thus potentially reducing the intervention's effectiveness.

The RCT by Blalock et al (2010) evaluated the effect of a community pharmacy based medication review targeting high-risk older adults on the rates of recurrent falls. Selection criteria included patients who had fallen at least once in the year preceding randomisation and were taking medications

associated with an increased risk of falling[10]. Participants assigned to the intervention group (n=93) received a face-to-face medication consultation conducted by a pharmacist at Drug Kerr community pharmacy nearest their home; participants assigned to the control group (n=93) received no medication review. During the medication consultation, the pharmacist reviewed the patient's medications and identified potential problems in their drug therapy, with attention given to medications that have been found to increase the risk of falling, with an emphasis on central nervous system-active medications. The primary outcome was the rate of recurrent falls. The total number of prescriptions for high-risk medications and the reduction in dose of high-risk medications were assessed as secondary end points.

The SMOG RCT by Vinks et al (2009) evaluated the benefit of medication review by a community pharmacist on reducing DRPs in elderly patients. It included 174 patients prescribed six or more drugs (polypharmacy), randomised with a 1:1 allocation ratio to either receiving a medication review or usual care. The medication review was performed by a pharmacist and focused on identifying DRPs and providing recommendations for medication change that were discussed with the GP. The pharmacist performed another review four months later and screened for potential DRPs. The main outcome of interest was the change in the number of potential DRPs between the groups from baseline to 4 months after the date of inclusion. On average, 2.7 recommendations were made per assessment. At four months around a quarter (28%) of the recommendations had been implemented.

The MEDMAN trial by Bond et al (2007) was a multicentred RCT commissioned by the UK Department of Health to inform changes to the community pharmacist contractual framework. Subjects were male or female, aged 18 years and over, with recorded coronary heart disease (CHD), defined as previous myocardial infarction, angina, coronary artery bypass graft, or angioplasty. Patients were identified from general practice computer systems, recruited and randomised (2:1) to intervention (receiving the MEDMAN service) or control (receiving usual care). The MEDMAN service was a collaborative medicine review service between the community pharmacist and the GP. It included an initial consultation with a community pharmacist to review: appropriateness of therapy (e.g. additional medicine required, medicine that should be discontinued, change of medicine, use of over-the-counter (OTC) medicines, formulation issues); compliance and concordance (e.g. daily consumption of medicine, any concerns/beliefs about medicines, information requirements); lifestyle (e.g. smoking cessation, increased exercise and dietary change); and social and support issues (either managing their medicines or their condition generally). The number of subsequent consultations was determined by the community pharmacist on the basis of each patient's need, with a maximum of four anticipated during the 12-month follow-up. The community pharmacist communicated any suggested changes to prescription medicines to the GP using a standard referral form. The control patients received usual care from their community pharmacists (opportunistic advice on OTC medicines and lifestyle, and ad hoc communication with the GP) and GP (authorisation of repeat medicines, review of medicines). Primary outcomes included a costing exercise that collected information on National Health Service (NHS) and patient costs (based on 2015 prices); a composite measure of 'appropriate treatment', quality of life using utility measures EuroQol (EQ-5D) and SF-6D scores. Secondary outcomes included patient self-reported satisfaction was collected at 12-month follow-up, adherence, and five-year risk of cardiovascular death.

The RCT by Bouvy et al (2003) evaluated the effect of a community pharmacy based medication review provided to patients with heart failure (predominantly New York Heart Association [NYHA] II and III) treated with loop diuretics. Patients in the intervention group (n=74) received an interview with the pharmacist aiming on discussing medicine use and reasons for noncompliance (such as potential DRPs). The pharmacist then forwards a short report of the interview to the GP, and follows up on the patient for six months. Patients in the control group (n=78) received usual care. The primary outcome measure was patients' compliance, while secondary outcomes included number of re-hospitalisations, mortality, and quality of life.

[10] The authors classified medications as high risk (central nervous system) to include benzodiazepines, antidepressants, anticonvulsants, sedative hypnotics, opioid analgesics, antipsychotics, and skeletal muscle relaxants.

Bernsten et al (2001) conducted a large multicentre RCT in seven European countries including the UK that evaluated a pharmaceutical care programme (in the form of a medication review) provided to elderly patients (aged 65 or older) taking four or more medicines by community pharmacists. A total of 1290 intervention patients and 1164 control patients were recruited. The intervention comprised a community pharmacy based medication review aimed at identifying DRPs followed by the development of a pharmaceutical care and monitoring plan for the patients that included: educating the patient about their medicine regimen and their condition; implementing compliance-improving interventions such as medicine reminder charts; and rationalising and simplifying medicine regimens in collaboration with the patients GP. This was a continuous process throughout the 18 months of the study. Study primary outcomes included quality of life, hospital admissions, costs, and patient satisfaction. Adherence was assessed as secondary outcome using self-reported questionnaire.

5.1.1 Clinical outcomes

Blood pressure

The RCT by Basheti et al (2016) showed that, after an average of 3.4-month follow-up, there was significant differences between the intervention group versus control group with regard to blood pressure readings (110.36/81.55 ± 9.45/3.91 vs 125.0/88.73 ± 10.34/4.12, $p<0.001$).

Blood glucose levels

The RCT by Basheti et al (2016) showed that, after an average of 3.4-month follow-up, there was significant differences between the intervention group versus control group with regard to blood glucose levels (99.08 ± 9.66 vs 115.48 ± 17.34, $p<0.001$).

Triglyceride levels

The RCT by Basheti et al (2016) showed that, after an average of 3.4-month follow-up, there was significant differences between the intervention group versus control group with regard to triglyceride levels (148.5 vs 170.7; $p=0.001$).

Findings: *Evidence from one RCT showed that a community pharmacy based medication review can lead to significant improvements in clinical outcomes, including blood pressure, glucose levels, and triglyceride levels. However, this RCT was conducted in a different health care system than Australia. The study was conducted in Jordan where most patients with a health ailment prefer to visit the community pharmacy first rather than a physician to save the time and cost of a doctor. Further, most medications can be dispensed by a pharmacist without a medical prescription, thus leading to major implications for the safety and effectiveness of the pharmacotherapy used in this country. Therefore, positive findings from this study may not necessarily translate to Australia's health care system, and thus should be considered with caution.*

5.1.2 Hospital and emergency department admissions

The conSIGUE cluster RCT by Martinez-Martinez et al (2015) reported a total of 83 hospitalisations in both groups, with 42 hospitalisations (50.6%) classified being "medicine-related" by an expert panel. Results from the sub-analysis by Malet-Larrea et al (2016) showed that the number of medication-related hospitalisations was significantly lower in patients receiving medication review compared to the control group (11 versus 31, respectively; $p=0.042$). The probability of being hospitalised was significantly higher in the control group compared with the medication review group (adjusted odds ratio 3.7, 95% CI 1.2–11.3, $p= 0.021$). A major limitation of this study is the small number of hospital admissions due to the low frequency of this outcome in the main RCT (conSIGUE). However, this is generally a common limitation in studies analysing hospitalised patients after receiving a pharmacist-led intervention.

The study by Ocampo et al (2015) found a significant reduction in the number of hospital admissions 18-month post-medication review compared to baseline (4 versus 12, OR 0.31, 95 % CI 0.10–0.99; p=0.039). Similarly, there was a significant reduction in the number of ED admissions post-intervention (3 versus 17, OR 0.16, 95% CI 0.05–0.55; p = 0.001).

The RCT by Touchette et al (2012) found no statistically significant changes in the proportion of patients hospitalised over time (3-6 months follow-up) (Basic medication review: mean difference 0.04, 95% CI –0.05 to 0.13; p value not significant). Similarly, there were no statistically significant changes in the proportion of patients with ED visits over time.

The RCT by Bouvy et al (2003) found no statistically significant changes in the proportion of patients re-hospitalised, with 26% of the patients in the intervention group versus 24% of patients in the usual care group were either readmitted or dead (p>0.05).

The RCT by Bernsten et al (2001) found no statistically significant changes in the proportion of patients hospitalised during the 18-month follow-up (35.6% vs 40.4%; p>0.05).

Findings: *Evidence is conflicting to draw conclusions about the effect of community pharmacy based medication review on reducing the number of hospitalisations. Three RCTs found no effect on number of hospital admissions (with one RCT reported no significant effect on reducing ED visits). On the other hand, evidence from a sub-analysis of a cluster RCT and another with a pre- post-design suggest that community pharmacy based medication review results in a significant reduction in hospital admissions. A major limitation of pharmacist-led interventions studies is their relatively small sample size and hence, they are not sufficiently powered to detect differences in health care use. Importantly, there is a lack of a cause and effect analysis in most of the included studies, and whether any observed reduction in hospitalisation was drug-related, thus restricting the generalisation of the results. Another limitation is the relatively short duration of follow-up in the included studies. It is likely that a study follow-up period of less than one year is too short to realise longer-term reduction in health care use. Therefore, the evidence of the impact of medication review performed at the pharmacy on hospital admissions remains uncertain.*

5.1.3 Health care resource costs

The retrospective sub-analysis of the conSIGUE RCT by Malet-Larrea et al (2016) estimated total cost of medication-related hospital admissions (n = 42) to €280 229, and the mean cost per medication-related hospital admission was €6672. The sub-analysis also indicated that medication-related hospitalisation costs were significantly lower for patients receiving the medication review compared to the control group[11] (€94 versus €301; 95% CI 35.9–378.0, p= 0.018).

Findings: *There is a paucity of evidence on the effect of a community pharmacy based medication review on reducing health care costs. Evidence from one retrospective sub-analysis of one RCT showed that medication-related hospital costs were significantly lower for patients receiving a community pharmacy based medication. However, these results should be interpreted with caution due to the poor quality of retrospective studies.*

5.1.4 Drug burden

The cluster RCT by Mott et al (2016) evaluated the effect of a community pharmacy based medication review on the rate of discontinuing FRID use. Results from this pilot study found that a significantly larger proportion of subjects stopped using all FRIDs in the intervention group compared with the control group (77% and 28%, respectively; p< 0.05). However, this reduction did not translate to a clinically meaningful reduction in falls, as the proportion of subjects falling and the number of falls during the follow-up time period were not different between study groups (refer to Section 5.1.5).

[11] These costs were calculated by dividing the costs per group of the medication-related hospital admissions by the number of patients per group in the main study (intervention group 688; control group 715).

The RCT by Blalock et al (2010) also evaluated the effect of a community pharmacy based medication review on reducing the number of high-risk medications (i.e. medications that affect the central nervous system) associated with falling in the elderly. As-treated analyses revealed numeric reductions in the filling prescriptions for high-risk medications (RR 0.85; 95% CI, 0.72–1.03) after receipt of the intervention, however the differences were not statistically significant. No effect on the reduction of falls was observed.

The observational study by Ocampo et al (2015) reported that the average number of medicines decreased from 6.1 (SD: 2.9) to 3.3 (SD: 2.2) (p value not reported), while the percentage of polypharmacy patients (those using five or more medicines) decreased from 69% to 28% (OR 0.18, 95% CI 0.10-0.30; p<0.001). However, the study did not investigate the impact of decreased drug burden on patients' health outcomes.

Findings: *Evidence from two RCTs that evaluated the effect of community pharmacy based medication review on reducing the number of medications associated with falling were contradictory, with one showing a significant reduction in medications associated with increased falling and the other showing no effect. Results from one observational study showed that community pharmacy based medication review has a positive effect in reducing the number of medicines, thus leading to a decrease in the percentage of polypharmacy patients. However, there is no evidence showing that a decreased drug burden improves any patients' health outcomes, such as decrease in DRPs or reduction in falls, and consequently a reduction in health care costs.*

5.1.5 Falls

The cluster RCT by Mott et al (2016) evaluated the effect of a community pharmacy based medication review on the reduction of falls in the elderly. Results from this pilot study found that a significantly larger proportion of subjects stopped using all FRIDs in the intervention group compared with the control group (77% and 28%, respectively; p<0.05). However, there were no significant changes between the study groups in the risk and rate of falling, despite a significant reduction in the use of FRIDs. The authors concluded that a targeted medication review provided by a community pharmacist that focused on FRID use among older adults was effective in modifying FRID use. However, a decrease in the use of FRID did not result in a decrease in falls, likely because the cause of falls in the elderly is multifaceted and not entirely caused by FRID use.

Similarly, as-treated analysis from the RCT by Blalock et al (2010) revealed no statistically significant reduction in the rates of recurrent falls (RR 0.76; 95% CI, 0.53–1.09; p not significant) or injurious falls (RR 0.67; 95% CI, 0.43–1.05; p not significant) after one-year follow-up. The study did not demonstrate a significant reduction in high-risk medications (central nervous system-medications) (refer to Section 5.1.4).

Findings: *Evidence from two RCTs suggests that community pharmacy based medication review has no effect on reducing falls in high-risk older adults. However, both RCTs were of small sample size; hence more research is needed to evaluate the community pharmacy based medication review using a larger sample size that provides greater power to detect clinically meaningful effects of reduction in the use of high-risk medications on preventing or reducing falls in the high-risk population.*

5.1.6 Mortality

The MEDMAN trial by Bond et al (2007) did not demonstrate any significant change in the future (5-year) risk of cardiovascular death. Similarly, the Bouvy et al (2003) RCT found no significant effect on reducing the number of deaths in heart failure patients.

Findings: *Evidence from two RCTs did not demonstrate a significant effect on mortality in patients with heart disease.*

5.1.7 Adverse drug events

The RCT by Basheti et al (2016) reported a total of 859 treatment-related problems (TRPs) identified in the intervention and control groups during the study period, with a mean of 5.37 ± 3.01 TRPs for each patient. The most commonly identified TRP categories were efficacy, inappropriate adherence, miscellaneous problems, and inappropriate knowledge. For the intervention group, the physicians' acceptance rate was very high (94%). Importantly, there were significant differences between the intervention and control groups with regard to TRP outcomes at follow-up. Patients in the intervention group had 70% of the identified TRPs resolved or improved compared with 2% in the control group ($p<0.001$).

The observational study by Ocampo et al (2015) reported that after 18 months of follow-up, approximately 66% (393/ 593) of negative outcomes related to medicines[12] were resolved and nearly 30% (180/593) were prevented.

The RCT by Touchette et al (2012) evaluated the effect of a community pharmacy based medication review (basic or advanced) on ADEs. The study reported a significant decrease in DRPs, however this did not translate into measurable differences in ADEs, and the proportion of participants with an identified potential ADE did not differ for either intervention group or the usual care group.

The SMOG RCT by Vinks et al (2009) evaluated the benefit of medication review by a community pharmacist on reducing DRPs in elderly patients. Four months after the intervention by the community pharmacist, there was a significant reduction in the mean number of DRPs per patient (mean difference -16.3%, 95% CI -24.3% to -8.3%). However, the impact of this improvement on reducing ADEs was not investigated. The study found that there was a modest but nonsignificant reduction in the mean number of drugs per patient. Thus, a decrease in the number of DRPs does not automatically lead to a similar decrease in the number of drugs

Findings*: Evidence for an effect of a community pharmacy based medication review on ADEs is inconclusive. One RCT that was statistically powered to detect a meaningful difference in ADEs found no effect of a community pharmacy based medication review on reducing ADEs. Another RCT reported a significant reduction in DRPs but without translating this effect into reductions in ADEs. A third RCT and one small observational study showed high acceptance of the pharmacist's recommendations by physicians, leading to the resolution, improvement, or prevention of identified medication-related problems and DRPs. Findings from these two studies may suggest that community pharmacy based medication review can assist patients achieve a safe and effective pharmacotherapy, however, there is no evidence to suggest that a reduction in DRPs or medication-related problems lead to reduction in ADEs or improvements in any other patient health outcome. Therefore, further research is needed to identify the link between DRPs and ADEs, and aspects of medication review that are particularly effective at improving patients' health outcomes, such as mortality, health-related QoL, hospital admissions and use of health services.*

5.1.8 Prescribing appropriateness

The MEDMAN trial by bond et al (2007) reported that the global score for appropriateness of medication was not significantly different between groups (total score, mean 0.19, 95% CI –0.07 to 0.46; $p=0.15$).

Findings: *Evidence from one large RCT suggests that a community pharmacy based medication review has no positive effect on improving appropriateness of medication prescribing.*

[12] The study by Ocampo et al (2015) defined negative outcomes related to medicines as uncontrolled health problems due to drug use or non-use. According to the authors, this outcome measure is not equivalent to drug-related problems. DRPs are defined as "an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes". Each detected DRP identified by the community pharmacist were analysed and classified according to their possible negative clinical outcomes.

5.1.9 Adherence

The RCT by Misserli et al (2016) evaluated the impact of Polymedication Check service on patients' adherence. The study showed that, for the primary outcome objective adherence, there was no significant improvement in the intervention group (mean MPR 88.3 % versus 87.5 % in the control group; p = 0.811). Similarly, there was no significant improvement in the DPPR in the intervention group (88.0±13.31 vs 87.5± 20.75 in the control group; p = 0.906). The authors noted that the adherence in the control population was already at an unexpectedly high rate of 87.5 %, thus making it difficult to observe a 5% increase in objective adherence in the intervention group. for improvement in the intervention group.

The study also evaluated subjective adherence as a secondary outcome using a self-report questionnaire and two telephone interviews carried out at two and 16 weeks post-intervention. The mean absolute change of subjective adherence between baseline and two weeks post-intervention was +1.03 % in the intervention and −0.41 % in the control group (p = 0.058). Sub-analysis showed that there was a higher percentage of patients in the intervention group with more than 5 % increase of subjective adherence compared to the controls ($N_{Improvement}$ = 30; $N_{Worsening}$ = 14 versus $N_{Improvement}$ = 20; $N_{Worsening}$ = 24; p = 0.028). However, this effect only appeared shortly after the intervention (two weeks period) and could not be observed again in the further course of the study.

The MEDMAN RCT by Bond et al (2007) evaluated the effect of a community pharmacy based medication review on adherence. The study found no significant improvement in adherence at follow-up. This was possibly due to the high median score for compliance with medication taking at baseline for the intervention and control groups (59, interquartile range IQR 56–60) and thus reducing the potential for improvements post-intervention.

The RCT by Bouvy et al (2003) reported improvements in medication compliance in patients with moderate to severe heart failure, six-month post-intervention. Results showed that patients in the intervention group had 140/7656 days without use of loop diuretics compared with 337/6196 days in the usual care group (RR 0.33, 95% CI 0.24–0.38). Two consecutive days of non-dosing occurred on 18/7656 days in the intervention group compared with 46/6196 days in the usual care group (RR 0.32, 95% CI 0.19–0.55).

The RCT by Bernsten et al (2001) also showed no statistically significant difference between groups in adherence. However, an analysis of changes in compliance during the study (change of compliance status compared with that reported at baseline) indicated that at 18 months a statistically significantly higher proportion of the intervention patients changed from being noncompliant to compliant compared with the control groups (15.2% and 12.2%; p=0.028).

Findings: *The evidence for an effect of community pharmacy based medication review on adherence was mixed. Results from three RCTs showed that a community pharmacy based medication review did not have a positive effect on improving patients' adherence to medication. However, one small RCT reported improvement in medication compliance in patients with moderate to severe heart failure.*

5.1.10 Quality of life

The observational study by Ocampo et al (2015) reported an improvement in all QoL (SF-36) domains, with the highest increase observed in the construct health transition (mean increase: 30.7±25.4), followed by bodily pain (mean increase: 22.3±25.4), and general health (mean increase: 20.7±23.7). Further, both physical and mental health summary scales improved, increasing from 65.8 and 66.2 (p<0.001) to 82.7 and 81.1 (p<0.001), respectively.

The RCT by Geurts et al (2015) evaluated the effect of a community pharmacy based medication review on patients' beliefs of medicines using the BMQ-General questionnaire and quality of life using

EQ-5D. Analysis of both parts of the BMQ-General questionnaire (General Harm and General Overuse) showed that intervention patients became more positive about medicines use (increase in mean scores), while patients in the control group indicated no difference or even became more negative. For the first part, General Harm, the mean score increased significantly from 3.297 at baseline to 3.423 at 12-month follow-up in the intervention group (mean 0.126; 95% CI −0.227 to −0.025; p= 0.014). However, the EQ-5D questionnaire showed no significant results in QoL in patients suffering from cardiovascular diseases.

The MEDMAN RCT by Bond et al (2007) found no significant differences between groups in any of the individual SF-36 domains or in overall EQ-5D score (mean difference 0.04, 95% CI –0.05 to 0.13; p=0.37).

The RCT by Bouvy et al (2003) found that (heart failure) disease-specific quality of life improved in both the intervention and usual care groups, however improvement in the usual care group tended to be higher, although this difference was not statistically significant. Generic quality of life (COOP/WONCA) measures improved in the usual care group and worsened slightly in the intervention group.

The RCT by Bernsten et al (2001) also showed no statistically significant difference between groups in any of the eight SF-36 dimensions over the 18-month follow-up period (p>0.05).

Findings: *The evidence for an effect of community pharmacy based medication review on quality of life was conflicting, with one observational study reporting an improvement in QoL, and four RCTs showing no significant effect on QoL. The inability of the pharmacy-led intervention to significantly affect health-related QoL in the elderly may partially be due to a greater disease burden experienced by the elderly and thus, the intervention may only have a nonsignificant effect on QoL. More research is necessary in order to define the effect of a clinical medication review on patient QoL.*

5.1.11 Patient satisfaction

Two RCTs reported on patient satisfaction. The MEDMAN RCT by Bond et al (2007) found statistically significant improvements in the intervention group in the single computed satisfaction score for patients' most recent pharmacy visit for prescription medicines compared with control patients (mean difference 4.0, 95% CI 1.7–6.3; p<0.01).

The RCT by Bernsten et al (2001) found that a pharmaceutical care plan (and a medication review) had some positive effects on humanistic health outcomes such as satisfaction with treatment and symptom control. Intervention patients rated the pharmacy services provided higher that the control at 6 and 18 months (p<0.05). There was a small statistically significant increase in satisfaction in the intervention group over time (baseline versus 12 months p=0.039).

Findings: *Evidence from two RCTs suggests that community pharmacy based medication review has a positive effect on patient satisfaction, especially in relation to treatment and symptom control as a result of the medication review.*

5.2 EVIDENCE FROM PRIMARY STUDIES-DIABETES MEDSCHECK

The systematic literature review identified a single RCT that evaluated the effect of a community pharmacy based medication review targeting type 2 diabetes patients in Denmark on clinical and humanistic outcomes.

Table 5.3: Characteristics of the included study-Diabetes MedsCheck performed by a pharmacist

Study ID Country	Study design/total study duration	Mean age	Population	Intervention	Control	Outcomes
Kjeldsen (2015) Denmark	RCT N= 205 (5 pharmacies) 6 months	63.1	Patients with type 2 diabetes ≥18 years; using oral antidiabetics; administered their own medication (n=80 intervention (Extended Intervention n=41; basic intervention=39) /control 125)	Community pharmacy based medication review (referred to an Extended Intervention (EI); n=41) provided by a pharmacist. It included a medication review, BP measurements, identifications of DRPs, comprehensive interview, coaching and patient education aimed at controlling the patient's diabetes	Standard care	• blood pressure • blood sugar • disease related knowledge • quality of life (EQ-5D) • patient satisfaction (patients reported satisfaction with pharmacy staff and not the intervention)

Abbreviations: BP, blood pressure; DRP, drug-related problem; EI, Extended Intervention; EQ-5D, EuroQol-5 dimensions; RCT, randomised controlled trial

Table 5.4: Summary of results of the included study

Study ID Country	Study design/ duration	Population	Relevant comparison	Effect	Authors' conclusions
Kjeldsen (2015) Denmark	RCT N= 205 (5 pharmacies) 6 months	Patients with type 2 diabetes ≥18 years; using oral antidiabetics; administered their own medication (n=41 Extended intervention/control 125)	Community pharmacy based medication review vs standard care	Clinical outcomes • BP: significant reduction in systolic blood pressure (mean difference between groups not reported; p=0.02) • blood glucose levels: no significant changes between groups Health care resource use • no significant differences between groups in hospital admissions (p=0.905) or in doctor visits (p=0.834) Drug burden • no significant differences in number of medications between groups (p=0.212) QoL • No SS differences between groups (p=0.084)	A community pharmacy based medication review targeting patients with type 2 diabetes resulted in a significant improvement in blood pressure. However, there was no significant effect on blood glucose levels, hospital admissions, GP visits, drug burden, or quality of life

Abbreviations: GP, general practitioner; QoL, quality of life; RCT, randomised controlled trial; SS, statistically significant; vs, versus

The RCT by Kjeldsen (2015) evaluated the effect of a community pharmacy based medication review for patients with type 2 diabetes. A total of 41 intervention patients (referred to as an Extended Intervention) and 125 control patients were recruited (a third group of 39 patients received a basic intervention performed by a pharmaconomist[13] and thus excluded from further discussion in this Report). The intervention was done in collaboration with the patient, and comprised a community pharmacy based medication review aimed at identifying DRPs as well as issues experienced by the patient in relation to medicines use, and consequently find individually tailored solutions to address the identified problems. A check of the patient's medication profile, a blood sugar measurement and blood pressure measurement was also performed as part of the intervention. The patients' GPs were informed about the program content and contacted whenever necessary. Study outcome measures included blood pressure, blood sugar, quality of life, patients' knowledge about diabetes and treatment of the disease, perceived concordance, hospital admissions and patient satisfaction. DRPs were identified among 90% of the patients. Problems with lack of knowledge about medication and treatment were reported for 54% of the patients in the intervention group.

5.2.1 Clinical outcomes

Blood pressure

The RCT by Kjeldsen et al (2015) reported a significant reduction in systolic blood pressure for patients in the (Extended) intervention group compared with the control group (mean difference not reported; $p=0.02$). The study reported that there was a significant decrease (-13.9 mm Hg; $p<0.001$)) in systolic blood pressure measured in the (Extended) intervention group during the consultations (at the first and last consultations) in the pharmacy.

Blood glucose levels

The RCT by Kjeldsen et al (2015) measured blood glucose levels during the trial at the pharmacy and found a nonsignificant reduction in the intervention group.

5.2.2 Health care resource use

The RCT by Kjeldsen et al (2015) found no significant differences between the intervention and control group in hospital admissions ($p=0.905$) or in doctor visits ($p=0.834$). The authors noted that hospital admissions were rather infrequent in the study's cohort of type 2 diabetes, hence detection of a significant difference would require a larger sample size. Study participants also visited their GPs frequently for monitoring of their diabetes also making it difficult to detect a significant change in this outcome.

5.2.3 Drug burden

The RCT by Kjeldsen et al (2015) found no significant change in the number of medications between the intervention and control groups during the trial ($p=0.212$)

5.2.4 Quality of life

The RCT by Kjeldsen et al (2015) found no significant difference in quality of life in the intervention group when compared with the control group ($p=0.084$).

[13] Pharmacists and pharmaconomists are two different professional groups with pharmaceutical education in Denmark. Pharmaconomists are with a three-year higher tertiary education whereas pharmacists are with a five-year higher tertiary education.

5.2.5 Patient satisfaction

The RCT by Kjeldsen et al (2015) reported on patient satisfaction with the pharmacy staff, with no evaluation of patients' satisfaction with the actual medication review service provided by the pharmacist.

Findings: *There is insufficient evidence evaluating the effect of a community pharmacy based medication review targeting patients with type 2 diabetes on patients' outcomes. A single small RCT found no significant effect on blood glucose levels, hospital admissions, GP visits, drug burden, or quality of life. However, a significant improvement in blood pressure was demonstrated. This study is limited by its sample size, and thus a larger cohort of patients is required to demonstrate a significant effect on outcome measures such as hospitalisations and quality of life. Additionally, the follow-up period was only half a year, and a longer follow-up period may be needed in order to detect larger differences between the groups.*

6
Evidence relating to cost and cost-effectiveness

This Chapter presents the evidence identified in the systematic literature review relating to the cost and cost-effectiveness of MedsCheck services with reference to the PICO criteria outlined in Section 3.1.1. This Chapter does not include evidence relating to cost and cost-effectiveness that has been reported in previous evaluations of the MedsCheck programs, which was summarised in Chapter 4.

A review of existing published economic evaluations of MedsCheck has been performed to provide a local and international economic context against which MedsCheck should be considered for use in Australia. Literature searches in Medline, Embase, Cochrane and Health Systems Evidence databases were conducted in Dec/Jan 2016/17 using the search strategy shown in Appendix B. References were included if they assessed the cost-effectiveness of MedsCheck, either in Australia or overseas. If no cost-effectiveness studies were identified, cost studies were included for discussion. Table 6.1 shows the two cost-effectiveness studies identified for inclusion in this review.

Table 6.1: Publication of economic evaluation in MedsCheck identified in the literature search

Ref ID	Citation
Jodar-Sanchez (2015)	Jodar-Sanchez F, Malet-Larrea A, Martin JJ et al. (2015) Cost-utility analysis of a medication review with follow-up service for older adults with polypharmacy in community pharmacies in Spain: the conSIGUE program. Pharmacoeconomics 33: 599–610.
Bond (MEDMAN, 2007)	Bond, C. (2007). The MEDMAN study: A randomized controlled trial of community pharmacy-led medicines management for patients with coronary heart disease. Family Practice 24(2): 189-200.

The characteristics of the cost-utility analysis conducted by Jodar-Sanchez et al (2015) are shown in Table 6.2. The cluster RCT upon which the economic evaluation was based (the conSIGUE Program) was conducted in Spain between November 2011 and January 2013, where pharmacies were allocated to either the intervention group (medication review with follow-up) or the control group (usual dispensing). To participate in the study, patients must have been 65 years or older, with polypharmacy (defined as taking five or more medicines per day).

By the end of the follow-up period (6 months), patients in both groups had reduced the mean number of prescribed medications they took (the primary outcome for the study), and this reduction was greater in the intervention group (0.28 ± 1.25 drugs; p <0.001) than in the control group (0.07 ± 0.95 drugs; p = 0.063). Results were reported as within-group comparisons for both the intervention and control groups, between baseline and the end of the follow-up period. It should be noted that the intervention and control groups were not balanced at baseline with respect to mean number of prescribed medications (p = 0.009). At baseline, patients in the intervention group were taking a mean of 7.74 medications, while patients in the control group were taking 7.39 medications. Since intervention group patients were taking a greater number of medications at baseline, there is greater scope for a decrease in number, possibly resulting in bias in favour of the intervention. A between-group comparison for the mean number of prescribed medications was reported as 0.21 ± 0.06 drugs (95 % CI 0.092 – 0.335).

Patients in the intervention group saw their QoL improved by 0.0528 ± 0.20 (p <0.001). In contrast, the control group experienced a slight reduction in their quality of life: 0.0022 ± 0.24 (p = 0.815). Again, it should be noted that the intervention and control groups were not balanced at baseline with respect to mobility problems as measured by EQ-5D (p = 0.003). A between-group comparison for QoL was reported as 0.0550 ± 0.01 in the utility score (95 % CI 0.0306–0.0794).

The cost of the intervention, based on pharmacists' time for the intervention itself and training previous to the intervention, was reported as €98.35 ± 143.03. The total mean total cost was €977.57 ± 1,455.88 for the intervention group and €1,173.44 ± 3,671.65 for the control group. The intervention group showed a significant decrease in cost with respect to healthcare resources and hospital admissions related to 'negative outcomes associated with medications' (NOMs).

To estimate the ICER, the costs (adjusted for baseline medications) and QALYs (adjusted for baseline utility score) were used, resulting in a mean incremental total cost of –€250.51 ± 156.82 (95 % CI -558.17 to 57.14) and a mean incremental QALY of 0.0156 ± 0.004 (95 % CI 0.008 – 0.023). The CUA shows that the medication review service is the dominant strategy. The acceptability curve shows that if the willingness-to-pay is between €30,000/QALY and €45,000/QALY, the probability of the medication review service being cost effective is 100%. The authors concluded that 'the MRF [medication review with follow-up] service is an effective intervention for optimising prescribed medication and improving QoL in older adults with polypharmacy in community pharmacies. The results from the CUA suggest that the MRF service is cost effective.'

In addition, with the intervention and control groups not being balanced at baseline, there are other concerns with this study in terms of the intervention and the study design. The nature of the intervention is unclear from the publication – the actual medication review is not fully described. The follow-up visits, occurring every 1.2 months, possibly allow more scope for medication changes than would normally occur in an Australian medication review, making the results not generalisable to an Australian MedsCheck population. The publication implies, but does not explicitly state, that the pharmacist is not present for the follow-up interviews, based on the description of how the cost of the intervention is calculated. Furthermore, a facilitator who provided training to the pharmacists at the start of the project may (or may not) have been present during the medication review. Finally, the cost of the intervention is not explicitly articulated – the cost is quoted as €98.35, but the authors do not state if this is for training and conducting one medication review per patient.

The study design is also of concern. The RCT upon which the economic evaluation was based had a cluster design, where pharmacies were allocated to either the intervention group (medication review with follow-up) or the control group (usual dispensing). Adults who satisfied the inclusion criteria were recruited by the pharmacy. Randomisation at the patient level did not occur, which may lead to biased results, as patients may self-select as being amenable to having a medication review and acting on the outcomes.

Table 6.2: Summary of the included MedsCheck study that examined cost-effectiveness

Study ID Country Evaluation type Setting	Derivation of effectiveness Intervention Population N Follow up Outcomes	Currency Price year Perspective Model type Time horizon Cycle length	Derivation of costs Discount rate Outcome of interest Source of utilities	Findings Conclusions	Assumptions
Jodar-Sanchez (2015) Spain CUA	• Study: Cluster RCT in Spanish pharmacies. Pharmacies were allocated to either the intervention group or the control group. • Intervention: Medication review with follow-up in community pharmacies vs usual dispensing in community pharmacies. • Population: ≥65 years, polypharmacy (≥5 medicines per day). • N = 1403; 688 in the intervention group and 715 in the control group. • Follow up: 6 months. • Outcomes: number of medicines used, number of uncontrolled health problems, HR-QoL, number of visits to A&E departments, and the number of hospital admissions.	• Currency: euros. • Price year: 2014. • Perspective: Health service. • Model type: NR. • Time horizon: 12 months. • Cycle length: NR.	• Medication prescribed, time employed by pharmacist, A&E department visits, hospital admissions, investment in community pharmacy infrastructure and training. • Discounting: none. • Outcome: QALY. • Utilities: EQ-5D-3L, Spanish version.	• Authors' findings: Both groups had reduced the mean number of prescribed medications they took, although this reduction was greater in the intervention group (0.28 ± 1.25 drugs; p <0.001) than in the control group (0.07 ± 0.95 drugs; p = 0.063). Patients in the intervention group saw their quality of life improved by 0.0528 ± 0.20 (p <0.001). In contrast, the control group experienced a slight reduction in their quality of life: 0.0022 ± 0.24 (p = 0.815). • The mean total cost was €977.57 ± 1,455.88 for the intervention group and €1,173.44 ± 3,671.65 for the control group. In order to estimate the ICER, we used the costs adjusted for baseline medications and QALYs adjusted for baseline utility score, resulting in a mean incremental total cost of -€250.51 ± 148.61 (95 % CI -541.79 to 40.76) and a mean incremental QALY of 0.0156 ± 0.004 (95 % CI 0.008–0.023). Regarding the results from the CUA, the medication review service emerged as the dominant strategy. • Authors' conclusion**:** The medication review service is an effective intervention for optimising prescribed medication and improving QoL in older adults with polypharmacy in community pharmacies. The results from the CUA suggest that the MRF service is CE.	NR

Abbreviations: A&E, accident and emergency; CE, cost effective; CI, confidence interval; CUA, cost-utility analysis; EQ-5D-3L, EuroQol five dimensions questionnaire with three levels of severity; HR-QoL, health-related quality of life; ICER, incremental cost-effectiveness ratio; NR, not reported; QALY, quality adjusted life year; QoL, quality of life; RCT, randomised controlled trial

The MEDMAN RCT by Bond et al (2007) performed an economic evaluation using cost-minimisation analysis. The RCT included 1,493 patients with coronary heart disease. Patients were randomised (2:1) to intervention (receiving the MEDMAN service, n=980) or control (receiving usual care, n=513). No statistically significant differences between intervention and control groups were shown at 12-month follow-up for any of the primary outcome measures such as prescription appropriateness, future risk of cardiovascular death, adherence, or quality of life.

The study collected information on National Health Service (NHS) and patient costs (based on 2015 UK prices). All relevant P-values were from a multiple regression analysis to examine differences in costs at follow-up between the intervention and the control group, adjusted for differences in costs at baseline and clustering within pharmacy, GP practice and area (where necessary). The analysis found that the difference at follow-up in total NHS-related cost (accounting for the cost of the pharmacy intervention) was statistically significant due to the cost of providing pharmacist training (Table 6.3). The pharmacist-led service was found to be more expensive than standard care.

Table 6.3: Summary of costs per patient-cost-minimisation analysis

Unit	Intervention (£) Baseline median (IQR)	Intervention (£) Follow-up median (IQR)	Control (£) Baseline median (IQR)	Control (£) Follow-up median (IQR)	P value
Cost of CHD medicines	347.7 (207.8–526.1))	422.6 (257.0–619.4)	325.7 (183.1–514.0)	411.6 (249.4–600.8)	0.92
Cost of non-CHD medicines	244.2 (71.2–589.3)	200.6 (50.8–401.0)	222.7 (75.4–446.6)	191.1 (54.0–416.9)	0.79
Cost of all medicines	597.5 (344.1–963.7)	605.2 (387.0–971.1)	513.6 (312.1–848.5)	584.9 (402.2–971.3)	0.04
NHS costs (GP and hospital visits)	139.7 (70.1–321.5)	127.4 (61.6–290.7)	138.7 (71.9–315.3)	120.2 (54.5–300.5)	0.65
Total cost of usual treatment (medicines plus NHS visits)[a]	852.4 (480.6–1694.2)	838.7 (544.1–1369.6)	737.8 (446.1–1239.7)	835.2 (534.4–1396.3)	0.22
Cost of the intervention (pharmacist time and training)	0	90 (60–118)	0	0	-
Total NHS-related study cost (medicines plus NHS visits plus intervention costs)[a]	*852.4 (480.6–1694.2)*	*970.5 (667.0–1489.0)*	*737.8 (446.1–1239.7)*	*835.2 (534.4–1396.3)*	*<0.0001*

Source: Bond et al (2007), Table 5, p. 196
Abbreviations: CHD, coronary heart disease; GP, general practitioner; NHS, National Health Service
a Total costs will not be the sum of presented components as these are all median values

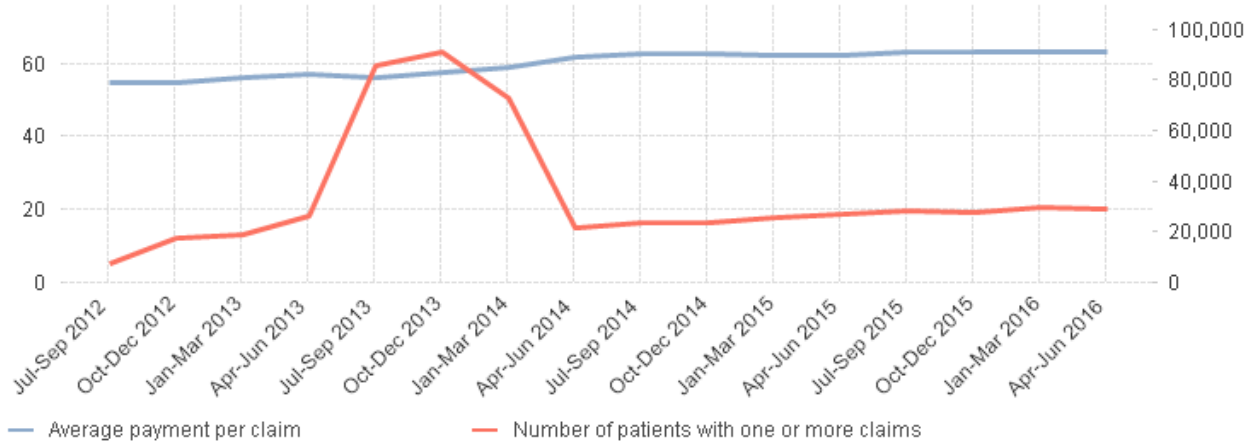
7
Utilisation Analysis

This Chapter examines the claims payment data held by the Department of Human Services and the Pharmacy Guild relating to 2011 to 2016. The data have been analysed primarily on inter-record and longitudinal relationships and also in the context of 'remoteness' inferred from the pharmacy postcode. The analysis seeks to assess whether the MedsChecks' pharmacies were implementing the two initiatives (i.e. MedsCheck and Diabetes MedsCheck) in line with guidance. Key metrics in the analysis are the amount of claims paid, the number of patient MedsCheck and Diabetes MedsCheck services provided, the interval time between dates of service for patients who received more than one service, the number of prescription medicines that the patient is taking, the number of chronic conditions that the patent has and summary information at patient level about the recommendations from their MedsChecks. MedsCheck and Diabetes MedsChecks are analysed separately.

7.1 CLAIMS MADE AND AMOUNT PER MEDSCHECK CLAIM

Figure 7.1 shows the average payment per claim (between July 2012 and June 2016 based upon the date of service) compared with the number of unique patients receiving MedsChecks over the same period. The average claim amount remained stable (between $55 and $63).

Figure 7.1: Movement in average payment per claim and patient volume July 2012 to June 2016



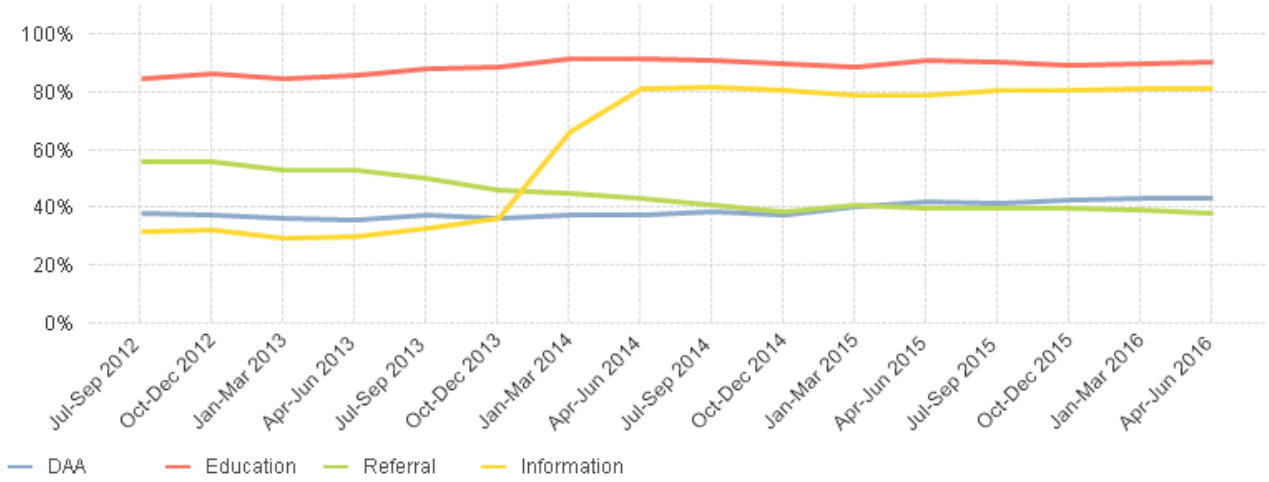
Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

There is a sharp but transient increase in the number of patients between Quarter 2, 2013 and Quarter 2, 2014, the number of unique patients increases from 26,135 in Quarter 1, 2013 to 85,598 unique patients (an increase of 228%) in the following quarter and are sustained at considerably higher levels until Quarter 2, 2014 when they return to near-pre-peak levels of 21,536 patients. The spike in activity reflects the scheme's rapid and unexpectedly high uptake and prompted the introduction of a MedsCheck cap in early 2014 (set at a combined total of 10 MedsCheck or Diabetes MedsCheck services per month, per pharmacy). If we ignore the unexpected uplift and the subsequent corrective action, MedsChecks have grown more modestly (but still significantly), from 17,480 patients in Quarter 4 2012 to 29,330 patients in Quarter 2 2016, an increase of 11,850 patients or 67.8%.

7.2 RECOMMENDATIONS MADE FROM MEDSCHECKS

Figure 7.2 examines the recommendations from patient's MedsChecks that are captured along with the claims data. The relative use of the different types of recommendations is quite consistent across all years with the exception of growth in recommendation of 'Information'. Between Quarter 3, 2013 and Quarter 2, 2014, the percentage of recommendations citing 'Information' increased from 36% to 81%. Note that more than one recommendation can be provided per MedsCheck.

Figure 7.2: Recommendations July 2012 to June 2016



Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

7.3 NUMBER OF MEDSCHECKS CLAIMS BY PATIENT AGE

Figure 7.3 profiles patients according to how many MedsCheck services they have received over eight continuous quarters before the claims cap (i.e. a date of service between July 2012 and June 2014). Note that patients who have had a MedsCheck service in both the pre- and post-cap periods are counted post-cap, and that patients have been classified according to their age at the time of receiving their most recent MedsCheck.

Figure 7.3: Patient age by number of MedsChecks between July 2012 and June 2014

Patient Age	Number of MedsCheck (regular) services performed										Age dist
	1	2	3	4	5	6	7	8	9	10 or more	
0-4	3335	176	2	-	-	-	-	-	-	-	1%
5-9	2272	134	6	-	-	-	-	-	-	-	1%
10-14	2379	111	6	-	-	-	1	-	-	1	1%
15-19	5606	271	14	1	-	-	-	-	-	-	2%
20-24	8783	451	18	-	-	-	-	-	-	-	3%
25-29	10414	530	20	-	-	-	-	-	-	-	3%
30-34	11580	605	31	3	-	-	-	-	-	-	4%
35-39	11562	580	34	5	-	-	-	2	-	-	4%
40-44	14248	776	44	5	-	1	-	-	-	-	5%
45-49	16521	947	50	5	1	1	-	1	-	-	6%
50-54	22006	1381	93	8	2	1	-	-	-	-	7%
55-59	26185	1744	137	13	1	-	4	1	-	-	9%
60-64	31054	2188	154	15	1	1	3	-	-	-	11%
65-69	32386	2554	227	14	3	1	-	-	1	-	11%
70-74	28827	2398	216	30	5	2	1	-	-	-	10%
75-79	26744	2396	213	24	4	2	1	-	-	1	9%
80-84	21781	1958	155	19	5	3	1	1	-	-	8%
85-89	13036	1185	102	11	-	-	1	1	1	-	5%
90-94	4020	351	24	2	-	-	-	-	-	-	1%
95-99	530	35	7	1	-	-	-	-	-	-	0%
100-104	126	3	-	-	-	-	-	-	-	-	0%
105-109	21	-	-	-	-	-	-	-	-	-	0%
110-114	11	-	-	-	-	-	-	-	-	-	0%
% Distribution	93%	7%	0%	0%	0%	0%	0%	0%	0%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

The data show that an overwhelming majority (93%) of patients received just a single MedsCheck service in the two-year period, only 1% of patients received three or more MedsCheck services. Interestingly, two patients received ten or more services in the 24 month period (i.e. on average, at least one every two months). However, only 7% of patients received repeat MedsChecks, where the between MedsCheck interval becomes relevant when considering adherence to guidelines (see Figure 7.5). Figure 7.3 (far right column) also shows that 44% of the patients receiving a MedsCheck were aged 65 years or more, and that there was at least one patient in every age cohort from 0-4 years through to 100-114 years who received a MedsCheck. The total number of unique patients counted in the pre-cap period was 316,000.

Figure 7.4 profiles patients according to how many MedsCheck services they have received over eight continuous quarters including the period with the introduction of the claims cap (i.e. a date of service between July 2014 and June 2016). Note again that patients who have had a MedsCheck service in both the pre- and post-cap periods are counted post-cap, and that patients have been classified according to their age at the time of receiving their most recent MedsCheck. Figure 7.4 (far right column) shows that post-cap 54% of the patients receiving an MedsCheck were aged 65 years or more (a 10% increase on pre-cap) indicating a significant shift towards an older patient profile in the post-cap period. There was at least one patient in every age cohort from 0-4 years through to 100-114 years who received a MedsCheck (same as pre-cap). The total number of unique patients counted in the pre-cap period was 211,000. This equates to a 105,000 patient reduction or 33% (compared to pre-cap). This overall reduction in patients underscores the significant effect on volumes that introduction of the cap has had.

Figure 7.4: MedsCheck interval by number of MedsChecks between July 2014 and June 2016

Patient Age	Number of MedsCheck (regular) services performed										Age dist
	1	2	3	4	5	6	7	8	9	10 or more	
0-4	998	9	-	-	-	-	-	-	-	-	0%
5-9	773	14	2	-	-	-	-	-	-	-	0%
10-14	855	6	-	-	-	-	-	-	-	-	0%
15-19	3085	43	1	-	-	-	-	-	-	-	1%
20-24	5079	106	6	-	1	-	-	-	-	-	2%
25-29	5737	151	10	-	-	-	-	-	-	-	3%
30-34	6180	181	9	2	-	-	-	-	-	-	3%
35-39	6249	249	22	-	-	-	-	-	-	-	3%
40-44	7658	369	47	-	-	-	-	-	-	-	4%
45-49	9244	577	66	7	-	-	-	-	-	-	5%
50-54	12080	939	94	15	-	-	-	-	-	-	6%
55-59	14581	1373	164	23	4	-	-	-	-	-	8%
60-64	17420	1926	257	25	1	-	-	-	-	-	9%
65-69	21852	2921	359	35	3	2	-	-	-	-	12%
70-74	21187	3291	433	37	4	1	-	-	-	-	12%
75-79	20608	3560	427	38	5	-	-	-	-	-	12%
80-84	16954	3023	383	41	5	-	-	-	-	-	10%
85-89	11236	2012	253	35	3	1	-	-	-	-	6%
90-94	3876	728	101	8	1	1	-	-	-	-	2%
95-99	599	102	15	2	-	-	-	-	-	-	0%
100-104	157	1	-	-	-	-	-	-	-	-	0%
105-109	17	-	-	-	-	-	-	-	-	-	0%
110-114	8	-	-	-	-	-	-	-	-	-	0%
115-119	2	-	-	-	-	-	-	-	-	-	0%
% Distribution	88%	10%	1%	0%	0%	0%	0%	0%	0%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.4 shows that, after the payment policy change, the proportion of patients receiving a single MedsCheck service declined by 5% to 88%, with 2% of patients receiving three or more MedsCheck services (compared to less than 1% pre-cap). Also, the maximum number of MedsChecks received was six, compared to ten or more pre-cap (despite a notably longer period of 48 months compared to 24 months pre-cap). Corresponding to the decrease on once only MedsChecks, the proportion of patients that received repeat MedsChecks increased from 7% to 12%. These data suggest that the introduction of the service cap policy simultaneously placed considerable restrictions on patient volumes and ostensibly shifted pharmacy focus towards those patients deemed more likely to require follow up MedsChecks.

7.4 ADHERENCE TO MEDSCHECK PROGRAM CLAIMING GUIDELINES

Figure 7.5 profiles patients that have received two or more MedsCheck services over eight continuous quarters in the pre-claim-cap period (i.e. with a date of service between July 2012 and June 2014). The patients have been classified according to their age at the time of receiving their most recent MedsCheck. The data show that 54% of patients receiving more than a single service, are aged 65 years or more, compared to 44% of patients receiving one or more MedsChecks (i.e. patients receiving repeat MedsChecks are on average older than patients receiving any MedsCheck).

Figure 7.5 also clearly shows that 80% of patients received their follow-up MedsChecks within six months of their previous MedsCheck, despite frequency of service guidelines mandating that MedsCheck services should be no more frequent than every 12 months (see Section 2.4). In the period, to June, 2014, only 14% of patients who had two or more MedsChecks had an interval of 12 months or greater.

Figure 7.5: Patient age by MedsCheck interval between July 2012 and June 2014

Patient Age	MedsCheck (regular) interval				Age dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0-4	191	-	2	-	1%
5-9	134	1	1	-	1%
10-14	125	2	1	-	1%
15-19	293	3	2	-	1%
20-24	464	11	4	-	2%
25-29	531	15	9	1	2%
30-34	604	25	15	-	3%
35-39	594	28	25	-	3%
40-44	764	29	61	2	4%
45-49	908	50	84	3	4%
50-54	1341	79	116	3	6%
55-59	1708	94	196	8	8%
60-64	2096	141	280	12	11%
65-69	2335	159	479	14	13%
70-74	2116	178	555	14	12%
75-79	2068	179	588	25	12%
80-84	1594	152	521	18	10%
85-89	959	77	339	8	6%
90-94	257	24	110	5	2%
95-99	36	4	9	-	0%
100-104	4	-	1	-	0%
105-109	2	-	-	-	0%
% Distribution	80%	5%	14%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.6 profiles patients that have received two or more MedsCheck services over eight continuous quarters in the post-cap period (i.e. with a date of service between January 2014 and June 2016). As before, the patients have been classified according to their age at the time of receiving their most recent MedsCheck. The data show that 75% of patients receiving more than a single service, are aged 65 years or more, compared to 54% of patients receiving one or more MedsChecks (i.e. patients receiving repeat MedsChecks are on average markedly older than patients receiving any MedsCheck).

Figure 7.6: Patient age by MedsCheck interval between July 2014 and June 2016

Patient Age	MedsCheck (regular) interval				Age dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0-4	3	-	3	1	0%
5-9	-	-	4	-	0%
10-14	1	-	2	1	0%
15-19	6	-	12	3	0%
20-24	11	1	18	4	0%
25-29	12	-	37	5	1%
30-34	13	-	41	2	1%
35-39	12	1	68	4	1%
40-44	13	2	92	7	2%
45-49	15	1	158	14	3%
50-54	33	5	223	28	4%
55-59	35	5	348	36	6%
60-64	60	5	461	52	8%
65-69	91	10	750	71	13%
70-74	119	11	904	84	15%
75-79	129	13	1034	95	17%
80-84	111	13	894	94	15%
85-89	55	5	622	47	10%
90-94	15	4	229	21	4%
95-99	1	-	27	2	0%
100-104	1	-	4	-	0%
% Distribution	10%	1%	81%	8%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.6 shows a dramatically different picture with regard to the MedsCheck service intervals in the post-cap period. Only 10% of patients received their follow-up MedsChecks within six months of their previous MedsCheck (a decrease of 70% by comparison to the pre-cap period). And, again in stark contrast to the pre-cap period, patients who had two or more MedsChecks had an interval of 12 months or greater. This equates to 67% more patients than pre-cap, indicating significantly better adherence to frequency guidelines.

7.5 MEDSCHECK CLAIMING BY CHRONIC CONDITIONS

Figure 7.7 profiles patients according to how many chronic conditions the patient has and the frequency of the MedsCheck services they have received over eight continuous quarters pre-cap (i.e. a date of service between July 2012 and June 2014). The majority (80%) of patients received their follow-up MedsChecks within six months of their previous MedsCheck (already discussed in Section 7.4). The data show that 51% of patients who had two or more MedsChecks have three or more chronic conditions.

Figure 7.7: Number of chronic conditions by MedsCheck intervals between July 2012 and June 2014

Chronic conditions	MedsCheck (regular) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	2292	70	144	1	10%
1	4556	145	191	7	20%
2	3603	208	609	21	15%
3	3749	304	934	30	21%
4	2671	261	787	30	16%
5	1407	141	397	13	8%
6	632	77	200	5	4%
7	243	28	74	5	1%
8	96	11	33	-	1%
9	45	8	15	-	0%
10 or more	43	2	14	1	0%
% Distribution	80%	5%	14%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.8 profiles patients according to how many chronic conditions the patient has and the frequency of the MedsCheck services they have received over eight continuous quarters post-cap (i.e. a date of service between July 2014 and June 2016). The majority (81%) of patients received their follow-up MedsChecks within 12-18 months of their previous MedsCheck (already discussed in Section 7.4). The data show that 76% of patients who had two or more MedsChecks have three or more chronic conditions, an increase of 25% on the pre-cap period. This aligns better with the intuitive notion that patients with higher complexity resulting from an increased number of chronic conditions are more likely to be approached by the pharmacists for a MedsCheck review.

Figure 7.8: Number of chronic conditions by MedsCheck intervals between July 2014 and June 2016

Chronic conditions	MedsCheck (regular) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	37	-	106	27	2%
1	96	8	326	48	7%
2	110	15	866	114	15%
3	141	19	1418	131	23%
4	156	13	1370	113	23%
5	95	15	968	62	16%
6	60	5	490	46	8%
7	23	-	198	15	3%
8	10	-	96	11	2%
9	5	-	53	2	1%
10 or more	5	-	40	2	1%
% Distribution	10%	1%	81%	8%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

7.6 ADHERENCE TO MEDSCHECK PROGRAM CLAIMING GUIDELINES BY NUMBER OF PRESCRIPTION MEDICINES

One of the patient eligibility criteria for MedsCheck is that they must be taking five or more prescription medicines. Figure 7.9 profiles patients according to how many prescription medicines the patient is taking and the frequency of the MedsCheck services they have received over eight continuous quarters pre-cap (i.e. a date of service between July 2012 and June 2014). The majority (80%) of patients received their follow-up MedsChecks within six months of their previous MedsCheck (already discussed in Section 7.4). The data show that 75% of patients who had two or more MedsChecks are also taking five or more prescription medicines.

Figure 7.9: Number of prescription medicines by MedsCheck intervals between July 2012 and June 2014

Prescription medicines	MedsCheck (regular) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	69	1	2	-	0%
1	1876	51	4	-	8%
2	1517	43	6	-	6%
3	1214	43	11	1	5%
4	1079	40	28	-	5%
5	2603	168	429	13	13%
6	2203	167	455	12	12%
7	1883	151	448	14	10%
8	1519	124	431	17	9%
9	1238	98	343	9	7%
10	946	76	279	15	5%
11	695	52	211	9	4%
12	597	54	184	6	3%
13	426	46	139	5	3%
14	316	28	109	3	2%
15 or more	1210	112	319	9	7%
% Distribution	80%	5%	14%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.10 profiles patients according to how many prescription medicines the patient is taking and the frequency of the MedsCheck services they have received over eight continuous quarters post-cap (i.e. a date of service between July 2011 and Dec 2013). The majority (81%) of patients received their follow-up MedsChecks within 12-18 months of their previous MedsCheck (already discussed in Section 7.4). The data show that 95% of patients who had two or more MedsChecks are also taking five or more prescription medicines, an increase of 20% on the pre-cap period. This is consistent with the program claims guidelines.

Figure 7.10: Number of prescription medicines by MedsCheck intervals between July 2014 and June 2016

Prescription medicines	MedsCheck (regular) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	-	-	7	-	0%
1	48	2	24	7	1%
2	29	-	31	5	1%
3	27	1	45	9	1%
4	19	2	70	11	1%
5	109	17	942	58	15%
6	97	10	953	89	16%
7	104	3	820	85	14%
8	75	11	703	64	12%
9	59	2	537	44	9%
10	51	9	403	57	7%
11	26	6	322	38	5%
12	25	-	271	21	4%
13	18	1	171	21	3%
14	8	3	142	14	2%
15 or more	44	8	490	48	8%
% Distribution	10%	1%	81%	8%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

7.7 MEDSCHECK CLAIMS BY PHARMACY PARTICIPATION

Table 7.1 summarises the key utilisation metrics with regard to patient, provider and MedsCheck service volumes and payments per claim for each half financial year.

Table 7.1: Key utilisation metrics July 2011 to June 2016 - MedsCheck

Year	Half	Average payment per claim	Patient volumes	Claims volume	Provider volume
2012-2013	H1	$55	24,867	27,722	1,243
	H2	$57	44,919	47,890	1,923
	Total	**$56**	**69,594**	**75,609**	**2,186**
2013-2014	H1	$57	175,667	185,185	2,462
	H2	$60	93,336	95,401	3,201
	Total	**$58**	**267,689**	**280,568**	**4,404**
2014-2015	H1	$62	47,677	47,736	2,162
	H2	$62	52,723	52,745	2,319
	Total	**$62**	**100,360**	**100,481**	**2,722**
2015-2016	H1	$63	55,653	55,765	2,411
	H2	$63	59,090	59,885	2,551
	Total	**$63**	**114,723**	**115,649**	**2,961**

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.
Abbreviations: BE, Business Entity (includes sole traders)
Note 1: Provider identifiers in years 2011/12, 2012/13 and 2013/14 were supplied in encrypted form. They have been categorised in cases where the encrypted identifier was also used in the 2014/15 or in 2015/16 datasets and in cases where the S90 Pharmacy identifier was

Table 7.1 shows that in the first half of 2012-2013, there were 1,243 participating pharmacies, participation had more than doubled by the second half of 2013-2014, peaking at 3,201 unique pharmacies, an increase of 1,958 pharmacies or 158%. In the second half of 2015-2016 (post-cap), participating pharmacies reduced to 2,551 pharmacies, a reduction of 650 pharmacies (20%). The claims cap is clearly a driver of patient volumes but it is also likely that the claims cap was the primary driver for reduced pharmacies, affecting the economics of participation and signalling to pharmacies greater stringency in claims policies, claims processing rigour and guideline enforcement.

7.8 MEDSCHECK CLAIMS BY GEOGRAPHIC LOCATION

Table 7.2 summarises the patient, provider and MedsCheck service volumes, sub-divided by the ABS remoteness area of the pharmacy in which the MedsCheck services were provided.

Table 7.2: Key utilisation metrics July 2011 to June 2016 - MedsCheck

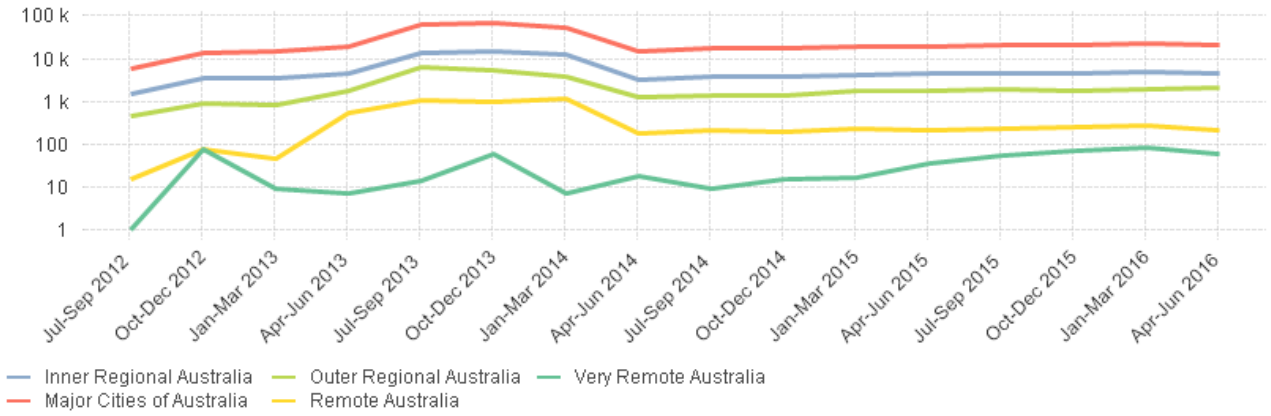
Period	ABS remoteness	Patient volume	Service volume	Provider volume
2012-2013	Major Cities of Australia	52,258	56,517	1,521
	Inner Regional Australia	12,623	14,022	438
	Outer Regional Australia	3,977	4,253	187
	Remote Australia	664	701	24
	Very Remote Australia	93	106	9
	Location unknown	10	10	7
	Total	**69,594**	**75,609**	**2,186**
2013-2014	Major Cities of Australia	201,038	210,455	2,956
	Inner Regional Australia	42,871	45,211	802
	Outer Regional Australia	16,525	17,238	356
	Remote Australia	3,363	3,504	43
	Very Remote Australia	100	120	13
	Location unknown	4,037	4,040	234
	Total	**267,689**	**280,568**	**4,404**

Period	ABS remoteness	Patient volume	Service volume	Provider volume
2014-2015	Major Cities of Australia	71,163	71,223	1,753
	Inner Regional Australia	16,102	16,132	482
	Outer Regional Australia	6,351	6,360	227
	Remote Australia	852	852	20
	Very Remote Australia	79	79	13
	Location unknown	5,829	5,835	227
	Total	**100,360**	**100,481**	**2,722**
2015-2016	Major Cities of Australia	83,210	83,824	1,963
	Inner Regional Australia	18,222	18,405	540
	Outer Regional Australia	7,667	7,740	264
	Remote Australia	972	973	32
	Very Remote Australia	267	267	12
	Location unknown	4,395	4,440	150
	Total	**114,723**	**115,649**	**2,961**

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16. In in conjunction with ABS postcode to remoteness.xls available from
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.006July%202011?OpenDocument (accessed 5th October, 2016)
Abbreviations: BE, Business Entity (includes sole traders). ABS, Australian Bureau of Statistics
Note 1: Provider identifiers in years 2011/12, 2012/13 and 2013/14 were supplied in encrypted form. They have been categorised in cases where the encrypted identifier was also used in the 2014/15 or in 2015/16 datasets and in cases where the S90 Pharmacy identifier was supplied.
Please note that 'Location Unknown' arises due to missing or unrecognised patient postcodes in the DHS and Pharmacy Guild datasets.

Table 7.2 and Figure 7.11 illustrate the relative growth in the MedsCheck scheme between July 2012 and June 2016. All locations experienced higher than expected uptake during the period of uncapped operation, which was largely corrected for via the introduction of capped claim volumes. Again, the spike in activity reflects the scheme's rapid and unexpectedly high uptake that prompted the introduction of a MedsCheck cap in early 2014. In absolute terms, 'Major Cities' and 'Inner Regional' locations (not surprisingly) delivered the strongest gains in numbers of patients and the volume of services provided between July 2012 and June 2016 (adding 30,952 patients and 5,599 patients respectively). In relative terms 'Outer Regional', 'Remote' and 'Very Remote' locations have grown the most, delivering (respectively) 82%, 38% and 251% more MedsCheck services over the period.

Figure 7.11: MedsCheck changes in patient volume in ABS remoteness categories between July 2012 and June 2016



Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16. In in conjunction with ABS postcode to remoteness.xls available from
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.006July%202011?OpenDocument (accessed 5th October, 2016)
Abbreviations: BE, Business Entity (includes sole traders). ABS, Australian Bureau of Statistics
Note 1: Provider identifiers in years 2011/12, 2012/13 and 2013/14 were supplied in encrypted form. They have been categorised in cases where the encrypted identifier was also used in the 2014/15 or in 2015/16 datasets and in cases where the S90 Pharmacy identifier was supplied.
Note 2: logarithmic scale for comparison

7.9 SUMMARY OF MEDSCHECK UTILSATION ANALYSIS FINDINGS

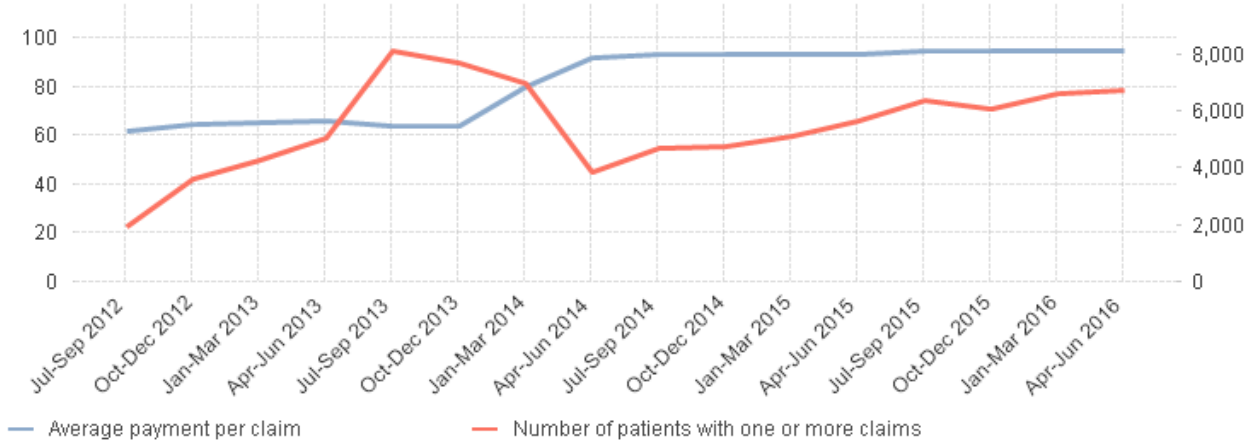
In summary, we found that claims payment policy changes (specifically the introduction of a claims cap of 10 MedsChecks per provider, per month) effectively checked burgeoning scheme uptake and promoted alignment with expectations for both frequency of service and patient profile in terms of age, the number of chronic conditions and the number of prescription medicines the patient is taking.

It is likely that the introduction of the claims cap was the primary driver for altering behaviour of the scheme participants, affecting the economics of participation and signalling to pharmacies greater stringency in claims policies, claims processing rigour and guideline enforcement.

7.10 DIABETES MEDSCHECK CLAIMS MADE AND AMOUNT PER CLAIM

Figure 7.12 shows the average payment per claim (between July 2012 and June 2016 based upon the date of service) compared with the number of unique patients receiving Diabetes MedsChecks over the same period. The average claim amount increased from $62 to $95 between January 2014 and June 2014.

Figure 7.12: Movement in average payment per claim and patient volume July 2012 to Jun 2016 – Diabetes MedsCheck



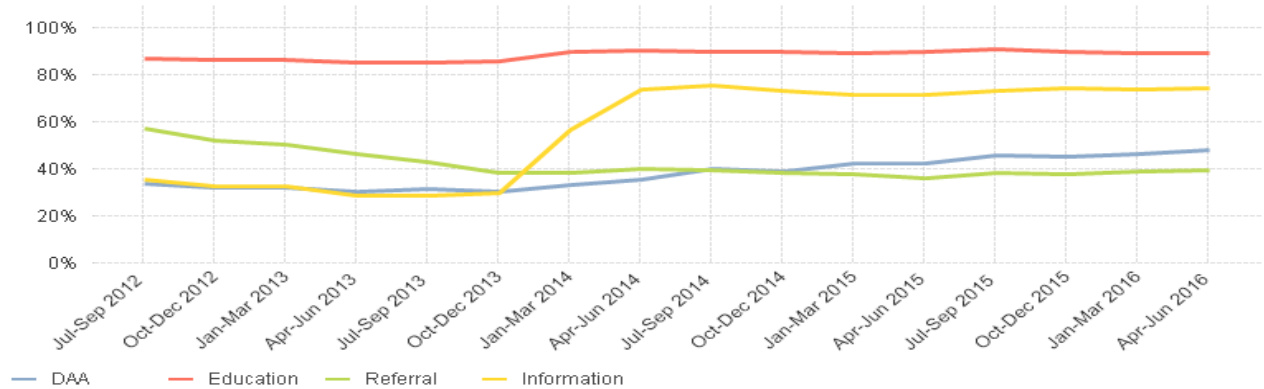
Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

There is a sharp but transient increase in the number of patients between Quarter 2, 2013 and Quarter 2, 2014, the number of patients increases from 5,024 in Quarter 1, 2013 to 8,104 (61%) in the following quarter and are sustained at considerably higher levels until Quarter 2, 2014 when they return to near-pre-peak levels of 3,526 patients. The spike in activity reflects the scheme's rapid and unexpectedly high uptake and prompted the introduction of a Diabetes MedsChecks cap in in early 2014 (set at a combined total of 10 MedsCheck or Diabetes MedsCheck services per month, per pharmacy). If we ignore the unexpected uplift and the subsequent corrective action, Diabetes MedsChecks have grown from 3,635 patients in Quarter 4 2012 to 6,452 patients in Quarter 2 2016, an increase of 2,817 patients or 77.5%.

7.11 RECOMMENDATIONS MADE FROM DIABETES MEDSCHECKS

Figure 7.13 examines the recommendations from patient's Diabetes MedsChecks that are captured along with the claims data. The relative use of the different types of recommendations is quite consistent across all years with the exception of growth in recommendation of 'Information'. Between Quarter 3, 2013 and Quarter 2, 2014, the percentage of recommendations citing 'Information' increased from 29% to 74%. Note that more than one referral reason can be provided per Diabetes MedsCheck.

Figure 7.13: Diabetes MedsCheck recommendations July 2012 to Jun 2016



Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

7.12 NUMBER OF DIABETES MEDSCHECKS CLAIMS BY PATIENT AGE

Figure 7.14 profiles patients according to how many Diabetes MedsCheck services they have received over 8 continuous quarters pre-cap (i.e. a date of service between July 2012 and June 2014). Note that patients who have had a Diabetes MedsCheck service in both the pre- and post-cap periods are counted post-cap, and that patients have been classified according to their age at the time of receiving their most recent Diabetes MedsCheck.

Figure 7.14: Patient age by number of Diabetes MedsChecks between July 2012 and June 2014

Patient Age	Number of MedsCheck (diabetes) services performed										Age dist
	1	2	3	4	5	6	7	8	9	10 or more	
0-4	32	-	-	-	-	-	-	-	-	-	0%
5-9	9	1	-	-	-	-	-	-	-	-	0%
10-14	32	3	1	-	-	-	-	-	-	1	0%
15-19	53	4	-	-	-	-	-	-	-	-	0%
20-24	120	6	1	-	-	-	-	-	-	-	0%
25-29	251	12	-	-	-	-	-	-	-	-	1%
30-34	375	27	2	-	-	-	-	-	-	-	1%
35-39	546	39	3	-	-	-	-	-	-	-	2%
40-44	985	73	6	1	-	-	-	-	-	-	3%
45-49	1569	135	6	1	1	-	-	-	-	-	5%
50-54	2516	224	21	-	-	-	-	-	-	-	8%
55-59	3612	349	34	-	-	-	-	-	-	-	11%
60-64	4592	445	39	2	-	-	-	-	-	-	14%
65-69	5427	582	54	3	-	-	-	-	1	-	17%
70-74	4666	473	45	5	1	-	-	-	-	-	14%
75-79	3827	456	45	4	-	-	-	-	-	-	12%
80-84	2525	310	26	1	-	-	-	1	-	-	8%
85-89	1059	135	7	1	-	-	-	-	-	-	3%
90-94	274	24	4	-	-	-	-	-	-	-	1%
95-99	33	4	-	-	-	-	-	-	-	-	0%
100-104	4	-	-	-	-	-	-	-	-	-	0%
105-109	1	-	-	-	-	-	-	-	-	-	0%
% Distribution	90%	9%	1%	0%	0%	0%	0%	0%	0%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

The data show that an overwhelming majority (90%) of patients received just a single Diabetes MedsCheck service in the two-year period, only 1% of patients received three or more Diabetes MedsCheck services. However, only 10% of patients received repeat Diabetes MedsChecks, where the between Diabetes MedsCheck interval becomes relevant is when considering adherence to guidelines (see Figure 7.16). Figure 7.14 (far right column) also shows that 55% of the patients receiving a Diabetes MedsCheck were aged 65 years or more, and that there was at least one patient in every age cohort from 0-4 years through to 105-109 years who received a Diabetes MedsCheck.

Figure 7.15 profiles patients according to how many Diabetes MedsCheck services they have received over eight continuous quarters after the introduction of the claims cap (i.e. a date of service between July 2014 and June 2016). Note again that patients who have had a Diabetes MedsCheck service in both the pre- and post-cap periods are counted post-cap, and that patients have been classified according to their age at the time of receiving their most recent Diabetes MedsCheck. Figure 7.15 (far right column) shows that post-cap 72% of the patients receiving a Diabetes MedsCheck were aged 65 years or more (a 17% increase on pre-cap) indicating a significant shift towards an older patient profile in the post-cap period. There was at least one patient in every age cohort from 0-4 years through to 105-109 years who received a Diabetes MedsCheck (same as pre-cap).

Figure 7.15: Patient age by number of Diabetes MedsCheck between July 2014 and June 2016

Patient Age	Number of MedsCheck (diabetes) services performed										Age dist
	1	2	3	4	5	6	7	8	9	10 or more	
0-4	56	-	-	-	-	-	-	-	-	-	0%
5-9	16	2	-	-	-	-	-	-	-	-	0%
10-14	36	1	-	-	-	-	-	-	-	-	0%
15-19	68	6	-	-	-	-	-	-	-	-	0%
20-24	125	10	1	-	-	-	-	-	-	-	0%
25-29	253	15	2	-	-	-	-	-	-	-	1%
30-34	409	23	3	-	-	-	-	-	-	-	1%
35-39	582	50	6	-	-	-	-	-	-	-	1%
40-44	1078	101	12	-	-	-	-	-	-	-	3%
45-49	1675	222	30	4	-	-	-	-	-	-	4%
50-54	2559	359	49	4	-	-	-	-	-	-	7%
55-59	3654	539	81	18	2	-	-	-	-	-	10%
60-64	4730	865	129	12	-	-	-	-	-	-	13%
65-69	6023	1272	192	26	3	-	-	-	-	-	17%
70-74	5430	1383	190	23	3	-	-	-	-	-	16%
75-79	4571	1208	171	22	2	-	-	-	-	-	13%
80-84	3070	844	134	24	1	-	-	-	-	-	9%
85-89	1457	417	70	7	1	-	-	-	-	-	4%
90-94	393	118	18	1	-	1	-	-	-	-	1%
95-99	45	16	4	-	-	-	-	-	-	-	0%
100-104	11	-	-	-	-	-	-	-	-	-	0%
% Distribution	81%	17%	2%	0%	0%	0%	0%	0%	0%	0%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.15 shows that, after the payment policy change, the proportion of patients receiving a single Diabetes MedsCheck service declined by 9% to 81%, with 2% of patients receiving three or more Diabetes MedsCheck services (compared to 1% pre-cap). Also, the maximum number of Diabetes MedsChecks received was six, compared to ten or more pre-cap (despite a notably longer period of 48 months compared to 24 months pre-cap). Corresponding to the decrease on once only Diabetes MedsChecks, the proportion of patients that received repeat Diabetes MedsChecks increased from 10% to 19%. These data suggest that the introduction of the claims cap simultaneously placed considerable restrictions on patient volumes and ostensibly shifted pharmacy focus towards those patients deemed more likely to require follow up Diabetes MedsChecks.

7.13 ADHERENCE TO DIABETES MEDSCHECK PROGRAM CLAIMING GUIDELINES

Figure 7.16 profiles patients that have received two or more Diabetes MedsCheck services over eight continuous quarters in the pre-claim-cap period (i.e. with a date of service between July 2012 and June 2014). The patients have been classified according to their age at the time of receiving their most recent Diabetes MedsCheck. The data show that 61% of patients receiving more than a single service, are aged 65 years or more, compared to 55% of patients receiving one or more Diabetes MedsChecks (i.e. patients receiving repeat Diabetes MedsChecks are on average older than patients receiving any Diabetes MedsCheck).

Figure 7.16 also shows that 60% of patients received their follow-up Diabetes MedsChecks within six months of their previous Diabetes MedsCheck, despite frequency of service guidelines mandating that Diabetes MedsCheck services should be no more frequent than every 12 months (see Section 2.4). In the period, to June, 2014, 40% of patients who had two or more Diabetes MedsChecks had an interval of 12 months or greater.

Figure 7.16: Patient age by Diabetes MedsCheck interval between July 2012 and June 2014

Patient Age	MedsCheck (diabetes) interval				Age dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0-4	1	-	-	-	0%
5-9	1	-	-	-	0%
10-14	2	1	1	-	0%
15-19	3	-	-	-	0%
20-24	3	1	1	-	0%
25-29	11	-	-	-	0%
30-34	22	3	2	1	1%
35-39	30	3	6	-	1%
40-44	51	5	15	-	2%
45-49	94	10	29	-	4%
50-54	175	16	48	2	7%
55-59	251	32	89	11	11%
60-64	310	32	133	3	13%
65-69	371	50	208	3	18%
70-74	303	42	195	9	15%
75-79	257	39	177	6	13%
80-84	174	20	138	2	9%
85-89	72	12	49	2	4%
90-94	13	2	9	-	1%
95-99	2	-	2	-	0%
% Distribution	60%	8%	31%	1%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.17 profiles patients that have received two or more Diabetes MedsCheck services over eight continuous quarters in the post-cap period (i.e. with a date of service between July 2014 and June 2016). As before, the patients have been classified according to their age at the time of receiving their most recent Diabetes MedsCheck. The data show that 72% of patients receiving more than a single service, are aged 65 years or more, compared to 60% of patients receiving one or more Diabetes MedsChecks (i.e. patients receiving repeat Diabetes MedsChecks are on average markedly older than patients receiving any Diabetes MedsCheck).

Figure 7.17: Patient age by Diabetes MedsCheck interval between July 2014 and June 2016

Patient Age	MedsCheck (diabetes) interval				Age dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0-4	-	-	1	-	0%
10-14	-	-	1	-	0%
15-19	1	-	1	-	0%
20-24	-	-	5	-	0%
25-29	-	-	3	-	0%
30-34	-	-	8	-	0%
35-39	-	-	17	2	1%
40-44	2	-	33	2	1%
45-49	7	-	76	5	3%
50-54	6	1	110	5	4%
55-59	9	1	150	14	6%
60-64	24	2	265	19	11%
65-69	32	4	385	35	17%
70-74	37	2	463	37	20%
75-79	40	5	370	32	16%
80-84	28	3	245	28	11%
85-89	9	2	125	11	5%
90-94	2	-	41	4	2%
95-99	1	-	3	2	0%
% Distribution	7%	1%	85%	7%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.17 shows a dramatically different picture with regard to the Diabetes MedsCheck service intervals in the post-cap period. Only 7% of patients received their follow-up Diabetes MedsChecks within six months of their previous Diabetes MedsCheck (a decrease of 53% by comparison to the pre-cap period). And, again in stark contrast to the pre-cap period, 85% of patients who had two or more Diabetes MedsChecks had an interval of 12 months or greater, this equates to 54% more patients than pre-cap, indicating significantly better adherence to frequency guidelines (see 2.4).

7.14 DIABETES MEDSCHECKS CLAIMING BY CHRONIC CONDITIONS

Figure 7.18 profiles patients according to how many chronic conditions the patient has and the frequency of the Diabetes MedsCheck services they have received over eight continuous quarters pre-cap (i.e. a date of service between July 2012 and June 2014). The majority (61%) of patients received their follow-up Diabetes MedsChecks within six months of their previous Diabetes MedsCheck (already discussed in 7.13). The data also show that 72% of patients who had two or more Diabetes MedsChecks have three or more chronic conditions.

Figure 7.18: Number of chronic conditions by Diabetes MedsCheck intervals between July 2012 and June 2014

Chronic conditions	MedsCheck (diabetes) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	158	5	21	-	5%
1	171	11	17	1	6%
2	420	40	155	5	17%
3	544	79	286	14	26%
4	435	63	274	9	22%
5	233	26	184	7	13%
6	103	22	102	3	6%
7	53	7	32	-	3%
8	28	6	18	-	1%
9	8	5	8	-	1%
10 or more	9	5	4	-	1%
% Distribution	61%	8%	31%	1%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.19 profiles patients according to how many chronic conditions the patient has and the frequency of the Diabetes MedsCheck services they have received over eight continuous quarters post-cap (i.e. a date of service between July 2014 and June 2016). The majority (85%) of patients received their follow-up Diabetes MedsChecks within 12-18 months of their previous Diabetes MedsCheck (already discussed in Section 7.13). The data also show that 85% of patients who had two or more Diabetes MedsChecks have three or more chronic conditions, an increase of 13% on the pre-cap period. This aligns better with the intuitive notion that patients with higher complexity resulting from an increased number of chronic conditions are more likely to receive a Diabetes MedsCheck review by the pharmacist.

Figure 7.19: Number of chronic conditions by Diabetes MedsCheck intervals between July 2014 and June 2016

Chronic conditions	MedsCheck (diabetes) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	1	-	26	-	1%
1	2	1	42	4	2%
2	29	2	283	24	12%
3	49	2	553	54	24%
4	46	3	567	46	24%
5	30	5	385	29	17%
6	23	4	242	21	11%
7	9	1	114	8	5%
8	5	1	42	7	2%
9	1	-	20	2	1%
10 or more	3	1	28	1	1%
% Distribution	7%	1%	85%	7%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

7.15 ADHERENCE TO DIABETES MEDSCHECKS PROGRAM CLAIMING GUIDELINES BY NUMBER OF PRESCRIPTION MEDICINES

One of the patient eligibility criteria for Diabetes MedsCheck is that they must be taking five or more prescription medicines. Figure 7.20 profiles patients according to how many prescription medicines the patient is taking and the frequency of the Diabetes MedsCheck services they have received over eight continuous quarters pre-cap (i.e. a date of service between July 2012 and June 2014). The majority (61%) of patients received their follow-up Diabetes MedsChecks within six months of their previous Diabetes MedsCheck (already discussed in Section 7.13). The data also show that 90% of patients who had two or more Diabetes MedsChecks are also taking five or more prescription medicines.

Figure 7.20: Number of prescription medicines by Diabetes MedsCheck intervals between July 2012 and June 2014

Prescription medicines	MedsCheck (diabetes) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	12	-	-	-	0%
1	46	1	1	-	1%
2	64	5	4	-	2%
3	76	11	9	-	3%
4	104	12	26	2	4%
5	291	35	132	6	13%
6	262	29	140	6	12%
7	253	40	139	8	12%
8	192	26	116	-	9%
9	181	18	129	-	9%
10	160	24	92	3	8%
11	117	19	68	2	6%
12	88	15	63	1	5%
13	72	6	46	2	4%
14	40	8	34	2	2%
15 or more	209	22	103	7	10%
% Distribution	61%	8%	31%	1%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.

Figure 7.21 profiles patients according to how many prescription medicines the patient is taking and the frequency of the Diabetes MedsCheck services they have received over eight continuous quarters post-cap (i.e. a date of service between July 2011 and Dec 2013). The majority (85%) of patients received their follow-up Diabetes MedsChecks within 12-18 months of their previous Diabetes MedsCheck (already discussed in Section 7.13). The data also show that 94% of patients who had two or more

Diabetes MedsChecks are also taking five or more prescription medicines, an increase of 4% on the pre-cap period.

Figure 7.21: Number of prescription medicines by Diabetes MedsCheck intervals between July 2014 and June 2016

Prescription medicines	MedsCheck (diabetes) interval				Dist
	0-6 Mths	6-12 Mths	12-18 Mths	18-24 Mths	
0	-	-	2	-	0%
1	2	-	8	1	0%
2	2	-	19	2	1%
3	1	-	48	1	2%
4	7	-	55	6	3%
5	21	2	290	16	12%
6	30	3	338	24	15%
7	24	1	297	29	13%
8	24	3	289	26	13%
9	17	4	229	23	10%
10	22	1	177	19	8%
11	18	4	139	7	6%
12	12	-	109	11	5%
13	5	-	68	9	3%
14	3	-	50	3	2%
15 or more	12	2	184	19	8%
% Distribution	7%	1%	85%	7%	

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16

7.16 DIABETES MEDSCHECK CLAIMS BY PHARMACY PARTICIPATION

Table 7.3 summarises the key utilisation metrics with regard to patient, provider and Diabetes MedsCheck service volumes and average payments per claim for each half financial year.

Table 7.3: Key utilisation metrics July 2011 to June 2016

Year	Half	Average payment per claim	Patient volumes	Claims volume	Provider volume
2012-2013	H1	$64	5,559	5,995	740
	H2	$66	9,297	9,715	1,041
	Total	**$65**	**14,816**	**15,710**	**1,314**
2013-2014	H1	$64	15,745	16,397	1,386
	H2	$84	10,686	10,796	1,662
	Total	**$72**	**26,316**	**27,189**	**2,555**
2014-2015	H1	$93	9,453	9,465	1,262
	H2	$93	10,803	10,806	1,369
	Total	**$93**	**20,250**	**20,271**	**1,743**
2015-2016	H1	$95	12,409	12,422	1,442
	H2	$95	13,318	13,462	1,533
	Total	**$95**	**25,722**	**25,884**	**1,946**

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16.
Abbreviations: BE, Business Entity (includes sole traders)
Note 1: Provider identifiers in years 2011/12, 2012/13 and 2013/14 were supplied in encrypted form. They have been categorised in cases where the encrypted identifier was also used in the 2014/15 or in 2015/16 datasets and in cases where the S90 Pharmacy identifier was supplied

In the first half of 2012-2013, there were 740 participating pharmacies. Participation increased rapidly and peaked in the second half of 2013-2014 at 1,662 unique pharmacies, an increase of 922 pharmacies or 125%. In the second half of 2015-2016 (post-cap), participating pharmacies reduced to 1,533 pharmacies, a reduction of 129 pharmacies (8%). The claims cap is clearly a driver of patient volumes but it is also likely that the claims cap was the primary driver for reduced pharmacy participation, with

the policy change affecting the economics of participation and signalling to pharmacies greater stringency in claims policies, claims processing rigour and guideline enforcement.

7.17 DIABETES MEDSCHECK CLAIMS BY GEOGRAPHIC LOCATION

Table 7.4 summarises the key utilisation metrics with regard to patient, provider and Diabetes MedsCheck service volumes.

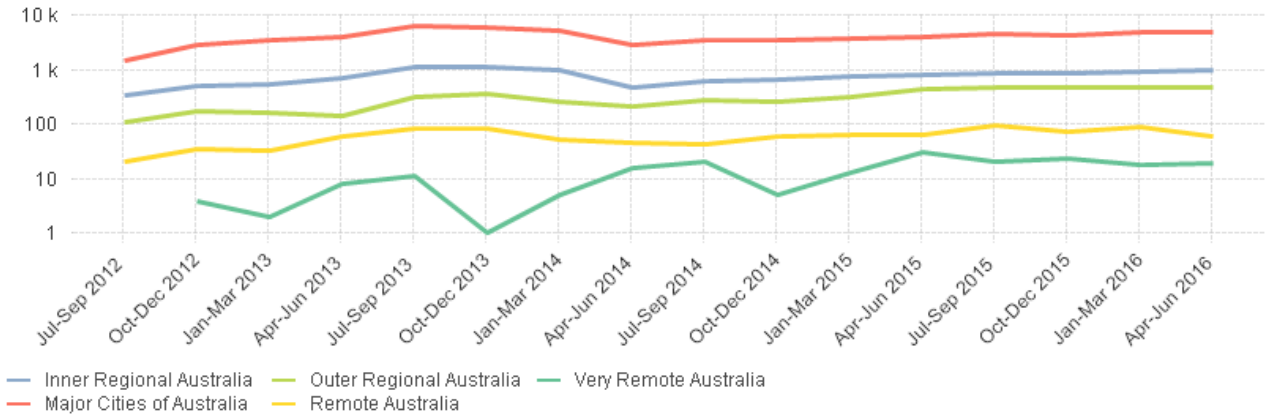
Table 7.4: Key utilisation metrics by ABS remoteness - July 2011 to June 2016

Period	ABS remoteness	Patient volume	Service volume	Provider volume
2012-2013	Major Cities of Australia	12,017	12,734	922
	Inner Regional Australia	2,055	2,197	259
	Outer Regional Australia	584	609	110
	Remote Australia	146	155	18
	Very Remote Australia	14	14	4
	Location unknown	1	1	1
	Total	**14,816**	**15,710**	**1,314**
2013-2014	Major Cities of Australia	20,541	21,215	1,745
	Inner Regional Australia	3,754	3,899	446
	Outer Regional Australia	1,145	1,175	212
	Remote Australia	262	266	23
	Very Remote Australia	33	39	8
	Location unknown	595	595	121
	Total	**26,316**	**27,189**	**2,555**
2014-2015	Major Cities of Australia	14,508	14,519	1,112
	Inner Regional Australia	2,841	2,843	300
	Outer Regional Australia	1,289	1,291	162
	Remote Australia	230	230	14
	Very Remote Australia	69	69	10
	Location unknown	1,319	1,319	145
	Total	**20,250**	**20,271**	**1,743**
2015-2016	Major Cities of Australia	18,754	18,840	1,301
	Inner Regional Australia	3,665	3,703	332
	Outer Regional Australia	1,881	1,900	186
	Remote Australia	312	313	23
	Very Remote Australia	80	80	9
	Location unknown	1,035	1,048	95
	Total	**25,722**	**25,884**	**1,946**

Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16. In in conjunction with ABS postcode to remoteness.xls available from http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.006July%202011?OpenDocument (accessed 5th October, 2016)
Abbreviations: BE, Business Entity (includes sole traders). ABS, Australian Bureau of Statistics
Note 1: Provider identifiers in years 2011/12, 2012/13 and 2013/14 were supplied in encrypted form. They have been categorised in cases where the encrypted identifier was also used in the 2014/15 or in 2015/16 datasets and in cases where the S90 Pharmacy identifier was supplied.
Please note that 'Location Unknown' arises due to missing or unrecognised patient postcodes in the DHS and Pharmacy Guild datasets.

Table 7.4 and Figure 7.22 illustrate the relative growth in the Diabetes MedsCheck scheme between July 2012 and June 2016. All locations experienced higher than expected uptake during the period of uncapped operation, which was largely corrected for via the introduction of capped claim volumes. In absolute terms, 'Major Cities' and 'Inner Regional' locations (not surprisingly) delivered the strongest gains in numbers of patients and volume of services provided between July 2012 and June 2016 (adding 6,737 patients and 1,610 patients respectively). In relative terms 'Outer Regional', 'Remote' and 'Very Remote' locations have grown the most, delivering (respectively) 311%, 201% and 571% more Diabetes MedsCheck services over the period.

Figure 7.22: Diabetes MedsCheck changes in patient volume in Australian ABS remoteness categories between July 2011 and June 2016



Source: DHS claims systems extracts for years 2011/12, 2012/13 and 2013/14, Pharmacy Guild claims systems extracts for years 2014/15 and 2015/16. In in conjunction with ABS postcode to remoteness.xls available from
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1270.0.55.006July%202011?OpenDocument (accessed 5th October, 2016)
Abbreviations: BE, Business Entity (includes sole traders). ABS, Australian Bureau of Statistics
Note 1: Provider identifiers in years 2011/12, 2012/13 and 2013/14 were supplied in encrypted form. They have been categorised in cases where the encrypted identifier was also used in the 2014/15 or in 2015/16 datasets and in cases where the S90 Pharmacy identifier was supplied.
Note 2: logarithmic scale for comparison

7.18 SUMMARY OF DIABETES MEDSCHECK UTILSATION ANALYSIS FINDINGS

In summary, we found that claims payment policy changes (specifically the introduction of a claims cap of 10 Diabetes MedsChecks per provider, per month) effectively checked burgeoning scheme uptake and promoted alignment with expectations for both frequency of service and patient profile in terms of age, the number of chronic conditions and the number of prescription medicines the patient is taking.

It is likely that the introduction of the claims cap was the primary driver for altering behaviour of the scheme participants, affecting the economics of participation and signalling to pharmacies greater stringency in claims policies, claims processing rigour and guideline enforcement.

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APPENDIX B SEARCH STRATEGY

The search strategies included in this evaluation report are presented in this appendix (Table A-B.1, Table A-B.2, Table A-B.3, and Table A-B.4).

Table A-B.1 Embase search strategy for studies relevant to Medication Management Review services

#	Search strategy for EMBASE OVID (19 Dec 2016)	Records
1	MedsCheck.mp.	20
2	home medic$ review.mp.	130
3	residential medic$ management.mp.	14
4	(residential adj2 medic$ adj2 (review or management)).ti,ab.	14
5	(home adj2 medic$ adj2 (review or management)).ti,ab.	183
6	or/1-5	245
7	(pharmacist-led or pharmacist-run).ti,ab.	1,055
8	(review$ or assess$ or management).ti,ab.	5,483,928
9	7 and 8	840
10	((medication$ or medicine$ or drug or pharmac$) adj2 (management or review)).ti,ab,kw.	27,309
11	(pharmacy or pharmacies or pharmacist$).ti,ab,kw.	104,037
12	10 and 11	6,738
13	(home or domiciliary or community).ti,ab.	648,137
14	12 and 13	2,209
15	residential.ti,ab.	30,024
16	((aged or geriatric or elderly) adj2 (care or home$ or facility or facilities or residential)).ti,ab.	13,701
17	((care or convalescent) adj (home$ or center$ or centre$ or facility or facilities)).ti,ab.	57,085
18	home$ for the aged.ti,ab.	1,623
19	home for the aged/	11,273
20	exp nursing homes/	49,989
21	or/15-20	142,931
22	12 and 21	440
23	6 or 9 or 14 or 22	3,214
24	((medication or medicine$) adj review).ti.	565
25	((medication or medicine$) adj management review).ti.	8
26	or/23-25	3,559
27	editorial/ or erratum/ or letter/ or note/ or short survey/ or abstract report/ or letter/ or case study/ or (editorial or erratum or letter or note or short survey or conference abstract or abstract report or case study or case report).tw.	3,474,064
28	26 not 27	3,241
29	remove duplicates from 28	3,131

Table A-B.2 Medline search strategy for studies relevant to Medication Management Review services

#	Search strategy for Medline OVID (19 Dec 2016) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, OVID MEDLINE(R) Daily and OVID MEDLINE(R) 1946 to Present	Records
1	MedsCheck.mp.	9
2	home medic$ review.mp.	63
3	residential medic$ management.mp.	8
4	(residential adj2 medic$ adj2 (review or management)).ti,ab.	10
5	(home adj2 medic$ adj2 (review or management)).ti,ab.	118
6	or/1-5	137
7	(pharmacist-led or pharmacist-run).ti,ab.	481
8	(review$ or assess$ or management).ti,ab.	4,491,449
9	7 and 8	374
10	((medication$ or medicine$ or drug or pharmac$) adj2 (management or review)).ti,ab,kw.	19,306
11	(pharmacy or pharmacies or pharmacist$).ti,ab,kw.	55,772
12	10 and 11	3,402
13	(home or domiciliary or community).ti,ab.	571,338

#	Search strategy for Medline OVID (19 Dec 2016) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, OVID MEDLINE(R) Daily and OVID MEDLINE(R) 1946 to Present	Records
14	12 and 13	1,015
15	residential.ti,ab.	26,722
16	((aged or geriatric or elderly) adj2 (care or home$ or facility or facilities or residential)).ti,ab.	11,685
17	((care or convalescent) adj (home$ or center$ or centre$ or facility or facilities)).ti,ab.	44,622
18	home$ for the aged.ti,ab.	1,469
19	homes for the aged/	12,927
20	exp nursing homes/	36,659
21	or/15-20	113,285
22	12 and 21	231
23	6 or 9 or 14 or 22	1,509
24	((medication or medicine$) adj review).ti.	300
25	((medication or medicine$) adj management review).ti.	8
26	or/23-25	1,709
27	editorial/ or erratum/ or letter/ or note/ or case study/ or (editorial or erratum or letter or note or short survey or conference abstract or abstract report or case study or case report).tw.	3,362,429
28	26 not 27	1,632
29	remove duplicates from 28	1,507

Table A-B.3 Cochrane Library search strategy for studies relevant to Medication Management Review services

#	Search strategy for Cochrane Library (19 December 2016)	Records
#1	MedsCheck (Word variations have been searched)	1
#2	"home medication review" or "home medicine* review"	15
#3	(home near/2 medic* near/2 (review or management))	36
#4	"residential medication management" or "residential medicine* management"	0
#5	residential and ((medication or medicine*) near/2 (review or management))	71
#6	(pharmacist-led or pharmacist-run):ti,ab,kw	151
#7	(review* or assess* or management):ti,ab,kw	341,261
#8	#6 and #7	129
#9	((medication* or medicine* or drug or pharmac*) near/2 (management or review)):ti,ab,kw	1,947
#10	(pharmacy or pharmacies or pharmacist*):ti,ab,kw	3,434
#11	#9 and #10	472
#12	MeSH descriptor: [Medication Therapy Management] explode all trees	72
#13	MeSH descriptor: [Medication Reconciliation] explode all trees	41
#14	(#12 or #13) and #10	61
#15	(medication* next management or medication* next therapy next management or medication* next strategy or medication* next strategies or (medication* near/2 review*)):ti,ab,kw	844
#16	#15 and #10	312
#17	#1 or #2 or #3 or #4 or #5 or #8 or #11 or #14 or #16	644
	By database:	
	Cochrane Database of Systematic Reviews	67
	Database of Abstracts of Reviews of Effects (Other reviews)	19
	Cochrane Central Register of Controlled Trials	525
	Methods studies	5
	Health Technology Assessments Database	3
	NHS Economic Evaluation Database	25

Table A-B.4 Health Systems Evidence search strategy for studies relevant to Medication Management Review services

Item	Search strategy for Health Systems Evidence database (3 January 2017)	
Search terms	'medicine review' OR 'medicines review' OR 'medication review' OR 'medication management'	2116
Filter	Provider = pharmacist	373