

3. Phase One: Literature Review

This chapter presents the key findings of the Literature Review stage of the project. This review of available literature since 2005 (on medication and management and the HMR Program) was conducted over December 2007 and January 2008. A number of revisions and additions were made over March and April 2008, and December 2008 and January 2009, in light of findings identified during the later stages of the research project, including the Call for Submissions.

The literature review commences an examination of recent and additional evidence relating to adverse drug events (ADEs) and hospitalisation related to these adverse events. Data relating to populations most at risk are examined - including those at risk and not receiving HMRs. There was no evidence identified regarding populations accessing the program but for whom benefits are limited.

Drivers of participation by health professionals and consumers are reviewed, together with descriptions of similar programs in Australia and internationally. Finally, recent research examining effectiveness and cost savings of medication reviews is examined.

3.1 Incidence of Adverse Drug Events - the need for HMRs

Australian and International estimates regarding the incidence of ADEs and resulting hospitalisations are explored in this section. The exploration of specific populations affected by adverse medical events is then provided in the following sections.

3.1.1 Incidence of ADEs in Australia

Estimating the frequency and seriousness of ADEs among the general population is notoriously difficult, largely due to methodological problems inherent in such studies, and inconsistencies in formal incident reporting rates.

In Australia, numerous estimates of the incidence of ADEs in hospital settings have taken place. Information from hospital studies come from multiple sources, ranging from small studies of hospital admissions data to analyses of national data sets. In contrast, studies into ADEs in the community have been researched less extensively (Australian Council For Safety And Quality In Health Care 2002). The main sources of information concerning ADEs in community settings are reviews of medication management services, emergency department presentations (without subsequent admission to hospital), and self-reports by general practitioners and community pharmacists (Australian Council For Safety And Quality In Health Care 2002).

Differing approaches taken to the measurement of ADEs, and extrapolation of study findings, have led to vigorous debate in the literature, notably between Miller (from the University of Sydney) and Roughead (from the University of South Australia). These differences of opinion will be reviewed in the following sections.

Hospital admissions studies of ADEs

Runciman, Roughead and colleagues examined drug-related hospital admissions as part of their 2003 systematic literature review and meta-analysis of ADEs and medication errors in Australia (Runciman, Roughead et al. 2003). As part of this comprehensive research, they examined events drawn from the 'Quality in Australian Health Care study, drug-related hospital admission studies, routine data collections, including the mortality data collection, the national and state hospital morbidity data collections, drug utilisation data from the Pharmaceutical Benefits Advisory Committee, the Australian Council for Health Care Standards indicator reports, studies of medication errors, the Australian



Incident Monitoring System, annual surveys of general practice activity, and the quality use of medicines in the community implementation trial' (Runciman, Roughead et al. 2003).

According to their review, 2-4% of all hospital admissions are medication-related; among patients aged 75 years and over, this figure rises to >30% of unplanned hospital admissions (Runciman, Roughead et al. 2003). Based on the findings of their review, the authors estimate that between 32% and 77% of these admissions were potentially preventable (Runciman, Roughead et al. 2003). The authors postulate that if we accept that 2.5% of hospital admissions are related to medication, then there would be 150,000 such admissions per year in Australia (based on 1999-2000 hospital admissions figures (Runciman, Roughead et al. 2003).

However, drug-related hospital admissions studies tend to be undertaken in single hospitals, with relatively smaller sample sizes ($n = <1000$); they also typically depend on a doctor or pharmacist to determine whether admissions were related to ADEs (Australian Council For Safety And Quality In Health Care 2002). As such, they may not fully reflect the true incidence of ADEs in hospital settings.

The Australian Institute of Health and Welfare (AIHW) reported that 4.8% of hospital admissions were classified as 'adverse events' in 2004 (2005, p.47), remained constant in 2005 (2006, p.56) but rose slightly to 5.8% in 2006 (2007, p.48). Nevertheless, the classification used by the AIHW (referred to as an ICD-10-AM diagnosis⁶) also encompasses adverse events resulting from falls or infections arising from medical procedures. Therefore, this definition is considerably broader than a mere 'Adverse Drug Event'.

Studies of ADEs in community settings

Miller and colleagues recently investigated the frequency, cause and severity of ADEs among general practice patients (Miller, Britt et al. 2006a). Three sub-samples comprising 852 patients were drawn from the BEACH (*Bettering the Evaluation And Care of Health*) program, a large, continuous, national cross-sectional study concerned with general practice encounters in Australia. Unlike typical hospital admission studies, the classification of patients' health problems is completed by GPs in conjunction with their patients, and hence more likely to be accurate. Hospitalisation and preventability questions were recorded for patients in the second and third sub-samples respectively.

Miller and colleagues' research revealed that among patients presenting to a GP in the previous 6 months (Miller, Britt et al. 2006a):

- 10.4% of patients had experienced an ADE
- Those most at risk of experiencing an ADE were:
 - Patients aged over 45 years (compared to those aged under 45 years)
 - Children aged 1-4 years (compared to other children)
 - Female patients (versus male patients)
- Whilst the majority of patients in this sample had experienced only one ADE, one in six had experienced multiple events.

Miller and colleagues classified ADEs according to the severity and preventability of the event. They found that (Miller, Britt et al. 2006a):

⁶ ICD-10-AM is the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification.



- Among 551 patients for whom GP severity ratings were given, over half were given a 'mild' rating, a third were rated as 'moderate', with a 'severe' rating assigned to 10% of those experiencing an ADE (NB. Severe events were defined as a reaction resulting in hospitalisation and/or limitations of daily activities).
- 7.6% (out of 223 patients surveyed) had been hospitalised due to their most recent ADE
- Among the 327 patients for whom GPs judged the preventability of the ADE, almost one-quarter of ADEs were considered preventable.

The authors cite Medicare Australia data which reveals that there were 96.3 million GP consultations in Australia during 2003-2004. (Miller, Britt et al. 2006a). The extrapolated results of their study thus suggest that if 10.4% of these GP consultations were with patients who had had an ADR in the previous 6 months, then GPs would have had over 10 million consultations with such patients during that year (Miller, Britt et al. 2006a).

Miller and colleagues state their study contained a number of limitations and potential sources of bias which could have limited the generalisability of their findings (Miller, Britt et al. 2006a). GPs participating in this study were constrained by time and the number of questions they could ask patients. Certain groups of patients are more likely to visit GPs due to their age and morbidity status; as such patients are more likely to have been selected to participate in this study, it is *not* possible to extrapolate the frequency of ADEs in patients attending GPs to a period prevalence of ADEs in the community. The study design prevented any grading the probability of causation, the identification of the individual drugs causing the ADEs, nor the period of exposure or dosage. The denominator in this study was all patients attending their GP, irrespective of whether they were receiving drug therapy. As a consequence, this study is likely to have underestimated the frequency of ADEs among patients taking medications. Finally, as the questions relied on the patients' and GPs recall of events over the preceding 6 months, recall bias may have occurred.

In an editorial in the *Medical Journal of Australia*, Roughead and Lexchin (2006) have subsequently extrapolated Miller and colleagues' (2006, p. 315) finding 'that 10.4% of patients attending general practice experience an ADR' to assert that almost 2 million Australians have an ADE annually (Roughead 2006; Roughead and Lexchin 2006). Furthermore, they state that around 1 million of these ADEs are 'moderate' or 'severe', with 138,000 requiring hospitalisation (Roughead 2006; Roughead and Lexchin 2006).

However, Miller and colleagues (Miller, Britt et al. 2006b) disputed this figure on the grounds that this calculation is based on all general practice patients having an equal chance of being in the sample. In their study they found that those most likely to experience an ADE were older people, the very young, and females. After adjusting for age and sex differences, Miller, Britt and colleagues (Miller, Britt et al. 2006b) estimated that 1.6 million people experienced an ADE in the previous 6 months, *not* in the preceding 12 months. Furthermore, they state that the annual incidence of ADEs is in fact likely to be *higher* than the figure proposed by Roughead and Lexchin, although they do not propose an alternative estimate.

The most recent estimate of consumer reported incidence of adverse events remains the population-based consumer survey conducted by Clarke (2001), who found that 6.5% of the Australian population reported experiencing an adverse event in the previous 12 months. Medication errors were the most commonly reported type of adverse event, reported by 36% of those who reported an adverse event (p41). Therefore, this consumer-based report estimated that around 2% of the Australian population over 18 years of age experienced a medication related adverse drug event during the previous 12 months. Whilst Clarke's estimate of 2% is markedly lower than the 10.4% proposed by Miller (2006a), it is worth noting that these figures apply to different populations and time frames. Clarke's (2001) study applies to the general Australian adult population over a 12 month period, whilst Miller's (Miller, Britt et al. 2006a) estimate is

confined to general practice patients with a much higher attendance rate than the general population over a 6 month period; this explains why the estimate is much higher in the latter study compared to the former.

3.1.2 *International estimates*

International studies reflect the incidence of ADEs and associated hospitalisation reported in Australian studies. Pirmohamed and colleagues (Pirmohamed, James et al. 2004) estimated that up to 6.5% of hospital admissions could be attributed to an 'adverse drug reaction' in the UK and that the reaction *directly* led to admission to hospital in 80% of these cases. Pirmohamed concluded that '*the burden of Adverse Drug Reactions on the National Health Service is high, accounting for considerable morbidity, mortality, and extra cost*' (Pirmohamed, James et al. 2004, p.15).

In the US, drug-related problems are frequent amongst older people receiving outpatient care, with 50.1 ADEs occurring per 1,000 person-years observed (Gurwitz, Field et al. 2003). It was estimated that 27.6% of ADEs were preventable (Gurwitz, Field et al. 2003). It is, however, difficult to compare this 'person/year' approach to incidence with the proportionally-based approach adopted in the Australian context.

Also in the US, Cannon and colleagues (Cannon, Choi et al. 2006) investigated the prevalence of inappropriate medications and dangerous interactions for a population of elderly patients receiving healthcare. Inappropriate medications were identified for 31% of consumers, and interactions were identified for 10% of consumers. The incidence of both were noted to increase for consumers receiving complex polypharmacy.

3.2 Populations at particular risk of Adverse Drug Events

A number of factors associated with an increase in the probability of an Adverse Drug Event were identified in the literature. Factors typically relate to age, cultural background, psychological health, recent hospital discharge and changes in medication regime. Further risk is noted when these factors interact - for example, the case of an elderly person with a complex medication regimen being discharged from hospital.

3.2.1 *The elderly*

Medication-related illness is a significant problem for an elderly population.

Chan and colleagues (Chan, Nicklason et al. 2001) estimated that three in ten (30.4%) hospital admissions for elderly people *may* have been the result of an ADE based on an Australian study a survey of 219 patients. Of these ADEs, half were associated with reactions to a single drug (46% of ADE admissions) and one-quarter were associated with interactions between multiple drugs (25%). A similar study of ageing Australians was conducted in 2003 and concluded that a similar proportion of hospital admissions (26%) were attributable to ADEs (Runciman, Roughead et al. 2003).

Based on qualitative research with consumers, the Consumer Health Forum (2001) concluded that:

Consumers, and particularly older consumers, often struggle to cope with complex regimens of multiple medicines and/or frequent changes in their medicines ... the standard doctor-patient consultation is not always conducive to good communication about medicine issues (p.1).

Limited recent Australian data could be obtained for ADEs and admissions for specific populations. Research conducted before 2005 remains the only available reference point.

3.2.2 *People from Culturally and Linguistically Diverse backgrounds*

Patients from a Culturally and Linguistically Diverse (CALD) background have twice the medication error rate than people for whom English is a first language (Fejzic and Tett 2004). Ajdukovic and



colleagues drew two key conclusions regarding CALD communities and medications (Ajdukovic, Crook et al. 2007). Firstly, that these communities are at particular risk of misadventure and hospital admission due to language barriers together with differences in cultural approaches to medicine. Secondly, interventions aimed at reducing medication misadventure in CALD communities must use trained interpreters to ensure that the purpose of the intervention is clear, and that the consumer fully understands the requirements of their medication regimens.

3.2.3 *People living with mental illness*

No available studies have explored the relationship between ADEs and people living with mental illness in the community. Maidment and colleagues, however, reviewed research into the incidence, causes and harms of medication error in UK mental health care services, with a primary focus on psychiatric inpatients and prescriptions dispensed by hospital pharmacists (Maidment, Lelliott et al. 2006). The study reported few errors that resulted in actual serious harm to patients but noted adverse events involving psychotropic drugs were common, and patients with mental health or cognitive disorders (e.g. dementia) were at higher risk of medication misadventure because of their diminished capacity. Maidment considered these patients '*may be less articulate and less likely to question a prescription, a change in the medication regimens, potential side effects or whether monitoring is required*' (Maidment, Lelliott et al. 2006, p.412) It was also suggested that persons with age related cognitive disorders such as dementia were similarly exposed to risk. Whilst this group is clearly susceptible to ADEs, it is worth noting that Maidment's study focused on inpatients, a population outside the scope of HMRs.

3.2.4 *People recently discharged or transferred from hospital*

Many studies have cited the importance of discharge from hospital, including transfer to another facility, as a period that poses a high risk of medication misadventure.

Notably, patient satisfaction surveys identify the information provided to patients on discharge, particularly information about medications, to be the areas of lowest satisfaction with hospital services (Victorian Government Department of Human Services 2008). Consumers are more dissatisfied with information about medications on discharge than any other aspect of their hospital experience.

In the US, one study examining the prevalence of medical errors related to the discontinuity of care from an inpatient to an outpatient setting found that after hospital discharge 49% of discharges experienced at least one medical or medication error (Moore, Wisnivesky et al. 2003). Furthermore, between 19% and 23% of discharges suffered an adverse event, most commonly an ADE (Moore, Wisnivesky et al. 2003). From the consumer's point of view, this high incidence of ADEs was attributed to changes to the medication regimen, new self-care responsibilities that may stress available resources, and complex discharge instructions.

In the UK, Brown and colleagues reported that the period immediately following discharge from hospital is characterised by significant changes to medication regimens, inaccurate, incomplete or uncommunicated medication information and a time of great stress for the consumer (Brown, Raue et al. 2006).

In the US, Foust and colleagues also demonstrated levels of elevated risk during discharge or transfer. The study concluded that for older adults, the increased likelihood of an ADE post-discharge is characterised by an abrupt shift in responsibility for medication management (Foust, Naylor et al. 2005, p.106). It was also estimated that ADEs were the most frequent type of medical injury following hospital discharge (Foust, Naylor et al. 2005).

A review by Sorenson and associates identified a number of additional ADE risk factors including: a strong relationship between the number of medications taken and the incidence of ADEs; and the storage of medication in multiple locations (Sorensen, Stokes et al. 2005).



3.2.5 Specific risk factors

In addition to the general factors described above, a number of specific risk factors in relation to ADEs have been documented. These specific risk factors have been identified by the Pharmaceutical Society of Australia, and are based on Australian pharmacists and GPs notes from HMR visits (Pharmaceutical Society of Australia 2002). These specific risk-factors include:

- Patients with three or more medical conditions
- Patients living alone, or who were housebound
- Patients with dexterity problems
- Patients taking more than 12 doses per day
- Patients with a newly diagnosed condition requiring new medications
- Patients on medications with a narrow therapeutic index requiring therapeutic drug monitoring
- Patients who were newly trained in the use of medication equipment (inhalers, compliance aids, etc)
- Patients with a history of inadequate or altered therapeutic response.

These risk factors reflect the criteria for an HMR.

In summary, the literature indicated that older persons, those living with a mental illness and those from CALD backgrounds are particularly at risk of ADEs. Discharge from hospital and complicated drug regimes are also identified as indicators of a heightened risk of an ADE.

3.3 Barriers to participation in the HMR Program

Studies have revealed a number of factors that present a barrier to effective access to HMRs. Consumer awareness of the program is of primary concern. A lack of integration into business practices together with professional and time-related frustrations were reported to be a common concern for professionals.

3.3.1 The GP perspective

Tatham (2007) describes the many frustrations that GPs experience in conducting HMRs, but does not cite references nor document how these views were obtained. Nevertheless, these frustrations are said to include:

- A feeling that community pharmacists are too busy to effectively participate in the HMR process
- A lack of training and qualification of pharmacists in medication management of this nature
- An ‘agnostic’ and ‘flippant’ supply of some medications by some pharmacists
- An inappropriate supply of information by pharmacists, who were reported to sometimes supply irrelevant or unhelpful information as part of HMRs
- A lack of control over who completes the review
- The amount of time required for the review
- Confusion about the HMR process.

Amongst a small ($n = 16$) purposive sample of six pharmacists, six patients and four GPs, Morris (2007) qualitatively explored factors contributing to low uptake of HMRs for GPs. Key concerns from the GP’s perspective were:

- A lack of time for HMR initiation during consultation and difficulty in remembering to recommend a HMR in the first place the variable timeframe for completing HMRs and recall systems
- Difficulties associated with information flow, including patient not taking referral to pharmacist, difficulty in providing relevant patients history to contracted pharmacist and the nature of pharmacists report
- The complexity of the HMR process, in particular the paperwork and long chain of people and steps involved
- No availability of accredited pharmacists, inability to choose conducting pharmacist and lack of relationship with accredited pharmacist.

Furhermore, Yu and associates pointed to low levels of awareness of the specific details of HMR requirements among providers (Yu, Nguyen et al. 2007). In particular, this study suggested that while GPs are willing to make a HMR referral, many were unfamiliar with the referral process.

3.3.2 The pharmacist perspective

Some commentators reported that the HMR Program is currently not integrated into the business models of many pharmacies. Gowan reported in the *Australian Journal of Pharmacy* that time and reporting requirements associated with HMRs are not part of normal pharmacy businesses (Gowan 2005a). For many, HMRs are an 'add on ... after-hours' activity (Gowan 2005a). This finding was supported by Roberts and colleagues who found:

... a large number of pharmacies do not appear to be integrating HMRs into their practice by using a staff pharmacist to undertake review, instead using external consultants ... the lack of complete integration may have implications for future services (Roberts, Benrimoj et al. 2005, p.808).

In an editorial piece in the *Australian Journal of Pharmacy*, Smith (2004) describes the very high cost and time barriers associated with pharmacist participation in HMRs. Smith estimates that between 40 and 50 hours of time is required for pharmacists to complete the extra course-work and competency test required for accreditation. As Smith herself puts it: 'no-one has an extra 40 hours hidden in their back pocket' (Smith 2004).

Similarly to the findings reported for GPs, (Morris 2007) identified a number of barriers from the pharmacists' perspective. These barriers include:

Time and resource constraints:

- Informing patient about HMR adds time to the review when GP did not explain initially
- Travelling time
- Conducting and/or writing review outside work hours
- Lack of resources
- Quality of report compromised due to time constraints
- Remuneration inadequate due to variable workflow

Communication issues:

- Poor communication between GPs and pharmacists, in particular lack of face-to-face communication and lack of professional relationship
- Expectations from GPs
- Lacking confidence in making clinical recommendations to GPs
- Detail lost between conducting and accredited pharmacists
- Unreceptive patients due to their lack of understanding



Administrative issues:

- Logistically complex - many steps involved prior to conducting HMR
- Prolonged and variable timeframe for completion of entire HMR process
- Accreditation process: too tedious, time-consuming, paper work
- Accreditation process: lost clinical knowledge since university
- Uncomfortable interviewing strangers in an unfamiliar environment-safety

Other issues:

- Requires a lot of discipline
- Pharmacists not proactive in referrals
- Older pharmacists feeling they have lost clinical knowledge
- Community pharmacies mainly concerned with primary care.

3.3.3 Consumer perspective

There is evidence from the literature of low levels of awareness of HMRs among consumers, as well as low rates of participation among certain populations, some of whom have an increased risk of medication misadventures compared to the general population.

Urbis Keys Young's evaluation of HMR program (pharmacy component) commissioned by the Pharmacy Guild in 2005 cited a lack of awareness of HMRs amongst consumers as a key barrier to participation. The absence of an awareness, education or communications campaign was also noted (Urbis Keys Young 2005).

Several smaller studies also found low levels of awareness. An informal small-scale Australian study found low levels of awareness amongst pharmacy consumers, with 74% of customers unaware of HMRs (Baldock, Kaufman et al. 2006)⁷. Yet 84% of these customers would be happy to take part in a HMR if it were offered. While Kyle and Nissen concluded that very few elderly Australians are aware of the existence of HMRs and how it could be of benefit (Kyle and Nissen 2006). The finding was based on a focus group study that investigated the feasibility of a nurse referral system to promote uptake of HMRs.

Barriers also exist for consumers who *are* aware or are offered an HMR. Based on qualitative consumer consultation, the Consumer Health Forum (2001) listed a number barriers to participation in HMRs, including a fear of being 'checked up on' and radical change to medication regimens. Other attitudinal factors that limited consumer uptake of HMRs were characterised as:

- A feeling that a review was not needed
- Feeling competent to manage the prescribed medication regimen
- A fear of being found out to be doing something wrong
- Concerns over possible cost implications.

The study concluded that:

Very often, the patients who had refused the service had the most need of it (Consumer Health Forum 2001).

The Morris (2007) research also listed barriers from a consumer perspective. These barriers included a lack of awareness, a fear of being policed and concerns over security. The list of issues included:

⁷ The exact sponsor or source of funding for the study was not reported in the article, nor was the size of the sample.

- Unaware the service is available
- Patients scared as they think they will be policed
- Safety concerns of particular patient groups e.g. elderly ladies living alone
- Not interested/ignorant
- Stockpilers or medication hoarders may not want a health professional entering their home
- In denial about their illness or condition
- Extent of GP relationship
- Embarrassed by their health condition/s and don't want to discuss sensitive issues.

The literature has identified a number of barriers to accessing HMRs among specific populations. Specific populations with particularly low access to the HMR Program include people from CALD backgrounds, males, the aged and Indigenous Australians. Both people from CALD backgrounds and the elderly have previously been identified as groups experiencing high relative rates of hospitalisation due to medication misadventure. A limited number of studies regarding access to HMRs for specific populations conducted after 2004 could not be sourced for this review. Further, much of the evidence presented in this section is qualitative and/or anecdotal in nature.

People from Culturally and Linguistically Diverse backgrounds

As previously described, CALD communities demonstrate a high need for HMRs due to high rates of medication misadventure and hospital admissions. One barrier resulting in a potential gap in access for CALD communities in Australia relates to language. The need for trained interpreters to overcome language barriers for particular consumers when conducting HMRs was stated in the previously mentioned Australian paper by Ajdukovic and colleagues (Ajdukovic, Crook et al. 2007). The need for interpreters was further emphasised by Martin (2006) in relation to pain management.

Funding is also needed for interpreters ... more than 50 languages are spoken in Australia and in order to meet this requirement and make HMRs more efficient, this problem needs to be addressed (Martin 2006, p.44).

Men

Men were also reported to have lower participation rates compared with women. In Australia, Gowan (2005b) concluded that:

Males in Western society are less inclined to take an active role in maintaining their own health and are less likely to seek professional help (Gowan 2005b, p.831).

This tendency was described by Gowan using notions of '*strength in silence*' and a propensity to feel '*invulnerable*'.

The impact of this finding was compounded by the fact that men have a significantly greater incidence of a number of medical conditions with complex medication requirements (cardio-vascular disease etc). The findings of the study are supported by later examination of HMR uptake data which concluded that '*a greater number of women are having this service compared with males*' (Gowan 2007, p.69).

The elderly

A trial of a nurse referral system for HMRs identified key barriers relating to the way in which HMRs are 'sold' to consumers. Focus group research with elderly people who might benefit from a HMR (Kyle and Nissen 2006) suggested that a number of barriers lead to reluctance to take part in an HMR, including:

- Many older Australians did not follow through with a review due to ‘information overload’ and the written and verbal information exchange required for an HMR was seen as daunting for some older Australians
- Many of the elderly consumers interviewed became confused and the volume of information and consent process was thought to limit consumer interest in a HMR
- Some elderly Australians felt that they may lose control of their medication management as a result of an HMR
- Some elderly Australians had sufficient trust in their GP, and saw the HMR process as being unnecessary.

Indigenous Australians

Indigenous Australians face significant barriers accessing HMRs. Issues affecting this population, which were identified in the (Urbis Keys Young 2005) evaluation of the HMR program, include the following:

- Lack of access to medications or inappropriate use of them are significant problems in Indigenous communities. Nevertheless, basic environmental health problems (for instance, overcrowding and poor sanitation) may in fact overshadow the need for individual medication management. HMRs may thus not be perceived as a high priority by under-resourced Aboriginal Health Services.
- Indigenous people may use ‘bush medicines’, with which accredited pharmacists are not well acquainted.
- Indigenous people may not feel comfortable about being visited at home by a non-Aboriginal pharmacist not known to them.

3.3.4 *Other barriers*

Ponniah and colleagues identified a number of specific barriers (Ponniah, Shakib et al. 2008). Using a qualitative methodology featuring interviews with GPs and pharmacists, some of the key barriers identified included:

- The time-consuming nature of HMR facilitator involvement in the process
- The intensive workload for pharmacists
- Difficulties in the timing of HMRs due to unpredictable discharge times
- Frustrations for all parties involved due to delays in the completion of the HMR process.

Peterson and associates concluded in an editorial piece that the organisation of a HMR should receive the same urgency in community pharmacy practice as dispensing a prescription (Peterson, Jackson et al. 2006).

Similar systemic and organisational barriers have been reported overseas. In America, Cameron (2005) listed a number of factors that influence uptake of HMR-like programs, including the use of overly strict criteria for individuals who are authorised to provide services; limiting the number of eligible participants (both provider and consumer); and providing levels of payment that do not cover expenses incurred.

Another American study that examined nurses’ roles in home medication management highlighted a similar difficulty in communication channels between nurses, pharmacists and GPs. This lack of communication was reported to impede the conduct of effective home review and to significantly increase rates of medication duplication, and drug interactions (Kovner, Menezes et al. 2005).

In summary, a wide range of barriers to participation in HMRs and similar programs have been identified both in Australia and overseas. Key barriers include time pressure and inter-professional



communication. For consumers, a lack of awareness and understanding were identified as barriers to communication.

3.4 Drivers of consumer and provider participation

The literature describes a number of factors that drive participation in HMRs. These include professional recognition, acknowledgement of HMRs as best practice and a general willingness to undergo a HMR for consumers. Notably, most literature has been produced by pharmacist and MMR facilitators, and little generated by GPs.

3.4.1 The GP perspective

MMR facilitators (Clifopoulos 2007) report that the key motivating factors that drive GP participation in HMRs include:

- Improving patient awareness of their medications
- Decreasing polypharmacy and costs to all
- Gaining a second opinion on prescribing trends
- Gaining a more complete understanding of the patient and their attitude towards their health and medications
- Assessing whether patients see other health care professionals, and whether they acquire medications from any other sources
- Providing an easy medication template for referral and medico-legal purposes.

3.4.2 The pharmacist perspective

Freedman (2005) describes the uniqueness of the Australian HMR Program, and states that pharmacist participation in the process is a privilege that is not available overseas. Freedman's editorial article in the *Australian Journal of Pharmacy*, stated:

The concept of being paid to provide a professional service is a privilege that few pharmacists in the world have ever achieved (Freedman 2005, p.324).

In another editorial article in *Pharmacy News*, Roberts (2006) describes HMRs as 'the best loyalty club in pharmacy' and a very effective means to 'generate customer loyalty while at the same time increasing business' (Roberts 2006, p.8). Roberts explains the potential to reap business benefits from HMRs and likens HMR consumers to 'frequent flyers'.

Historically, remuneration provided for HMR services was seen by some practitioners to be insufficient to cover the cost of the review. However, recent articles report that the increase in remuneration in November 2006 has gone some way in addressing this barrier.

Annabel (2006) reports in the *Australian Journal of Pharmacy* that \$220 per HMR is required to make the review profitable for pharmacists. It was estimated that when combined with accreditation incentives, pharmacists were remunerated at around \$220 per HMR.

Improvements to funding of HMRs for community pharmacy owners are further emphasised in an editorial article by Peterson and associates (2006) in the *Australian Journal of Pharmacy*. They stated:

There should no longer be any financial impediments to community pharmacy owners and individual pharmacists embracing HMRs (Peterson, Jackson et al. 2006, p862).

3.4.3 The consumer perspective

An evaluation of the HMR Program commissioned by the Pharmacy Guild in 2005 concluded that consumers are happy to undergo a HMR, and recognise the benefits arising from the process (Urbis Keys Young 2005). Specific health benefits arising from HMRs cited by consumers included reductions in symptoms and side effects, an increased sense of wellbeing, and indirect benefits arising from better management of their health (such as improved diet and cholesterol management). Other general benefits of HMRs reported by consumers included:

- Reassurance and improved confidence related to medications
- An improved relationship with the pharmacist and/or GP
- Increased knowledge and sense of control over their medication and health
- Increased understanding of the importance of compliance with medication regimes. (Urbis Keys Young 2005).

These findings are reflected in later editorial content in *Pharmacy News*, with one commentator stating that: *Needless to say, the public think that HMRs are fantastic* (Freedman 2005, p.325).

Consumer consultations conducted by the Consumer Health Forum (2001) led to the conclusion that many consumers are more than willing to take the opportunity to discuss and review their medications. The outcomes of taking this opportunity were also reported to be positive. The study concluded:

... many consumers are particularly attracted by the opportunity (offered by home-based medication reviews) for detailed discussion and information exchange on medication matters of importance to consumers. This in turn can give consumers greater control in managing their medicines and a greater sense of control over their medications and conditions (p. 1).

3.5 Best practice in the conduct of HMRs

Many commentators have documented consideration of 'best practice' in the conduct of HMRs. These include effective communication, collaboration, provision of information to consumers, and appropriate remuneration for physicians.

Communication between all parties to the HMR was seen as essential to the review process. In an editorial article in the *Australian Journal of Pharmacy*, Rigby (2007) states:

... good communication skills have a significant positive impact on patient understanding and satisfaction leading to positive outcomes and improved adherence (Rigby 2007, p.34).

In an article published in the *Journal of Pharmacy Practice and Research*, Blennerhassett and colleagues describes the need for close and effective collaboration, including collaboration with hospital staff during the high-risk period of discharge and transfer (Blennerhassett, Cusack et al. 2006). In summarising consumer pathways and communication during discharge, Blennerhassett and colleagues concluded:

GPs, community pharmacists and accredited pharmacists reported that collaboration between community liaison pharmacists and the medication management review facilitator improved the hospital and community link and Home Medicines Review implementation (Blennerhassett, Cusack et al. 2006).

Blennerhassett reported that effective communication should be promoted by strong procedures and protocols for hospital and community-based practitioners. The role of the HMR facilitator was seen to be essential to the effective implementation of these systems.

Collaboration with other interested parties and stakeholders, such as caregivers, is also crucial to HMR best practice. The importance of this approach was highlighted in a study of medication reviews amongst people living with Alzheimer's or dementia in American communities and study concluded that:

... interaction with beneficiary caregivers is essential for medication regimen reviews ... Care-givers, sometimes with the aid of special packaging, have a central role in ensuring compliance with drug regimens (Medicare Rights Centre 2007, p.90).

In an observation study amongst the Australian veteran community ($n = 89,497$) and their GPs ($n = 15,014$), Roughead (2007) highlighted the benefits of notifying and educating doctors who treat veterans that meet the HMR criteria and of informing consumers of the availability and benefit of HMRs. The study was conducted as part of the Medicines Advice and Therapeutics Education Service (MATES), the HMR Program funded and conducted by the Department of Veterans Affairs specifically for the Veteran community (discussed in more detail in Section 3.6.1). The study documented a fourfold increase in the number of veterans who received an HMR and an increase in the number of GPs providing referrals amongst those who received the intervention. While the duration of the effect was not sustained over time Roughead concluded that:

Patient specific feedback provided to GPs supported by education materials increased HMR rates for targeted veterans and increased GP participation in the delivery of HMRs (Roughead 2007, p.797).

3.6 Other models of medication review

A number of approaches to medication reviews and other measures for improving medication safety have been adopted in Australia and overseas. An overview of these approaches and possible implications for the HMR Program is provided in this section.

3.6.1 The Australian context

A number of other medication management services are available in Australia including general nursing care, medication management for patients with specific conditions and care for specific populations such as veterans and palliative care patients.

The Royal District Nursing Service (RDNS) offers the Hospital in the Home (HITH) Program in Victoria, whereby the hospital purchases domiciliary nursing services on a fee-for-service basis. Hospital staff make contact with the service prior to the patient being discharged. HITH provides general nursing care in addition to medication management such as monitoring post-operative recovery, intravenous therapy and pain management (Royal District Nursing Service 2008). A search of health departments in other states did not yield information about similar State-based programs outside of Victoria.

The University of Queensland, a Brisbane community nursing service and DGP conducted a study looking at community nurse identification of patients at risk of medication misadventure, and developed and tested an approach for community nurse HMR referral. The HMR model has a provision whereby anyone who is concerned about the risk of medication misadventure can request a HMR from the patient's GP, and given the high level of care provided in-home and the primary care and triage skills of community nurses they were identified as a logical professional to request a HMR referral. Although the uptake of HMRs was low, this study identified problems related to research processes, delays in Program delivery, as well as consumer resistance. Nevertheless, GPs and other healthcare professionals recognised and supported the benefit of the referral of patients for HMRs by community nurses (Kyle and Nissen 2006).

The Department of Veteran's Affairs Veterans MATES program identifies members of the veteran community who are living at home and at risk of medication misadventure by using data from prescription claims. The program provides information targeted at assisting and improving the management of medications by the veteran community (Department of Veterans Affairs 2008). The program places veterans' and their GP are at the core of the program and aims to create collaborative team that includes veterans, their carers, their community pharmacists, other medical specialists and health practitioners. A chief component of the MATES program is to educate veterans about managing

their chronic medical conditions and to promote better communication between veterans' and their healthcare team. MATES is delivered through clinical modules every 3-4 months. Each module focuses on a specific aspect of medicines management, for example: diabetes, caring for your heart, heartburn and antidepressants. There is also a separate module available for GPs and pharmacists.

In addition to the HITH program discussed previously, the Royal District Nursing Service operates a Palliative care and Bereavement support program, which provides care to palliative patients including medication management and other nursing support (Royal District Nursing Service 2008).

The Hospital Admission Risk Program Chronic Disease Management (HARP) was established by the Victorian Government in 2001-2002. The program was designed to address continuous increased demand on the hospital system by targeting frequent hospital attendees including people with chronic heart disease, chronic respiratory disease, diabetes and those with complex psychosocial or age related needs. HARP offers client targeted interventions such as education, medication review and individualised action plans. In a similar manner to the MATES program, HARP provides a core healthcare team approach. According to the Program's website, HARP was reported to have met its key objective: reducing avoidable hospital use in the Victorian hospital system (Victorian Government Health Information 2008).

The Commonwealth government, with the Pharmacy Guild, established the Patient Medication Profiling Program in May 2008. The program intends to *reduce the risk of medication-related adverse events by assisting people to better understand and manage their medications, including prescription, over the counter and complementary medicines* (Pharmacy Guild of Australia 2008, online), as well as increasing the patients' awareness about the medications they are taking, how they should be taken, what they do and how to identify them. Unlike HMRs, this program takes place in-pharmacy, and involves provision of a list of medicines and information about these medicines.

The Department of Health and Ageing established the Residential Medication Management Review (RMMR) funded under the Medicare Benefits Schedule (MBS) for permanent residents residing in aged care homes, including veterans. Similar to the HMR, the RMMR is specifically aimed at residents of aged care homes for whom quality use of medicines may be of concern, or those who are at risk of medication misadventure due to their medical condition or medication schedule. In this program, a GP conducts the review in collaboration with the pharmacist, allowing the GP to provide medical information to inform the pharmacist's part of the review (Department of Health and Ageing 2008). These reviews can be collaborative, involving both GPs and pharmacists, or they may be conducted by an accredited pharmacist alone. The collaborative approach, however, is regarded as best practice. Such reviews also incorporate quality activities such as education of staff in aged care facilities, but do not extend to discussions with patients.

Video telepharmacy shows some promise as an alternative delivery method, with an unpublished study amongst nine consumers reported to be particularly useful for people in remote locations with complex medication regimens. Those consumers who had undergone an HMR remotely using video conferencing equipment reported that the process was satisfying and useful (University of Tasmania 2006), and the study concluded ... *the trial was a success and telepharmacy is a practical alternative in the situation where distance makes it difficult to conduct a medication review.*

3.6.2 Medication management approaches employed internationally

A number of different approaches to medication management are employed internationally, including the use of internet technologies and comprehensive education packages. An overview and the impacts and outcomes of the different approaches to medication management are discussed in the following sections.

A UK based company has designed a computer program that consumers can download: the program *E-Pill Pal* (E-PillPal 2008). The program works by reminding patients when to take their medication -



using technologies such as mobile phones, PDA or pagers. A person's full medication history can be uploaded to a PC. The company also markets a range of digital watches with alarms and pill dispensers. According to the manufacturer, these programs are reported to be of added benefit in lowering the risk factors for those whom quality use of medicines may be of concern or those who are at risk of medication misadventure in conjunction with medication reviews (E-PillPal 2008).

The Institute for Safe Medication Practices (ISMP), an independent American not-for-profit healthcare organisation, maintains a number of medication management materials, programs and systems aimed at increasing medication safety. Using a range of error reporting tools, ISMP bridges the gap between practitioners, patients and pharmaceutical companies in the promotion of safety and effective management. A 2003 evaluation of the effectiveness of the 194-item ISMP Medication Safety Self-Assessment for hospitals revealed that participating organisations had implemented a wide variety of medication safety improvements (Lesar, Mattis et al. 2003) although this tool's effectiveness in reducing medication error has not yet been established in Australia (Hughes 2008). Further, the ISMP produces a range of information products and programs, including teleconferences on current medication use issues; offering posters, videos, patient brochures, books and other resources (Institute for Safe Medication Practices 2008).

The PILL (Pharmacokinetics Involves Lifelong Learning) program in America is an intervention very similar to the HMR Program. PILL was an all-inclusive medication management pilot program trialed in Los Angeles, and based on a collaborative approach to client care. Eligibility for the service was confirmed through an assessment procedure, and all clients were referred to PILL by the Southeast Area Social Services Funding Authority. On confirmation of eligibility, the client was referred to a pharmacist who visited the client in their home and carried out a comprehensive in-home review. The pharmacist made note of all medication information, in addition to undertaking a review of the clients' understanding of each medication, including the clients' ability to read the instructions and open the containers that the medication was stored in. On completion of the pharmacist's assessment, an individualised care plan is devised. The pharmacist also assisted clients with medication management and education and referral to additional services where necessary (Beck and Rodman 1995).

Other forms of medication review programs were identified in the literature pertaining to health outcomes for participants. The findings and limitations of studies that evaluated these alternative models are discussed in Section 3.6. The following alternative models under evaluation included:

➤ **The HOMER Program in the United Kingdom (UK)**

Under this program, recently discharged patients were referred to a 'review pharmacist' for a home visit to assess the patient's ability to adhere to medication regimens and appropriately self medicate. The pharmacist then provided education and information, and when necessary adjusted the patient's regimen. When risk of an adverse event was identified the GP was notified and corrective action taken. An evaluation of this program concluded that the intervention had little effect over quality of life, and actually increased the likelihood of a hospital admission and called for further research to identify more effective methods of medication review (Holland, Lenaghan et al. 2005; Holland, Desborough et al. 2008).

➤ **The POLYMED program in the UK**

The POLYMED program targeted people aged over 80 living in their own homes. Selected participants had their patient and medication information reviewed by a pharmacist prior to the scheduling of a home visit. As with the HOMER program, the review pharmacist educated where necessary and removed medications that were unnecessary and/or risky. The pharmacist and GP also meet to discuss the medication regime with corrective action taken as necessary. A follow-up visit was conducted six to eight weeks after the initial home visit. Like the HOMER trial, no impact on clinical

outcomes or quality of life was noted but an overall reduction in the number of medications prescribed was demonstrated (Lenaghan, Holland et al. 2007).

➤ **Brown Bag check-ups in the US**

Under the US Brown Bag check, all prescription, over-the-counter and herbal medications that are used by the patient are taken to their pharmacist in a brown bag for review. The review can take place at the pharmacy, in the community, or in specific settings such as community housing. The pharmacist examines medications in the hope of identifying unnecessary medications, improper drug selection or dosing, poor compliance and the need for additional drug therapy. The involvement of a GP is not noted in the literature. A study of these reviews concluded that they are of value in the identification of Medication Related Problems (MRPs). The Brown Bag approach has been utilised in Denmark and Canada, and in the UK Nathan and associates note that some smaller scale projects have also been set up (Nathan, Goodyer et al. 1999).

3.6.3 Implications for the HMR Program

The review of related medication review programs revealed that the HMR Program stands alone in Australia in providing Home Medicines Reviews at home for the general population. However, many of the services outlined complement HMR and indicate further augmentation could see considerable gains to HMR as a whole.

The University of Queensland study endorsed the use of community nurses and described them as ‘... a largely untapped resource for identifying people at risk of medication misadventure based on assessments made in their home environment’ (Kyle and Nissen 2006, p329). The study also supported an open referral process for healthcare professionals and argued that open referral could minimise confusion and delays. The importance of this is further highlighted within the PILL pilot program which permits referral by case managers.

The educative components of MATES could further contribute to HMRs achieving its objective to “improve the patient's, and health professional's knowledge and understanding about medications”. Although it is noted that during the HMR a pharmacist often provides health promotional material, MATES provides clinical modules of education at regular intervals during the year. The education component of MATES not only raises awareness of chronic health issues and gives patients control of their health, but also creates a community of health professionals that are better informed about the need for medicines review, risk factors for medication misadventure, HMR, its benefits and how to access the services.

Collaboration as described in the MATES and PILL programs could be advantageous to HMR, and while it does exist to some degree already, there could be room for further development. The individualised care plan used in PILL could benefit members of the population in cases where patients have multiple services and providers involved. It is acknowledged that HMR has some provision for this currently and there are privacy issues that can make communication between services difficult. However, consideration could be given to more collaborative models for particular members of the community.

Program specific (E-PillPal 2008) and broad studies about the use of information technology in medication safety and management suggest that these systems can be effective in the identification of medication errors (Bates, Scott Evans et al. 2003) and the reduction of ADEs (Kaushal, Barker et al. 2001). However, these studies point out that limited data is available for specific packages. An evaluation specifically focusing on medication management technology for use in the home could not be sourced for the review.

Key opportunities identified in alternative medication management programs include a strong role for nurses, education of patients, and collaboration between health professionals. New technologies are identified as having a *potential* role.

3.7 Outcomes of participation in HMR and comparable programs

The literature on outcomes of HMRs and other medication review processes provide inconsistent evidence of efficacy. A number of studies from Australia and overseas are presented below. Most international interventions bear similarities to the program, but do not use the HMR model of service delivery and caution is urged in the over-application of findings research to the Australian context (Rigby 2007; Kelly 2007a; Kelly 2007b).

Medication review outcomes described in the literature can be broadly classified into two types:

- 'Primary outcomes' such as the identification of medication-related issues, changes to regimens and increased understanding of medication requirements
- 'Secondary outcomes' such as reductions in hospital admissions and health system costs, improved health and quality of life.

It may seem reasonable to assume that the former 'primary' outcomes would logically lead to the latter 'secondary' outcomes. The review of the literature revealed evidence that HMRs were affecting primary outcomes; however, evidence for secondary outcomes were limited and, at times, contradictory.

3.7.1 Outcomes and evidence of efficacy

Australian studies looking at efficacy of the HMR Program reported that the program is successful in the identification of medication related issues and in suggesting alternatives to problematic regimes.

Based on a non-controlled study of one Australian practice ($n = 49$), Quirke and associates (2006) concluded that HMRs were effective in identifying issues and affecting regime change (Quirke, Wheatland et al. 2006). Following a HMR, the study found that 20% of consumers discarded some of their medications and a further 25% changed their medication regimen. Moreover, Quirke felt that ... *HMR may improve delivery of appropriate medicines and relationships between GPs, pharmacists and patients* (Quirke, Wheatland et al. 2006, p.266).

In a study of a pilot program of HMRs for recently discharged patients, Nguyen and colleagues concluded that the intervention was effective in identifying clinically significant issues (Nguyen, Yu et al. 2007). In 21 reports, 98 issues were identified and of these 90% were described as clinically significant and 2 cases were potentially life saving (Nguyen, Yu et al. 2007, p.111).

Meanwhile, in 2006 Bell and associates concluded that HMRs are an effective mechanism to facilitate pharmacy-led investigation into medication use among people receiving treatment for mental illness in a community setting. The study examined HMR documentation from a sample of home visits in Sydney ($n = 49$) and found that a high incidence of drug-related problems and of overall drug use was identified and documented during the HMRs (Bell, Whitehead et al. 2006, p.415). The study also noted that recommendations made by the pharmacist were often accepted by the GP. For instance, when a non-drug treatment was recommended, the GP acted upon this advice 41% of the time, whilst when a new drug treatment was recommended, the GP heeded this advice in 49% of cases (Bell, Whitehead et al. 2006).

Based on a survey of consumers who had undergone a HMR, the Consumer Health Forum (2001) concluded that a number of positive outcomes were apparent following a HMR; these included

improved medication management and an enhanced relationship with GPs and pharmacists. The study also noted that almost half of these consumers reported improvements in their health. However, the authors of this survey are quick to state that this finding should be interpreted with caution⁸.

The *Australian Journal of Pharmacy* anecdotally reports a range of direct and indirect benefits arising from HMRs. These included: facilitation of identification of medication issues by GPs; implementation of skills and knowledge by pharmacists; increased opportunity to discuss medication needs for consumers; and facilitation of consumer follow-up for pharmacists (Sorensen, King et al. 2004).

International studies that showed evidence for medication management program efficacy also tend to report that medication reviews conducted by community pharmacists with reports to general practitioners were likely to have had a direct impact on medication usage.

In 2006 Burkiewicz and Sweeney (Burkiewicz and Sweeney 2006) found pharmacists' reviews of medication usage amongst seniors of a US community housing centre identified 119 Medication Related Problems (MRPs). On examination of the pharmacists' notes, Burkiewicz and Sweeney identified high levels of unnecessary medications, low levels of consumer compliance and the need for further medication management. The majority were referred to another health care professional to resolve the problem identified.

A similar program conducted in the US state of Iowa also concluded that medication reviews by community pharmacists were effective in promoting improvements in medication regimens. In the Medication Therapy Management (MTM) program, community pharmacists assessed medication use of ambulatory patients with chronic illness, pharmacists then made written recommendations to the patient's physician, and the physicians subsequently responded (Doucette, McDonough et al. 2005). Following a review of data gathered from 150 patients, Doucette and associates found that physicians accepted 47% of the 659 recommendations to alter medication use made by pharmacists, with the highest rates of agreement to stop or change a medication.

3.7.2 Secondary outcomes: limited evidence for efficacy

Ponniah and associates conducted a meta-analysis of seven **Australian** studies evaluating outpatient or post-discharge medication reviews for heart failure patients (Ponniah, Anderson et al. 2007). The study concluded that there was *some* evidence of health-related benefits for these patients as a result of the review and that *“in six of these studies, positive outcomes, such as decreases in unplanned hospital readmission, death rates and greater compliance and medication knowledge were demonstrated”* (Ponniah, Anderson et al. 2007, p.343). However, in the course of analysis the study also assessed the quality of the evidence under review, and noted that each demonstrated a potential for bias.

Also in the Australian context small-scale studies and anecdotal feedback (typically reported in editorial pieces) suggest that HMRs may lead to positive health outcomes. A study by Vowles (Vowles is an employee of The Guild.) suggested a range of both clinical and fiscal outcomes could be realised as a result of medication reviews (Vowles 2007). Vowles suggested that those who had been subject to a medication support program (similar to HMR, although few details were provided) were slightly less likely to experience a hospital readmission and medication discrepancies at discharge, but showed higher levels of compliance and knowledge when compared to those who had not. Vowles estimated that the support program involving pharmacists visiting patients on Warfarin post-discharge had the potential to save up to \$10m per year in reduced bleeding costs if implemented nationally (Vowles 2007).

⁸ The sample size and methodology were not reported in the article sourced for this review.

Internationally, most studies showed limited robust evidence on this subject. In 2005 Holland and associates conducted a randomised controlled trial of ‘Home-Based Medication Reviews’ as part of the UK based HOMER study (as described in Section 1.6.2) (Holland, Lenaghan et al. 2005). The key outcome under consideration was the incidence of hospital readmission for those who had and had not been subject to a review. The study tracked health outcomes for 872 patients. Counter-intuitively, the HOMER trial *increased both* hospital admissions and GP visits and was *not* associated with a positive impact on quality of life or mortality. Holland and colleagues subsequently followed up the HOMER trial with a systematic review and meta-analysis of 32 studies looking at the effects of pharmacist-led medication review on hospital admissions and deaths in older people (Holland, Desborough et al. 2008). They concluded that there was insufficient evidence to suggest that medication reviews were effective in reducing hospital admissions (*‘no significant effect on all-cause admissions’*) or mortality (*‘trials found no significant benefit for mortality’*) (Holland, Desborough et al. 2008). They did, however, conclude that medication reviews could improve knowledge and adherence, and may slightly decrease the number of drugs prescribed.

A similar randomised controlled trial conducted by Lenaghan and associates in the United Kingdom reached the same conclusion (Lenaghan, Holland et al. 2007). The trial of the POLYMED intervention (as described in Section 1.6.2) was conducted to assess the impact of reviews for at-risk older people on hospital admissions. Following a review of 136 patients receiving two home visits by a community pharmacist, the researchers detected no significant effects at 6-months post intervention in hospital admissions, care home admissions or deaths. They concluded: *“No positive impacts on clinical outcomes or quality of life was demonstrated”* (Lenaghan, Holland et al. 2007, p.293). However, they did note that the intervention appeared to reduce the number of medications prescribed, and thus might represent a modest reduction in costs.

In regards to cost outcomes, recent cost studies in the Australian healthcare system could not be sourced for this review. However, two UK studies identified small or insignificant financial gain as a result of medication reviews.

In 2007 Pacini and associates compared medication and hospital costs for those who received a medication review as part of the HOMER trial, and those in the control group who had not received a review (as discussed above). The researchers concluded that the intervention resulted in *“... a small, non-significant gain in quality of life, no reduction in hospital admissions and a low probability of cost effectiveness”* (Pacini, Smith et al. 2007, p.171).

In contrast, another randomised controlled trial and cost-minimisation analysis concluded that medication reviews did not necessarily lead to cost-savings. After analysis of health cost data for 1,480 patients who had (intervention group) and had not (control group) taken part in a community pharmacist-led medicines management service for patients with coronary heart disease, Scott and associates observed that *“The cost of the intervention outweighed the observed reduction in the cost of drugs in the intervention group”* (Scott, Tinelli et al. 2007, p.398) and that *“...the greater cost in the intervention group largely reflects the additional cost of the pharmacist training and the time taken to deliver the intervention”* (Scott, Tinelli et al. 2007, p.398).

3.8 Information gaps and hypotheses for further testing

The review of the literature readily available since 2005 leaves a number of questions and avenues for further consideration.

Primarily, the variability in outcomes resulting from HMRs and other community based medicine reviews warrants further examination. Specifically, the discrepancy between primary and expected secondary outcomes resulting from HMRs (discussed in sections 3.7.1 and 3.7.2) could be further explored.



Investigation of whether *hospital admissions* are a negative outcome of medicine reviews should be considered. It is possible that admission could be a *positive* aspect of a HMR. For example, an admission may have been triggered by a review and act in a preventative manner, circumventing a longer term and more serious problem that may have arisen in the absence of a HMR.

Several articles included in the literature review indicated that technologies and alternative approaches demonstrate a potential for integration into the HMR model. In particular:

- The information and education packages provided by MATES in Australia, and to a lesser extent the ISMP in the US
- The inclusion of other health professionals in the referral process such as nurses
- Modern technology including internet and telecommunications devices could also play a role in the further promotion of effective medication management.

Since 2005, much of the research and anecdotal reporting has centred on enablers, barriers and uptake factors relating to health professionals (pharmacists, GPs etc) participation. Little work has been undertaken to provide evidence from the consumer perspective since the Urbis Keys Young report of 2005, prepared for The Pharmacy Guild. The qualitative component of the HMR research reported herein will contribute to filling this gap in knowledge.

3.9 Conclusions arising from Literature Review

The available research identifies the widespread extent of adverse medication events and the resultant impact on health services. Key populations identified as having the potential to benefit from appropriate medication management interventions include the elderly and persons from culturally and diverse backgrounds. Discharge from hospital was also identified as a key event at which time medication management is important, as well as a time when consumers are disappointed with medication information they receive.

There was a dearth of evidence identifying drivers of participation in HMRs by health professionals, with only anecdotal or editorial material available on the subject. However, numerous barriers were identified. Much has been published in the form of editorial opinion indicating levels of professional concern with the issue.

New research does not provide strong evidence for effective outcomes or cost effectiveness.

Nevertheless, medication reviews continue to be supported as an important tool in the repertoire of GPs and pharmacists in raising awareness of medication safety and ultimately reducing adverse events and unnecessary hospital admissions.