Assessment of Home Medicines Review (HMR) and non-HMR in Aboriginal and Torres Strait Islander patients with chronic disease receiving integrated pharmacist support within Aboriginal Community -Controlled Health Services (IPAC Project)

REPORT TO THE PHARMACEUTICAL SOCIETY OF AUSTRALIA FOR THE IPAC PROJECT

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Prepared by: Couzos S, Smith D, Buttner P, Biros E. College of Medicine and Dentistry, James Cook University, on behalf of the IPAC Project Team.

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Integrating Pharmacists within Aboriginal Community Controlled Health Services (ACCHSs) *to improve Chronic Disease Management* (IPAC) Project.

Correspondence:
Associate Professor Sophia Couzos
General Practice and Rural Medicine
College of Medicine and Dentistry,
James Cook University,
Townsville, Queensland, 4811
Australia

ABSTRACT

Objective
To assess the effect of integrated pharmacist interventions on utilisation of Home Medicine Reviews (HMR, MBS item 900) and medication reviews not fully meeting HMR criteria (non-HMR) in Aboriginal and Torres Strait Islander adults with chronic disease attending Aboriginal Community Controlled Health Services (ACCHSs) enrolled in the IPAC study, compared with usual care.

Design and participants
Consented participants enrolled in a non-randomised, prospective, pre and post quasi-experimental community-based, participatory, and pragmatic study that integrated a registered pharmacist within ACCHS in Qld, NT and Vic. The intervention comprised non-dispensing medicines-related services, collaborative and coordinated care, including the provision of medication management reviews. Deidentified participant data was electronically extracted from health records including claims for Medicare Benefits Schedule (MBS) item 900 (HMR). Pharmacists electronically logged HMR, non-HMRs and descriptive data. Medication related problems (MRPs) were defined mostly by Medication Appropriateness Index criteria.

Outcome measures
Number and proportion of participants with at least one HMR over a 12-month pre-intervention period representing usual care compared to post-intervention at the end of the study; number and proportion of non-HMRs; reasons for reviews and follow-up reviews, and their characteristics including the prevalence of MRP and proportion of participants with MRPs by type of review.

Results
Participants (n=1,456) from 18 ACCHSs involving 26 integrated pharmacists had a 3.9 times (p<0.001) significant increase in HMR access (based on MBS claims) compared with usual care whilst the number of HMRs (MBS claims) increased 4.1 times (p<0,001). There were 609 (41.8%) HMR, and 719 (49.4%) non-HMR recipients after a mean of 284 days (SD ±11.5) following study enrolment. HMR recipients had a mean age was 58.7 years (SD ±21.9), a mean of 8 prescribed medications each, and 89% had comorbidity. The vast majority of HMR and non-HMR recipients were Aboriginal and/or Torres Strait Islander. Almost all HMRs were undertaken by IPAC pharmacists. A HMR or non-HMR was most commonly indicated for participants taking 5 or more regular medications (78% and 66%, p=0.037) and/or suspected non-adherence (38% and 43%, p=0.364 respectively) The median time for completing a non-HMR was 1 hour 15 mins (30 mins less than an HMR). Of non-HMRs, 91% (n=689) were conducted within the ACCHS; whilst most recipients were from remote (19.8%) or very remote ACCHSs (21.4%); and had the non-HMR commonly completed for opportunistic reasons being at risk of forgoing a HMR [48.1% (n=364)]. Limited access to an accredited pharmacist (30.6%), and patient preference (14.1%) were also reasons for a non-HMR. Pharmacists delivered 1,548 follow-up assessments to HMR or non-HMR- recipients (median time to assess was 30 mins). Of HMR recipients, 87.9% (n=535) compared with 70.0% (n=503) of non-HMR recipients had at least one MRP (p=0.035). Non-HMR eligibility criteria, participant need for a medication review, pharmacist recommendations, and identified types of MRPs in recipients were similar to a HMR.

Conclusion
Within ACCHS, integrated pharmacists significantly increased access to medication management reviews (HMR and non-HMR), and follow-up to these reviews for Aboriginal and Torres Strait Islander adults with chronic disease. Pharmacists needed to assess only 5 participants for one to receive an HMR. Pharmacists integrated within ACCHSs are well placed to deliver medication management reviews to patients who experience barriers in accessing HMRs under current program rules, especially for patients who would otherwise forgo a medication review. Generalisability of the outcomes observed from the integrated pharmacist intervention to the broader ACCHS adult patient population with chronic disease who are at risk of developing medication related problems, is supported.

INTRODUCTION

In Australia, a Home Medicines Review (HMR) is a review of the patient's medications that aims to achieve safe, effective, and appropriate use of medicines by assisting healthcare providers to detect and address medicine-related problems that interfere with desired patient outcomes.[1] A general practitioner (GP) and an accredited pharmacist can be funded for a HMR under a fee-for-service arrangement from the Medicare Benefits Schedule (MBS)[2] and the 6th Community Pharmacy Agreement (6CPA).[3] The effectiveness of medication reviews (in all their forms) in reducing medication errors and medication-related problems, enhancing patient safety with regard to the use of medicines, improving medication adherence, reducing the number of prescribed medications, improving clinical biomarkers, and reducing hospitalisation, have been reported.[4] [5] [6] [7]

Currently, registered pharmacists provide only limited clinical pharmacy services to Indigenous Australians due to several barriers.[8] [9] These include prohibitive HMR business rules and processes that are not always possible or culturally acceptable.[10] [11] Many Aboriginal health services provide few HMR referrals due to issues with the cultural responsiveness of pharmacists, and lack of relationships pharmacists have with these services.[12] [13] Yet, when medication reviews are delivered in culturally appropriate settings (such as in Aboriginal health services) there is great potential to increase patients' medication knowledge, medication adherence and to improve chronic disease management.[14]

The Australian Government Department of Health, under the Pharmacy Trials Program (PTP, Tranche 2) funding as part of the Sixth Community Pharmacy Agreement (6CPA) sought to improve clinical outcomes for patients utilizing the full scope of pharmacist's role in delivering primary health care services. This Program supported a project to investigate the potential gains in health outcomes arising from integrated models of care within Aboriginal health settings- the *Integrating Pharmacists within Aboriginal Community Controlled Health Services* (ACCHSs) *to improve Chronic Disease Management* (IPAC) Project. The project explored if integrating a registered pharmacist as part of the primary health care (PHC) team within ACCHSs (the intervention) led to improvements in the quality of the care received by Aboriginal and Torres Strait Islander peoples with chronic diseases. Pharmacists integrated within ACCHSs delivered medication management reviews such as HMRs and another type

of comprehensive medication review that was conducted under circumstances that did not comply with the HMR program. These circumstances included reviews conducted outside the patient's home, or if the pharmacist conducting the review was not accredited to conduct a HMR. These comprehensive reviews were designated for the purposes of the study as 'non-HMRs'. Integration within ACCHSs meant that pharmacists had identified positions and core roles, shared access to clinical information systems, provided continuous clinical care to patients, received administrative and other supports from primary health care staff, and adhered to the governance, cultural, and clinical protocols within ACCHSs as part of their shared vision.

The IPAC project commenced in 2018 and recorded the number of participants in receipt of HMR and non-HMR services, reasons for referral, and the characteristics of these reviews including the prevalence of medication related problems (MRPs) by type of review. The aim was to investigate if the number of Aboriginal and Torres Strait Islander participants in receipt of HMRs increased after integrated pharmacist service provision within the ACCHS setting, compared to a 12-month usual care baseline period that preceded the intervention.

METHOD

The IPAC project was a pragmatic, community-based, participatory, non-randomised, prospective, pre and post quasi-experimental study (Trial Registration Number and Register: ACTRN12618002002268) that integrated a registered pharmacist within the ACCHS primary healthcare team for up to a 15-month period. ACCHS services (n=18) were recruited for the project across three jurisdictions: Victoria, Queensland and the Northern Territory (NT), and comprised 34% (18/53) of all ACCHSs in these jurisdictions. Patients recruited into the study were aged 18 years and over with a diagnosis of: cardiovascular disease (CVD), Type 2 diabetes mellitus (T2DM), chronic kidney disease (CKD), or other chronic conditions and at high risk of developing medication-related problems (e.g. polypharmacy).

The IPAC project methodology has been described in detail elsewhere,[15] and health services characteristics were summarized in a separate report.[16] Briefly, IPAC pharmacists delivered non-dispensing clinical medication-related services within ACCHSs through a coordinated, collaborative and integrated approach to improve the quality of care of patients (the

intervention). ACCHS sites were similar to other ACCHSs in their jurisdiction according to geographic location, and proportionate patient distribution by sex and Aboriginality [data not shown]. Six ACCHSs were eligible for remote area support from community pharmacy through the section 100 program. These services continued to receive this form of remote area support during the intervention phase of the IPAC study. The Section 100 program supports the quality assurance of medications dispensed from remote area Aboriginal health services[17] and does not involve the provision of HMR services. Five ACCHS sites participated in the Health Care Homes (HCH) program funded by the Australian Government designed to better coordinate the health care of patients with chronic disease,[18] with all located in the NT and predominantly in remote locations. The intervention phase of the IPAC study comprised the period from participant enrolment to the end of the study (31st October 2019).

As a pragmatic trial, pharmacists functioned within existing and usual primary health care service delivery systems and were trained to deliver ten core roles during the intervention phase. Pharmacists provided medication management reviews (to resolve identified medication -related problems and optimise prescribing quality), assessed adherence and medication appropriateness, provided medicines information and education and training, collaborated with healthcare teams, delivered preventive care, liaised with stakeholders, provided transitional care, and undertook a drug utilisation review. Their intervention targeted both consented patients (participants) and practices, with practice-specific activities directed to health professionals and systems within the service.

Patient-specific services included the conduct of medication management reviews. Two types of medication reviews were undertaken by pharmacists: a) Home Medicines Review (HMR, also known as Medicare item 900), and b) non-HMR which was a comprehensive review that did not fulfil the MBS HMR criteria, such as a review conducted outside the patient's home or by a non-accredited pharmacist.

Home Medicines Review

According to the MBS rules, an item 900 rebate can be claimed as a fee-for service when the patient's usual general practitioner (GP) obtains patient consent and requests a HMR from a

pharmacist. To be eligible for this service, the patient must have 'a chronic medical condition or a complex medication regimen, and not [have] their therapeutic goals met'.[19] For the HMR, the GP is required to refer the patient to a community pharmacy or an accredited pharmacist after which a discussion with the reviewing pharmacist must include the results of the review including suggested medication management strategies. The HMR must also include the development of a written medication management plan by the GP following discussion with the patient, which is then provided to a community pharmacy chosen by the patient.[20] Provided that all relevant program rules are met, a separate pharmacist service fee for the HMR can be remunerated under the 6CPA.

The MBS item for a HMR can be claimed once in each 12-month period except if the patient's condition or medication regimen has significantly changed. Thus, a HMR is not intended to be conducted as an ongoing annual review.[21] Based on these MBS rules, every IPAC participant was eligible for a HMR (item 900 claim) at least once during the project period if their therapeutic goals were not being met.

At the time of this study, regulatory requirements for GPs in relation to MBS Item 900 rebate required the pharmacist to visit the patient at home 'unless exceptional circumstances apply, or they are an Aboriginal or Torres Strait Islander patient'. [22] The patient must also consent for the pharmacist to visit the patient at home. At the same time, 6CPA Program Rules for pharmacists conducting HMRs required the service to be conducted in the patient's home unless prior written approval to conduct the HMR in an alternate location was granted by the Pharmacy Programs Administrator. Seeking approval required the accredited pharmacist to submit a variation request through the administrator at least 10 working days prior to the proposed date of the HMR Interview. The approval process also required patient details to be shared with the Australian Government, Department of Health.[23] This process posed a potential risk that there would be a loss of patient engagement especially in ACCHS settings where staff were often managing opportunistic healthcare delivery.[24] As such, the IPAC project introduced an alternative type of medication review which could be delivered by integrated pharmacists in a location of the patients' preference (such as the clinic) without the need for a home visit (a non-HMR).

Non-Home Medicines Review

For the purposes of the IPAC project, a non-HMR is a comprehensive medication review conducted by an IPAC pharmacist that could be undertaken outside the participant's home for those whose therapeutic goals were not being met, and was defined by eight mandatory criteria that included:

1. an interactive face-to-face or telehealth interview with the patient;

2. the collection of patient-specific data;

3. the compilation of a comprehensive medication profile;

4. education of the patient about their medications;

5. the assessment of the medication profile to identify medication-related problems;

6. prioritizing a list of medication-related problems;

7. recommendations made and documented in the ACCHS clinical information system; and

8. recommendations discussed with the prescriber.[25]

The non-HMR criteria were developed as a modification to the Pharmaceutical Society of Australia (PSA) criteria for the pharmacist provision of HMR services. IPAC pharmacists logging the completion of a non-HMR for this study were required to confirm the completion of all eight criteria. Consequently, all completed non-HMRs fulfilled all eight criteria. Non-HMRs were not billable by GPs under the MBS and did not incur a pharmacist fee under the 6 CPA.

A non-HMR was distinct from a HMR in that a non-HMR allowed for an opportunistic medication review by a pharmacist without needing a referral from the patient's GP; the non-HMR could be conducted within or outside the patient's home; and the absence of frequency restrictions for a non-HMR whereupon a patient may have a non-HMR following a HMR, or repeat non-HMRs as deemed clinically necessary. Unlike the HMR, the project protocol did not stipulate that the medication management plan arising from a non-HMR needed to be forwarded to the patient's usual or preferred community pharmacy, with this requirement being optional.

Follow-up to an HMR or a non-HMR

The project protocol required that an IPAC pharmacist should schedule a patient follow-up 3-6 months after the completion of an HMR or a non-HMR. Information regarding pharmacist's follow-up activity was collected for patients who had a HMR or a non-HMR. Pharmacists undertaking a follow-up activity were required to fulfil three criteria for each activity:

1. reinforce the HMR and non-HMR advice and recommendations provided by the pharmacist (and the GP, if appropriate);

2. assess the impact of any actions recommended from the HMR or non-HMR; and

3. determine if another HMR or non-HMR, education session or preventive intervention was needed.

Pharmacists logging the completion of participant follow-up for the IPAC study were required to confirm the assessment of all three criteria. Pharmacist follow-up activity up to an HMR or a non-HMR was not billable under the MBS and did not incur a pharmacist fee.

Medication-related problems

For every HMR or non-HMR during the intervention phase, pharmacists were required to report any MRPs identified. The prevalence of MRPs was not ascertained pre-intervention as this did not comprise usual care.

MRPs are commonly defined as 'an event or circumstance involving a patient's drug treatment that actually, or potentially interferes with the achievement of an optimal outcome', and can arise from medication inappropriateness as well as other factors.[26] Given the absence of an established consensus on which classification system for MRPs to use,[27][28] [29] the research team derived a small list of MRPs adapted from some of the criteria in the Medication Appropriateness Index (MAI) that have also been used to assess drug-related problems,[30][31] supplemented by two additional problems commonly reported in other studies.[32][33]

The MRP criteria adapted from the MAI were to assess if: at least one medicine was not indicated, was ineffective for the condition, had a drug-drug interaction, and/or had a drug

to condition interaction; if there was an unnecessary duplication of drugs; the patient directions were incorrect; and/or the patient directions were impractical. The remaining MAI criteria that took account of the duration of therapy and the least expensive drug alternative, were not used to assess MRPs. The two additional MRP criteria included in the IPAC study explored if any medicine was associated with an adverse drug reaction, and if the medication dosage was subtherapeutic or if there was an overdosage. Pharmacists could also report 'other' MRPs not included in this list, or the complete absence of a MRP. This categorization of MRPs is consistent with the nine criteria used in a study involving the integration of pharmacists within general practice teams[34] except that MRP criteria for the underuse of medications, problems related to laboratory testing to monitor medications, nor subcategories of any of the criteria were included. Other more complex classification methods to assess MRPs were not used due to the time intensive nature of this activity and the lack of validation within the ACCHS context.[35] The IPAC study explored the underuse of medications in a separate analysis.[36]

The MAI criteria were familiar to pharmacists who were trained to use these criteria, and the tool was externally validated to assess the potential for medicine-related risks that outweigh the benefits to the patient.[37 38] In assessing for MRPs, pharmacists were not required to evaluate medication appropriateness nor to derive the MAI score, but merely to indicate if the criteria were met for any medication following the participants' medication review.

Study participants

A non-probability sampling method was used to recruit participants to the IPAC study where health service staff and pharmacists invited patients attending ACCHSs for their usual care. Patients were consented into the study by pharmacists or other health service staff according to the cultural protocols of the IPAC service. Once consented, pharmacists provided supportive clinical care as part of the primary healthcare team to meet the individual needs of the participant. All participating health service sites included participant access to a GP. The decision to provide any medication review to a participant was based on usual clinical criteria consistent with MBS rules, and was a decision made by the GP, with or without consultation with the IPAC pharmacist.

Pharmacists

The Pharmaceutical Society of Australia (PSA) recruited pharmacists to be integrated within ACCHSs, in partnership with the National Aboriginal Community Controlled Health Organization (NACCHO). IPAC pharmacists fulfilled the following eligibility criteria: registration with the Australian Health Practitioners Regulation Agency (AHPRA); more than 2 years' post-registration experience; and post-graduate clinical qualifications or demonstrated clinical experience. Accreditation to conduct an HMR was preferred, however it was not mandatory for IPAC pharmacists. Accreditation is conferred by a credentialing body in Australia (such as the Society of Hospital Pharmacists of Australia) and permits the pharmacist to conduct and claim payment for a HMR.[39] These criteria enabled the selection of pharmacists with skills aligned to the expected scope of practice for this project.

As a member of the health care team, all pharmacists had access to participants electronic medical records held at the ACCHS. Medications were accepted by pharmacists as 'prescribed' if they were included in the patient's current medication list within the records. Pharmacists were also able to check other sources of information to validate the current medication list such as correspondence from specialist clinicians, discussion with the individual patient, or other clinical staff.

Pharmacist accreditation for HMR

The HMR for IPAC patients could have been conducted by the accredited IPAC pharmacist or by an external pharmacist. In services where IPAC pharmacists were not accredited to conduct an HMR, the GP may have referred the HMR service to an external accredited pharmacist from a local community pharmacy. The IPAC pharmacist may have assisted the external pharmacist to conduct the HMR by facilitating the sharing of relevant patient information. If this activity involved the IPAC pharmacist assisting in the patient interview, this would have resulted in the external pharmacist not being remunerated for those HMR services without prior approval.[40] Thus, it was expected that this type of assistance from IPAC pharmacists to external pharmacists would be uncommon.

Pharmacists were required to record if a HMR conducted during the project period was completed by an IPAC or external pharmacist. If the HMR was conducted by an accredited IPAC pharmacist, the HMR was conducted either within IPAC hours or outside IPAC hours. If the HMR was conducted within IPAC hours, the IPAC pharmacist was not specifically or additionally remunerated for this activity with regard to the 6CPA fee. An algorithm for HMR and non-HMR completion within the IPAC project is included as Figure 1.

Data collection

De-identified participant data was collected from two existing clinical information systems (CIS) used by ACCHSs (Best Practice and Communicare) to manage patients' electronic health records and a bespoke online database (pharmacist logbook) to record information about pharmacist activity. Demographic, biomedical and health service utilization indices were extracted from CISs in de-identified form using an electronic tool called GRHANITE that required remote installation and regular extraction from IPAC sites for the term of the project.[41] Participant consent was recorded in the CIS by pharmacists. GRHANITE extracted data only from consented patients and copied it to a JCU databank employing internationally recognised point-to-point encryption (P2PE) mechanisms to protect data in transit.

The scope of the data extractions was agreed based on IPAC-specific data requirements and extract definitions for GRHANITE XML's (site interfaces) to ensure they were fit-for-purpose, such as for MBS item claims. All ACCHSs consented to the installation of GRHANITE and the de-identified data extractions required for the project. Each ACCHS successfully completed 'site acceptance testing' that confirmed the extraction of fit-for purpose data. The integrity of the data extraction process was monitored with weekly data uploads. XML interface maintenance ensured that any vendor software upgrades to the CIS were aligned with data extract definitions. The deidentified CIS participant identification numbers in the GRHANITE extractions linked with participant data recorded by pharmacists in the logbook.

The pharmacist logbook was a secure password protected online database, accessible from any device connected to the internet, with dual recording and reporting functionality. The electronic interface was developed to be intuitive and user-friendly to minimise the burden

of data entry and reporting. Pharmacists were trained to record details of HMR and non-HMR medication review assessments that they completed in the logbook. Pharmacists were required to document the clinical indications for a HMR and a non-HMR, the location where the non-HMR was conducted, the reasons for selecting a non-HMR over a HMR for the patient, and if an MBS rebate claim for item 900 was generated by the health service as well as reasons for not claiming. Pharmacists also recorded clinical diagnoses in the logbook based on what was documented in electronic health records or supplemented by discussion with clinicians. The logbook did not contain details regarding HMRs that were completed by non-IPAC (external) pharmacists for IPAC participants.

GRHANITE extracted relevant MBS claims data for each consented IPAC participant including MBS item 900 (HMR) for the 12-month period prior to participant enrolment into the study (representing usual care pre-intervention) and for the duration of the intervention until the end of the study set at 31st October 2019. The number of MBS claims for a HMR in the 12 months prior to participant enrolment was defined as 'baseline', whilst the number of claims from enrolment until the end of the study was defined as the intervention period or follow-up period. The frequency and characteristics of completed non-HMRs was recorded in the logbook by IPAC pharmacists.

Data analysis

All participants with less than 90 days between baseline and follow-up were removed from the analysis due to their short length of stay in the study. Health Care Homes (HCH) participants who were concomitantly enrolled in another program- the '*Community Pharmacy in Health Care Homes Trial* '[42] - were also removed from the analysis.

Participant characteristics and MBS claims data was extracted from the JCU SQL Server database using the Navicat 15 for SQL Server (PremiumSoft) database management tool, whilst HMR, non-HMR and MRP data was extracted from the pharmacist logbook as Microsoft Excel files, and subsequently analysed using a number of statistical tools including the SPSS Statistics Premium version 24 (IBM) statistical package, Stata/MP 13.0 (StataCorp LP), and Microsoft Office 2016 (Microsoft). Nominal variables are presented as absolute and relative frequencies. Depending on their distribution, continuous variables are presented as

mean and standard deviation (SD) or median and inter-quartile range (IQR), as indicated accordingly. The event rates of MBS item claims were calculated for pre and post intervention as the number of participants with claims (or the number of claims) per 100 person-years of observation. MRPs were classified according to explicit criteria and free-text responses documented in the pharmacist's logbook. Responses were coded and thematically analysed according to identified problems commonly reported in Australian studies.[43][44]

The study design of IPAC involved cluster sampling using ACCHSs as the primary sampling units. As a consequence, statistical analyses were cluster-adjusted for the design effect of ACCHSs. P-values for comparisons between baseline and end of the study for changes in nominal and continuous variables (unpaired data) were determined using logistic regression analyses that were cluster-adjusted for ACCHSs. P-values for comparisons between baseline and end of the study for changes in nominal variables (paired data) were determined using conditional logistic regression analyses that were cluster-adjusted for ACCHSs. P-values for changes in numerical variables for participants (paired data) were derived from the cluster-adjusted confidence interval (ACCHS cluster) of the differences as this is equivalent to a paired t-test.   Statistical significance was assumed at the conventional 5% level.

Ethics approval

Ethics approval for the project was received from four ethics committees in the three jurisdictions including St Vincent's Hospital Melbourne (SVHM) Human Research Ethics Committee (HREC), Victoria (HREC/17/SVHM/280), James Cook University HREC (mutual recognition of SVHM HREC, approval HREC/H7348), Menzies School of Health Research (HREC/2018-3072) and the Central Australian HREC (HREC/CA-18-3085).

RESULTS

A total of 26 IPAC pharmacists participated in the intervention, and of these 20 (77%) were accredited to conduct HMRs. One pharmacist acquired accreditation during the study intervention. The total IPAC cohort comprised 1,456 enrolled participants who remained in the study until the end, from whom logbook and MBS item 900 claims data at baseline and follow-up was available (Figure 2).

During the intervention phase, 609 (41.8%) participants were recipients of at least one HMR, and 719 (49.4%) participants received at least one non-HMR (Table 1). Of these participants, 101 (8.2% of participants with ≥1 medication management review) had both an HMR and a non-HMR. The proportion of HMR and non-HMR recipients that had both assessments did not differ between them (P=0.676 from cluster-adjusted logistic regression; ACCHS cluster) and they were therefore retained in the analysis. Participants were followed-up for a mean of 284 days (SD± 11.5) following enrolment into the study (Table 2).

The characteristics of participants who received a HMR and a non-HMR during the study is shown in Table 1. The mean age of HMR recipients at baseline was 58.7 years (SD± 21.9). Participants did not differ according to the type of medication review they received with respect to age, sex, the geographical location of the ACCHS they attended, pensioner status, the number of prescribed medications, the number of doctors encounters prior to enrolment, self-reported medication adherence, self-assessed health status, the presence of co- or multimorbidity, nor in the proportion with a clinical diagnosis of type 2 diabetes mellitus (T2DM), hypertension, dyslipidaemia, chronic kidney disease (CKD), rheumatic heart disease or acute rheumatic fever, chronic obstructive pulmonary disease (COPD) or depressive disorders. Recipients of a HMR were just as likely to have had a previous HMR at baseline (12 months prior to study enrolment based on MBS item 900 claims) as recipients of a non-HMR (15.4% versus 7.5%, p=0.111, Table 1).

Almost all HMR recipients (96.4%) were Aboriginal and/or Torres Strait Islander, compared with 88.2% of those who received a non-HMR (p=0.001, Table 1). Although participants who had a non-HMR were more commonly attending ACCHSs in remote (19.8%) or very remote (21.4%) locations compared to those with an HMR (0.3- 3.8% respectively), this difference was not significant (p=0.178). However, non-HMR recipients were significantly more likely to be patients engaged with the HCH program than recipients of an HMR (17.0% versus 2.0%, p =0.039), which is consistent with the predominantly remote geographical location of IPAC ACCHSs participating in the HCH program.

HMR recipients were significantly more likely than non-HMR recipients to be eligible for Close the Gap (CTG) scripts which are only for non-remote Aboriginal and Torres Strait Islander persons (90.8% versus 60.6%, p=0.009), and to have established or existing cardiovascular disease (CVD) (37.3% versus 29.1%, p=0.006).

Completed HMRs (by MBS rebate claim for item 900)

At baseline, 10.0% (146/1456) of participants had received at least one HMR based on MBS item 900 claims data from CISs and this increased to 30.1% (438/1456) of participants by the end of the study. After intervention, 38.7 (95% CI 29.6-49.3] participants had received at least one HMR for every 100 person-years of observation. This was a significant 3.9 times increase in the number of participants with at least one HMR after the intervention compared with the rate of HMR completion from the preceding 12-months of usual care (p<0.001, Table 2). Similarly, the total number of completed HMRs (based on MBS claims) significantly increased by 4.1 times (p<0.001) post- intervention compared with HMR claims from usual care in the 12-month period preceding the intervention (Table 3).

There were 405 participants who changed from no HMR at baseline to having at least one HMR by the end of the study, indicating an absolute increase of 27.8% in participant access to HMRs (Table 4). However, adjusting for those who already had a HMR at baseline, but did not receive a subsequent HMR (n=113), the net increase in the number of participants who benefited from an HMR during the study was +292. This approach assumes that all 113 participants who had at least one baseline HMR without a subsequent HMR during the intervention period, were potential failures to follow-up. However, the majority of these participants were enrolled in the IPAC study for less than 12 months and may not have been eligible for a repeat HMR according to MBS rules, or may not have required a repeat HMR for clinical reasons. With this conservative approach, only 5 patients needed to be assessed by IPAC pharmacists to result in one additional participant with a completed HMR.

Description of HMRs

According to pharmacists' entries in the logbook, a total of 639 HMRs were conducted for 609 individual participants during the intervention (Table 5 and 6). This number exceeded the number of participants with completed HMRs based on the number of services claimed

for an MBS item 900 rebate (Table 2). The vast majority of participants had one HMR and 30 participants had two HMRs completed during the intervention period (Table 5). The most common reason given for conducting the HMR was the patient taking 5 or more regular medications (n=498, 77.9%), and suspected non-adherence to medications (n=241, 37.7%). HMRs were also completed for patients having difficulty managing their medicines (n=210, 32.9%), and patients attending a number of different doctors (148, 23.2%). Recent discharge from a facility/hospital (in the last 4 weeks) was cited as a reason for 77 (12.1%) of HMRs. More than one reason was often identified for conducting HMRs (Table 6).

Almost all HMRs were completed by the IPAC pharmacist (n=616, 96.4%) with the remaining reviews completed by an external pharmacist (n=23, 3.6%). Of those undertaken by the IPAC pharmacist (n=614), just over half of the HMRs were conducted within IPAC hours (n=324, 52.8%, Table 7). The median time taken for IPAC pharmacists to complete an HMR was 1 hour and 45 minutes (IQR= 45-150 mins).

Of the 23 HMRs conducted by an external pharmacist, IPAC pharmacists provided assistance through the sharing of clinical records or other information, and facilitated ACCHS staff involvement (n=20, 87.0% each) to contextualise and optimise the HMR (Table 8). The primary reason recorded by IPAC pharmacists for the HMR being referred to an external pharmacist was that the health service had an existing arrangement with an external independent pharmacist (n=19, 82.6%, Table 9)

Description of Non-HMRs

Of the participants who had non-HMRs, the vast majority (n=682, 94.9%) had one non-HMR and 36 participants had two non-HMRs during the intervention period (Table 5). A total of 757 non-HMR services were received by 719 individual participants (Table 6). The reasons for conducting a non-HMR were ranked similarly to HMRs for all listed criteria. Like HMRs, the most common reason for conducting the non-HMR was for patients taking 5 or more regular medications (n=497 reviews, 65.7%), and suspected non-adherence (n=328, 43.3%).

HMRs were significantly more likely to be completed than non-HMRs for reasons related to the 'patient taking 5 or more regular medications', 'patient taking more than 12 medicines

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per day', 'patients having difficulty managing their own medicines', 'recent discharge from a facility/hospital (in the last 4 weeks)', and 'patients attending a number of different doctors' (all p<0.05, Table 6).

Reasons for a medication management review such as 'suspected non-adherence', 'significant changes to the patient's medication regimen in the last three months', 'patient on medication requiring therapeutic monitoring', 'symptoms suggestive of an adverse medicine reaction' and other reasons, did not significantly differ between HMRs and non-HMRs (Table 6). Like HMRs, often more than one reason was identified for conducting a non-HMR for the participant. The median time for completing a non-HMR as reported by IPAC pharmacists was one hour and 15 minutes (IQR=60-120 mins).

Location of non-HMR's

The usual location for conducting the non-HMR was within the health service (n=689, 91.0%, Table 10). In only 39 of 757 (5.2%) reviews was the non-HMR completed in the patient's home. Of the 2.9% 'other' locations for the review, most were conducted with the patient via a phone call, with two reviews being completed at dialysis or rehabilitation units. The reviews conducted over the phone may have included an interaction at the health service or at the patient's home prior to or following the phone call.

The most common reason for the health service, participant, or IPAC pharmacist choosing to conduct a non-HMR over an HMR was that the patient was 'at risk of forgoing an HMR' if it was not conducted opportunistically (n=364, 48.1%, Table 11). The next most common reason was 'no accredited pharmacist available' to conduct the review (n=232, 30.6%). Patient preference for the medication review to the conducted outside the patient's home was the third most common reason given for a non-HMR over a HMR (n=107, 14.1% of all non-HMRs). Reasons also commonly related to program rules such as criteria restricting when a repeat HMR was approved, and a cap on the number of HMRs that could be completed by an accredited pharmacist per month. For some non-HMRs, pharmacists reported that a review conducted in the home would be culturally inappropriate (3.3%), or travel to the patient's home posed a risk (2.9%).

HMR and non-HMR recommendations

Pharmacist recommendations following a HMR were most likely to suggest self-management and education advice to the patient (62.3% of HMRs, Table 12). The next most common recommendation was a change in the dose of any existing medication (45.4%), followed by cessation of any medicine (37.9%), advice to community pharmacy (31.3%), pathology testing (28.2%), addition of a new medicine/s (27.4%), and correction to the medication list in the CIS (26.9%). In 11.4% of HMRs, a recommendation was made for a dose-administration aid. IPAC pharmacists rarely recommended referrals to other healthcare providers.

Similarly, for non-HMRs, the most common recommendation was self-management and education advice to the patient (57.6% of all non-HMRs, Table 12). The type and frequency of recommendations for medication change were similar to an HMR. Advice to a community pharmacy featured in only 8.2% of non-HMR recommendations. There were more referrals for a follow-up to the non-HMR (7.4% of non-HMRs recommended a follow-up compared to 0.8% of HMRs), fewer recommendations for a dose-administration aid (6.5%) and no patients required patient registration for CTG scripts.

IPAC pharmacists reported that 61.5% (n=1,165) of all recommendations from HMRs were discussed with the prescriber and of these 66.4% (n=773) were accepted. For non-HMRs, 58.5% of all recommendations were discussed with the prescriber (n=1,052), and 55.5% of these were accepted (n=584, Table 12).

The reason why review recommendations were not discussed with the prescriber varied by type of review and included discussions that were pending for case conferences or appointments, the GP being unavailable, or because recommendations were documented in a report to the GP. For 19.1% of non-HMRs, the pharmacist felt a discussion with the GP was not necessary (Table 13).

Follow-up to a HMR or non-HMR

Pharmacists delivered 1,548 participant assessments as a follow-up to an HMR (n=839, 54.2%) or a non-HMR (n=709, 45.8%) during the intervention. The majority of these assessments

took place at the health service (n=1,126, 71.1%, Table 14). Other follow-up assessments were conducted during transportation of the patient, at the dialysis clinic, community pharmacy, women's group meetings, or by email. The median time to undertake the follow-up to an HMR or non-HMR was 30 minutes.

Of all follow-up assessments, 46.2% (n=715) were discussed with the prescriber. Pharmacists reported it was not necessary to discuss the recommendations of this assessment with the prescriber in 42.2% (n=654) of occasions (Table 15). For the remaining 179 (11.9%) occasions of follow-up to a HMR or non-HMR, pharmacist recommendations were not discussed with the prescriber because the recommendations were provided in a report (such as for a case conference), sent by email, were recorded in the CIS, or the prescriber was unavailable. Pharmacist recommendations were accepted by prescribers on 70.9% (n=506) of follow-up occasions of service but pharmacists were unsure if those from the remaining occasions of service were accepted.

Medication related problems

Of the 609 participants who had at least one HMR, 535 (87.9%) had at least one MRP. A total of 1,056 MRPs were identified by pharmacists from 639 HMRs (Table 16), or 1.65 MRPs per HMR. Some reviews revealed multiple types of MRPs. Of the listed explicit types, the most common MRP was *'at least one medicine was not indicated'* (n=176, 16.7% of all MRPs). Nearly one-third of participants (32.4%, n=174) had this type of MRP following an HMR (as a proportion of all participants identified with at least one MRP). Around one fifth of participants with an HMR (n=102) had *at least one medicine associated with an adverse drug reaction*. A wrong medication dosage, such as the dose being too high was evident in 10.8% (n=58) and 'subtherapeutic dosage' in 13.6% (n=73) of HMR recipients. Other MRPs were identified in nearly 50% of HMR recipients (n=251, Tables 16 and 17).

In comparison, of the 719 recipients of at least one non-HMR, 503 (70.0%) had at least one MRP – significantly lower than reported for those receiving an HMR (p=0.035, Table 16). However, if a problem was identified, the number of MRPs per recipient was similar between review types (1.9 and 2.0 MRPs/recipient for HMRs and non-HMRs respectively, Table 16).

The type of MRPs identified from participants did not significantly differ between HMR or non-HMR recipients for almost every type of MRP. As with HMRs, the most common MRP identified for non-HMR recipients was *'at least one medicine was not indicated'* (n=148, 29.4%, p=0.561). A difference in the proportion of participants with MRPs between the review-types was found only for medications where the dose was too high (10.8% of HMR versus 17.1% of non-HMR recipients, p=0.018), and when *'the patient directions were impractical'* (16.1% HMR, and 10.1% non-HMR recipients, p=0.032). The number of participants with 'other' MRPs also did not differ between recipients of the two review types (p=0.101).

Other MRPs described by pharmacists' (Table 17) included patient non-adherence to medications (25.6% of 'other MRPs' from HMRs versus 30% for non-HMRs), changes in medications or dosages (20-31%), documentation errors (9-16%), a requirement for pathology or other testing (11-24%), and a prescribing omission (9.9-9.2% respectively). In general, the type of 'other MRPs' was similar whether identified from an HMR or non-HMR, although proportionately more 'other' problems were identified with HMRs (Table 16).

DISCUSSION

This study was set in primary health care services that were ACCHSs and is the first to explore the impact of integrated pharmacists on access to medication management reviews (such as an HMR) for Aboriginal and Torres Strait Islander adult patients with chronic disease. At baseline, 10% of participants had received at least one HMR according to MBS claims recorded within the CISs of ACCHSs for the 12 months pre-intervention. After receiving integrated pharmacist services, there was a significant increase in the proportion of participants who received an HMR, increasing by 3.9 times after a median of 284 days enrolment in the study. Pharmacists needed to assess only 5 participants for one to receive a HMR.

Pharmacists logged a greater number of HMRs than was recorded through ACCHS claims for the MBS item 900 rebate. A rebate for MBS item 900 was claimed by IPAC sites for 74% (471/639) of HMRs undertaken by accredited pharmacists (a difference of +168 HMRs). The number of MBS claims underestimates the quantum of HMRs actually completed by

integrated pharmacists. This suggests that claims for the MBS item 900 rebate are underutilised following an HMR. Most of this difference may be explained by GP ineligibility to claim the rebate for rendered services if the patient did not return to the GP to consider the results of the medication management review. Patient attendance is necessary to generate the medication management plan that is required to log an MBS claim. The difference may also be explained if the MBS claim was still pending at the time of data extraction. The difficulty some ACCHSs have logging MBS claims for an HMR has been reported elsewhere, but to a greater extent than reported for the IPAC study.[45]

Based on pharmacist logged HMRs, almost all participants were Aboriginal and/or Torres Strait Islander and had substantial multimorbidity. Pharmacists completed HMRs for clinical reasons consistent with program rules, predominantly for patient's taking 5 or more regular medications,[46] as has similarly been reported in an analysis of HMR uptake in the NT.[47] As 77% of IPAC pharmacists were accredited to complete HMRs, the vast bulk were completed by them. An important reason for the ACCHS to refer an HMR to another pharmacist for completion was the presence of an existing arrangement with an external independent pharmacist, which was consistent with the IPAC HMR referral algorithm (Figure 1). The finding that 52.8% of all HMRs completed by IPAC pharmacists were conducted within project hours meant that the pharmacist fee (6CPA cost) was not claimed for 324 of the HMR services (Table 7).

Integrated pharmacists provided HMR as well as a non-HMR services, including follow-up assessments to both a HMR and non-HMR, due to national concerns and evidence that patients most in need of a HMR were missing out on this service.[48] A non-HMR was offered in recognition of the known barriers Aboriginal peoples and Torres Strait Islanders faced accessing a HMR, particularly challenges associated with reviews undertaken in the patient's home, and one-off services with no regular follow-up.[49] Participant eligibility for a non-HMR was based on the same criteria established for a HMR.

This study found that participants who had a non-HMR did not substantially differ in clinically meaningful ways from those who had a HMR. A few significant differences were identified but these can be explained by the geographical location of the ACCHSs attended

by participants. For example, HMR recipients were more likely to be CTG script eligible than non-HMR recipients. This is to be expected as HMR recipients were those attending ACCHSs in mostly non-remote locations, and only non-remote residents were CTG script eligible. More non-HMR recipients were engaged in the HCH program than HMR recipients for possibly similar reasons, as the HCH program particularly affected remote area IPAC services. A larger number of non-HMR recipients had attended remote-area ACCHSs than those who had a HMR. This observation may also reflect the reduced availability of HMR accredited pharmacists in remote and very remote locations.

Non-HMRs took a median of 30 mins less to complete than a HMR and there were no differences in the proportion of participants who had received a second HMR or non-HMR during the follow-up period (about 5% respectively). Also, the reasons for conducting a non-HMR were ranked in a similar order to HMRs indicating that both types of medication review targeted high-risk patients in need of support such as patient's taking 5 or more medications or those suspected of non-adherence. However, of all the reasons given for conducting the review, a proportionately greater number applied to HMRs than non-HMRs. However, this difference did not reach statistical significance for most of the reasons given for conducting the medication management review.

Offering a non-HMR service clearly enhanced participants' access to comprehensive medication management reviews. Importantly, pharmacists selected non-HMRs over a HMR for predominantly opportunistic reasons as participants were otherwise 'at risk of forgoing a HMR'. Moreover, delivering a non-HMR instead of a HMR service denied ACCHSs a financial gain through an MBS 900 claim, yet a larger number of non-HMRs were completed for participants during the intervention phase than HMRs. Most non-HMRs were conducted within the health service clinic (only 5% were in the participant's home) and the ease of providing this service may partly explain why more non-HMR services were provided to participants. Usually only one HMR is permitted per person per year,[50] but no such restriction was placed on non-HMRs. Yet, participants were just as likely to receive two HMRs as two non-HMRs during the intervention, making it unlikely that this program rule explained why a greater number of non-HMRs than HMRs were undertaken.

A lack of pharmacist accreditation to conduct HMRs as a reason for undertaking a non-HMR suggests the number of HMRs would be increased further if more integrated pharmacists were accredited. Patient preference for the review to be conducted outside the patient's home was a dominant reason for choosing a non-HMR, consistent with external findings.[51] Similarly, the intervention promoted pharmacist follow-up assessments to both a HMR and non-HMR with substantial numbers of both being completed mostly outside the participants' home. These aimed to reinforce the advice from the medication review (to patient and GP) and determine if other interventions were needed. Prescribers accepted most (70.9%) pharmacist recommendations from these follow-up assessments.

For most participants, the medication review identified at least one MRP, but HMR recipients were significantly more likely to have a MRP than those in receipt of a non-HMR. However, the type of MRPs identified from participants did not significantly differ between HMR or non-HMR recipients for most MRPs. The most common type of MRP for both types of review suggested medication overuse (≥1 medication was not indicated). Under-prescribing (an untreated indication for medication), was not listed in the explicit MRP criteria, but was identified by some pharmacists as 'other' MRPs. In a separate analysis, the prevalence of potential prescribing omissions was explored in a subset of IPAC participants and found to be common.[52] The broad range of MRPs identified by pharmacists in both types of medication review illustrates the complexity and difficulties associated with quality prescribing for patients attending ACCHSs.

Comparatively, integrated pharmacists increased HMR provision at much higher rates than reported from mainstream Australian health services. A population-based cohort study of adults aged 45 years or older in NSW, Australia showed that only 6.8% of patients with 5-9 medications received at least one HMR over 5 years of follow-up with a rate approximating 0.019 patients per person-year.[53] The number of IPAC participants with at least one HMR was at least 20 times higher than reported in this study, equating to 0.39 participants per person-year. Moreover, HMR access increased for Aboriginal peoples and Torres Strait Islander participants at high-risk of MRPs, who had a much higher prevalence of chronic disease at baseline than reported in other Australian studies aiming to quantify or improve

quality prescribing. These studies took place in both general practice and ACCHS settings with study subjects of similar age to the IPAC cohort.[54] [55]

Increased access to medication reviews was observed from within already high performing ACCHS settings, based on a range of other quality assurance indicators from this sector.[56] This is likely to have been mediated by the involvement of an Aboriginal Health Worker (AHW) working in partnership with the pharmacist within the ACCHS. In a qualitative analysis of the IPAC study, pharmacists described the critical role AHWs played to support pharmacist integration within ACCHSs and patient follow-up.[57] For example, pharmacists engaged in 1,082 team-based activities within ACCHS sites during the intervention phase and 23.3% (252/1082) of these activities involved an AHW. Nearly 50% (22/49) of stakeholder liaison plans developed by IPAC pharmacists were co-designed with AHWs to support ACCHS engagement with community pharmacy and hospitals [*Data is not included in this report*]. Others have also reported the vital role AHWs play to enhance Aboriginal people's access to a HMR because of their community knowledge and integration within the community.[58] [59]

Although the type of pharmacist recommendations to prescribers following a HMR or non-HMR did not substantially differ, only around 60% of recommendations were discussed with the prescriber. Pharmacists reported they did not need to discuss all recommendations with the prescriber, or the recommendations were communicated through other means, or the discussion with the prescriber had not yet taken place. This observation is similar to the proportion of pharmacist recommendations implemented following HMRs (52%) within a large ACCHS in the NT with an integrated pharmacist,[60] and in a general practice setting supported by an external pharmacist (53%).[61] With integrated pharmacists working in general practices, the prescriber acceptance rate following HMRs was 70%.[62] [63] In qualitative analysis for the IPAC project, prescribers reported a very high degree of confidence in, and were able to utilise pharmacist recommendations, but sometimes prescribers considered them unsuitable to the patient's context.[64] This highlights the importance of pharmacist integration within ACCHS settings given the complexity of factors like social circumstances and patient preference to influence review recommendations.

Pharmacist medication reviews are an important risk reduction strategy to identify medication errors, inappropriate medications, overuse of medications, and potential prescribing omissions and are most important in those patients who have chronic disease and experience a greater burden of disease due to social or health system factors. Medication reviews can improve prescribing quality,[65] reduce both underuse and overuse of medications,[66] support patients with medication adherence, chronic disease self-management, and their adoption of a healthy lifestyle.[67] However, pharmacists need to be skilled in identifying a range of MRPs including underuse, and to target high-value interventions specifically for the Aboriginal and Torres Strait Islander population.[68] A receptive clinical environment, trusting relationships with prescribers, and access to patients' medical records are key characteristics of integrated models of care with pharmacists within primary health care settings.[69] If increasing Aboriginal peoples and Torres Strait Islanders access to comprehensive medication management reviews is a priority, consideration should be given to adopting the IPAC project approach more broadly.

Limitations

Without a control group, it is possible that participant access to a HMR increased independently of the IPAC intervention. However, this outcome is highly unlikely. Firstly, usual practice would infer no change in the prevalence of HMR recipients during the study period. More broadly, the pattern of aggregated MBS 900 claims across all participating jurisdictions (for all people) has been remarkably constant in the 4 years preceding 2018 (pre-IPAC),[70] so it is unlikely that external and independent influences served to increase HMRs, and in such a way to specifically affect the participating ACCHSs. In another IPAC report, it was shown that ACCHS characteristics did not change in clinically meaningful ways[71] to independently explain the increase in HMR access. Secondly, in qualitative analysis, clinicians and participants reported that the intervention had increased their access to medication reviews.[72] Thirdly, pharmacists had completed a substantial number of non-HMRs and given that most pharmacists were HMR accredited, it is plausible that the number of HMRs would also increase. Finally, the significant quantum of change in HMR access occurred in a relatively short time period. Moreover, this increase occurred on a background of already relatively higher proportions of participants with an HMR at baseline than reported for all Australians.[73]

Another potential confounder to the relationship between the intervention and HMR access was the HCH program. However, all participants concurrently enrolled in the *Community Pharmacy in Health Care Homes* (HCH) Trial program (undertaken in the NT around the same time as the IPAC project[74]) were removed from the IPAC analysis (Figure 1). Of the few IPAC participants concurrently enrolled in the broader HCH program, they were not in receipt of additional community pharmacy support beyond usual care. They comprised only 2% of HMR recipients, meaning that the HCH program was highly unlikely to have increased access to HMRs independently of the IPAC project. Moreover, the IPAC pharmacist was integrated within those services operating concurrently as a HCH trial site, which implies that the HCH program could not have acted as a confounder independently of the pharmacist. Whilst 17% of non-HMR recipients were HCH enrolees, this program could not have influenced participant access to non-HMRs as these reviews were unique to the IPAC project.

Data reporting constraints may have explained why pharmacists did not report a higher proportion of medication management review recommendations being accepted by prescribers. The logbook did not permit pharmacists to update data that had already been entered. Pharmacists who did not know if the prescriber had accepted their recommendations could not adjust their report at a later date. This reason was also evident for a follow-up to a HMR or non-HMR (Table 15).

The total number of MBS claims for item 900 for all peoples in the NT increased 2.5 times in 2019 compared with numbers in 2017 (304 claims to 122 claims respectively) and was the highest ever reported according to annual claims data from the MBS.[75] This change possibly reflects increased IPAC participant access to HMRs throughout the intervention phase (July 2018- October 2019), and possibly 'all person' gains from the *Community Pharmacy in HCH* program in the NT.

Only a few participants had more than two HMRs or non-HMRs during the intervention phase of the IPAC study, so change in the prevalence of MRPs could not be ascertained. MRP assessment was also not part of usual care at baseline. The IPAC study defined MRPs

from MAI criteria supplemented by thematic coding of MRPs based on commonly reported problems, which although not as explicit as other methods,[76] is a similar approach to that used by other Australian studies.[77] Tools designed specifically to code MRPs to compare prevalence across different settings were not used due to being labour intensive and lack of validation within the ACCHS context. For this reason, it is invalid to compare the prevalence and type of MRPs reported for the IPAC project with other studies. Further studies could explore MRP prevalence by using a more expansive set of MRP criteria such as the 81 criteria recently developed for use with Aboriginal peoples that may predict hospitalisation risk.[78]

Generalisability of the observed outcomes is supported, arising from the integrated pharmacist intervention to the broader ACCHS adult patient population with chronic disease who are at risk of developing medication related problems. All study participants were accessing ACCHSs, a large number of these services participated, and the study design was pragmatic. HMR access for adult patients with chronic disease especially for those who are not accessing primary health care or lack access to culturally appropriate care, is likely to be much less than estimated in this study. Measures to increase Aboriginal and Torres Strait Islander peoples' access to comprehensive and culturally appropriate primary health care, is also an important priority if there are to be further gains in access to medication management reviews.

CONCLUSION

This large prospective study enrolled Aboriginal and Torres Strait Islander participants with chronic disease from ACCHSs in order to assess the impact of pharmacists on quality of care outcomes when integrated within primary health care. The intervention comprised non-dispensing medicines-related services, collaborative and coordinated care, including the provision of medication management reviews. Despite known barriers to Aboriginal peoples and Torres Strait Islanders accessing medication reviews, there were 3.9 times as many participants with at least one HMR following the intervention than was observed with usual care. Only 5 participants needed to be assessed by an integrated pharmacist for one to benefit from an HMR. A non-HMR service was accessed by 719 (49.4%) participants who met eligibility criteria for a review but had almost no prior access to an HMR. A non-HMR

was most often undertaken for opportunistic reasons for participants at high risk of forgoing a medication review. Non-HMR eligibility criteria, participant need for a medication review, pharmacist recommendations, and identified MRPs were similar to an HMR.

Comprehensive medication reviews are a key strategy to improve chronic disease outcomes, and interventions such as integrated pharmacists within ACCHSs that have greatly improved access to these reviews, are likely to have a real influence on improving health outcomes for Aboriginal and Torres Strait Islander patients. The magnitude of the increase in medication management reviews would, if the intervention was implemented within other ACCHSs, contribute significantly to Aboriginal and Torres Strait Islander morbidity reduction through the effect of such reviews on prescribing quality, reduced medication errors, and other reported benefits. Pharmacists integrated within ACCHSs are well placed to deliver comprehensive medication management reviews to patients who experience barriers in accessing HMRs under current program rules, especially for those who would otherwise forgo a medication management review.

Figure 1. Algorithm for the Home Medicines Review (HMR) and non-HMR undertaken by IPAC pharmacists.

HMR and non-HMR model for the IPAC Project

IPAC pharmacist, GP or other ACCHS staff identifies patient eligible for HMR.

Does the ACCHS have an established relationship with an external HMR service provider they would like to use?

No — Is the IPAC pharmacist accredited for HMRs?

Yes — HMR referral from GP (IPAC pharmacist ensures HMR consent from the patient is obtained & all relevant information is included).

No — IPAC pharmacist conducts **non-HMR** within IPAC time.

Yes — HMR referral from GP, IPAC pharmacist obtains HMR patient consent & liaises with patient & AHW to arrange date/time for HMR.

IPAC pharmacist forwards HMR referral to external accredited pharmacist.

IPAC pharmacist records the activity as a **non-HMR** in the logbook & schedules patient follow-up as per non-HMR recommendations & IPAC protocol

Once HMR conducted, IPAC pharmacist records this in the logbook & schedules patient follow-up as per HMR recommendations & IPAC protocol

Once HMR report is received, the IPAC pharmacist records this in the logbook & schedules patient follow-up as per HMR recommendations & IPAC protocol.

MBS item 900 is NOT claimed but the pharmacist should consider whether activity has contributed to TCA, GPMP or case conference (MBS items 735-758)

Did the IPAC pharmacist conduct HMR outside IPAC time?

IPAC pharmacist ensures HMR Medication Management Plan completed by ACCHS GP.

No — IPAC pharmacist does NOT claim pharmacist fee. Pharmacist ensures HMR Medication Management Plan completed by ACCHS and MBS item 900 is claimed by the service.

Yes — IPAC pharmacist claims pharmacist fee. Pharmacist ensures HMR Medication Management Plan completed by ACCHS and MBS item 900 is claimed by the service.

IPAC Pharmacist ensures MBS item 900 claimed by the ACCHS.
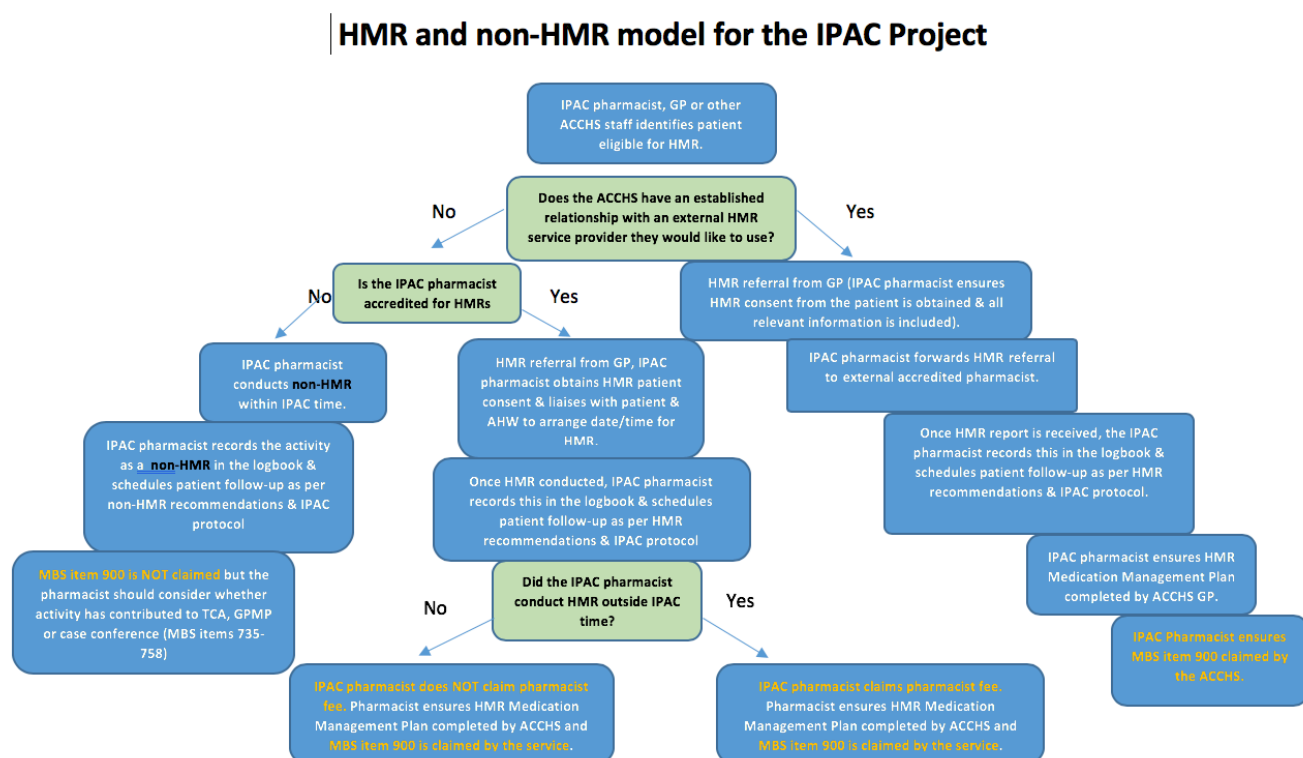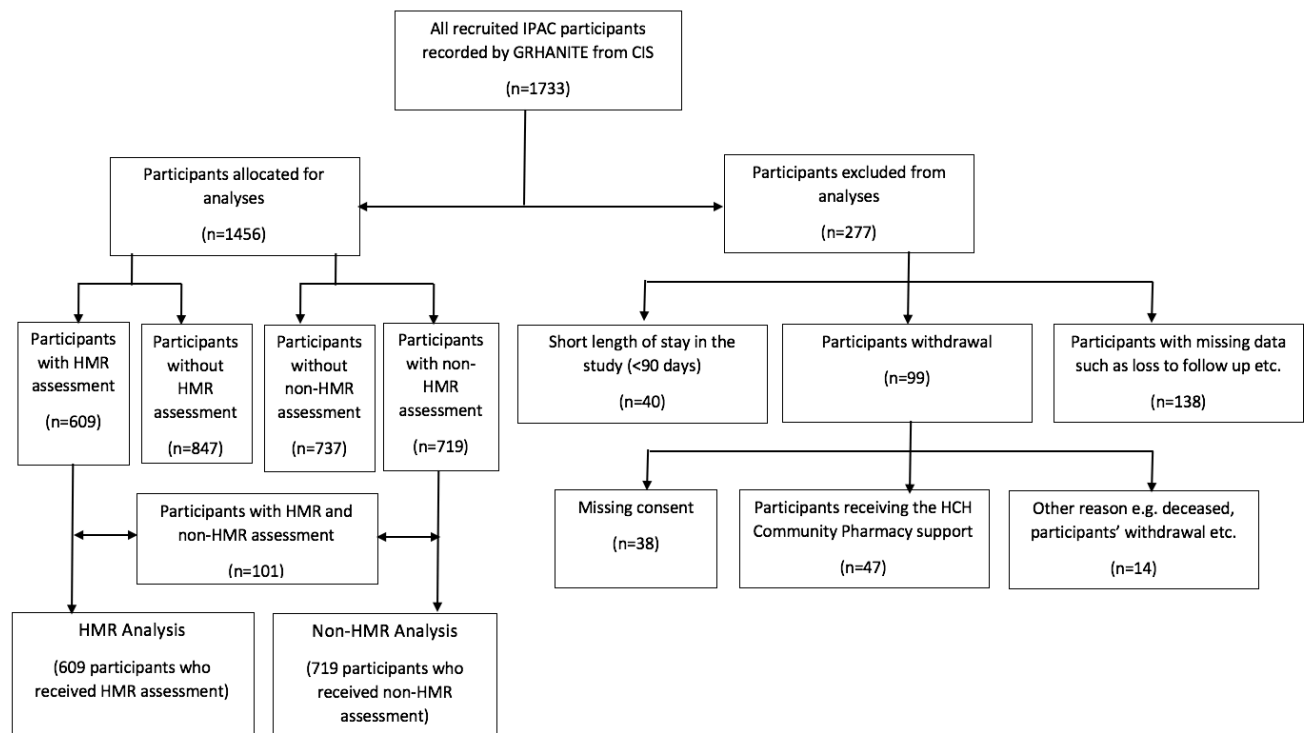
31

Figure 2. Participant flow diagram for medication management review analysis in the IPAC study

CIS= Clinical information systems
GRHANITE= Data extraction tool
HCH= Health Care Homes
HCH Community Pharmacy support= Community Pharmacy in Health Care Homes Trial Program

Table 1: Baseline characteristics of patients who received an HMR and/or a non-HMR.

Patient characteristics	HMR recipients (n=609)	Non-HMR recipients (n=719)	P-value
Location classification by ASGS-RA (2016)			
Major city (RA1)	19 /609 (3.1%)	15 /719 (2.1%)	
Inner regional (RA2)	149 /609 (24.5%)	259 /719 (36.0%)	
Outer regional (RA3)	416 /609 (68.3%)	149 /719 (20.7%)	0.178
Remote (RA4)	2 /609 (0.3%)	142 /719 (19.8%)	
Very remote (RA5)	23 /609 (3.8%)	154 /719 (21.4%)	
Mean age at baseline (SD) [years]	*n=607*	*n=718*	
	58.7 (21.9)	57.5 (30.0)	0.413
Sex (n,%)			
Male	237 /607 (39.0%)	281 /718 (39.1%)	0.974
Female	370 /607 (61.0%)	437 /718 (60.9%)	
Ethnicity (n,%)			
Aboriginal and/or Torres Strait Islander	584 /606 (96.4%)	632 /717 (88.2%)	**0.001**
Non-Indigenous	22 /606 (3.6%)	85 /717 (11.9%)	
Pensioner/concessional (n, %)	554 /607 (91.3%)	549 /718 (76.5%)	0.065
CTG scripts eligible (n,%)	551 /607 (90.8%)	435 /718 (60.6%)	**0.009**
Patient engaged in Health Care Home program (n, %)	12 /609 (2.0%)	122 /719 (17.0%)	**0.039**
Number of medications[# a]	*n=507*	*n=579*	
Mean (SD)	8.0 (7.2)	7.0 (13.7)	0.141
Median (IQR)	8 (6-10)	7 (4-9)	
Prior medication review (MBS item 900) [b] (n,%)	94 /609 (15.4%)	54 /719 (7.5%)	0.111
Doctors' encounters prior to enrolment (per 12 months)[c]	*n=574*	*n=663*	
Mean (SD)	8.5 (15.6)	7.3 (18.0)	0.214
Median (IQR)	7 (3-11)	6 (3-10)	
Mean number of medication 'adherent days' (SD)[d]	*n=507*	*n=579*	
	6.4 (1.8)	6.0 (6.7)	0.193
Self-assessed health status score (SF1): [# e] (n,%)			
Excellent	26 /434 (6.0%)	14 /540 (2.6%)	
Very good	64 /434 (14.8%)	71 /540 (13.2%)	
Good	201 /434 (46.3%)	209 /540 (38.7%)	0.082
Fair	101 /434 (23.3%)	175 /540 (32.4%)	
Poor	26 /434 (6.0%)	62 /540 (11.5%)	
Very poor	16 /434 (3.7%)	9 /540 (1.7%)	
Recorded clinical diagnoses: [#] (n,%)			

Type 2 diabetes mellitus	386/609 (63.4%)	438/719 (60.9%)	0.622
Hypertension	406/609 (66.7%)	455/719 (63.3)	0.643
Dyslipidaemia	312/609 (51.2%)	366/719 (50.9%)	0.967
Patients with established or existing CVD[f]	227/609 (37.3%)	209/719 (29.1%)	**0.006**
Chronic kidney disease	246/609 (40.4%)	289/719 (40.2%)	0.976
Patients with a diagnosis of rheumatic heart disease (RHD) or Acute rheumatic fever (ARF)	14/609 (2.3%)	22/719 (3.1%)	0.572
Chronic obstructive pulmonary disease (COPD)	52/609 (8.5%)	62/719 (8.6%)	0.966
Depressive disorder	33/609 (5.4%)	44/719 (6.1%)	0.792
Patients with comorbidity (1 or more chronic diseases)	542/609 (89.0%)	634/719 (88.2%)	0.822
Patients with multi-morbidity (2 or more chronic diseases)	491/609 (80.6%)	557/719 (77.5%)	0.571

Bold= statistically significant at the 0.05 level. P-value is cluster adjusted (ACCHS cluster) that was determined using the .
svy linearized : logit Stata command (data not paired).

SD = standard deviation -cluster-adjusted (ACCHS cluster)

IQR = inter-quartile range

[#] Sourced from the pharmacist's logbook.

[a] Denominator was sourced from logbook data entered by pharmacists when reporting medication adherence.

[b] Prior MBS claim was measured for the 12-month period prior to participant enrolment.

[c] Medicare GP consultation claim items: vocational registration: 3, 23, 36, 44. Non-vocational registration: 52, 53, 54, 57.

[d] A self-reported single-item question ('*How many days in the last week have you taken this medication?*') exploring the extent of non-adherence, assessed as a mean score for all medications. An 'adherent day' was defined as not missing any doses of prescribed medicines on that day. Pharmacists recorded the number of adherent days for each medication the patient was taking.

[e] Derived from the first question of the Short Form (SF)-36 health related quality of life instrument that asks: '*In general, would you say your health is excellent, very good, good, fair, poor, or very poor?*'

[f] CVD= cardiovascular disease: It refers to any of the following: coronary heart disease, cerebrovascular disease, and peripheral vascular disease.

Table 2: Total number of participants with a completed HMR (at least one MBS item 900 rebate claim) during the study period (n=1456).

	Baseline	Intervention period	p-value*
Number of participants with a completed HMR:			
None	1310/1456 (89.97%)	1018/1456 (69.9%)	
One	143/1456 (9.8%)	409/1456 (28.1%)	p<0.001
Two	3/1456 (0.2%)	26 (1.8%)	
More than two	0/1456 (0%)	3/1456 (0.2%)	
Total number of participants with at least one completed HMR	146/1456 (10.0%)	438/1456 (30.1%)	p<0.001
Total person-days of observation**	531 440	413 723	p<0.001
Number of participants with at least one completed HMR per 100 person-years [95% CI]*	10.0 [5.2-18.0]	38.7 [29.6-49.3]	p<0.001
Rate ratio of participants with at least one completed HMR per 100 person-years	1	3.86	

HMR= Home Medicines Review. A completed HMR represents a Medicare Benefits Scheme (MBS) claim for item 900, as sourced from GRHANITE data extraction from clinical information systems.
Baseline represents the period 12-months prior to the participant enrolment in the IPAC study.
The intervention period represents the period from patient enrolment to the end of the study.
End of the study: 31st October 2019
* Cluster adjusted p-value for ACCHS. P-values were determined using the . svy linearized : clogit Stata command (proportions) and using the cluster-adjusted SD from the . svy linearized : mean Stata command (means).
**Baseline represents 365 days of observation for each of 1456 patients (or 1456 person-years). Over the intervention period, the total number of days of participant observation is equivalent to 1133.5 person-years.

Table 3: Total number of MBS item 900 rebate claims (a completed HMR) during the study period (n=1,456).

	Baseline	Intervention period	p-value*
Total number of completed HMRs	149	471	
Number of completed HMRs claims per patient	0.10	0.32	<0.001
Total person-days of observation**	531 440	413 723	<0.001
Total number of completed HMRs per 100 person-years [95% CI]*	10.2 [5.5 - 18.0]	41.6 [32.2 – 52.3]	<0.001
Rate ratio of completed HMRs per 100 person-years	1	4.07	

HMR= Home Medicines Review. A completed HMR represents a Medicare Benefits Scheme (MBS) claim for item 900, as sourced from GRHANITE data extraction from clinical information systems.

Baseline represents the period 12-months prior to the participant enrolment in the IPAC study.

The intervention period represents the period from patient enrolment to the end of the study.

End of the study: 31st October 2019

*Cluster adjusted p-value for ACCHS and patients. P-values were determined using the . svy linearized : clogit Stata command (proportions) and using the cluster-adjusted SD from the . svy linearized : mean Stata command (means).

**Baseline represents 365 days of observation for each of 1456 patients (or 1456 person-years). Over the intervention period, the total number of days of participant observation is equivalent to 1133.5 person-years.

Table 4. Comparison of the number of participants who had at least one completed HMR (MBS item 900 rebate claim) at baseline compared to the end of the study

		Patients with HMR at BASELINE		
		Patient with HMR item 900 claimed (yes)	Patient without HMR claimed (no)	Total
Patients with HMR AT THE END OF THE STUDY	Patient with HMR claimed (yes)	33	405	438
	Patient without HMR claimed (no)	113	905	1018
Total		146	1310	1456

HMR= Home Medicines Review (MBS item 900), as sourced from GRHANITE data extraction from clinical information systems.
MBS= Medicare Benefits Schedule

Table 5. Number of Home Medicines Review (HMR) or non-HMRs recipients from 1,456 enrolled participants following intervention.

Number of HMRs or non-HMRs received per participant	Number of individual participants with HMR N=609 (n,%)	Number of individual participants with non-HMR N=719 (n,%)
1	579 (95.1%)	682 (94.9%)
2	30 (4.9%)	36 (5.0%)
3	0 (0%)	1 (0.1%)

Table 6. Number of Home Medicines Review (HMR) and non-HMR completed for participants during the intervention period as reported by IPAC pharmacists, and the reasons given for conducting the HMR.

Reason for conducting an HMR or non-HMR	Number of HMRs N=639 N (%)	Number of non-HMR's N=757, N (%)	p-value
Patient is taking 5 or more regular medications	498 (77.9%)	497 (65.7%)	**0.037**
Suspected non-adherence	241 (37.7%)	328 (43.3%)	0.364
Patient having difficulty managing their own medicines because of literacy or language difficulties, dexterity problems or impaired sight, confusion/dementia or other cognitive difficulties	210 (32.9%)	147 (19.4%)	**0.005**
Patient attending a number of different doctors, both general practitioners and specialists	148 (23.2%)	82 (10.8%)	**0.011**
Significant changes to the patient's medication regimen in the last three months	128 (20.0%)	87 (11.5%)	0.105
Other **	92 (14.4%)	65 (8.6%)	0.069
Patient taking more than 12 medicines per day	77 (12.1%)	47 (6.2%)	**0.020**
Recent discharge from a facility / hospital (in the last four weeks)	77 (12.1%)	49 (6.5%)	**0.014**
Patient on medication requiring therapeutic monitoring	48 (7.5%)	38 (5.0%)	0.093
Symptoms suggestive of an adverse medicine reaction	45 (7.0%)	47 (6.2%)	0.604
Medication with a narrow therapeutic index	44 (6.9%)	45 (5.9%)	0.734
Patient inability to manage drug related devices	30 (4.7%)	20 (2.6%)	0.075

Bold= statistically significant at the 0.05 level. P-value was cluster adjusted (ACCHS cluster) that was determined using the . svy linearized : logit Stata command (data not paired).
Source: Pharmacists Logbook
HMR= Home Medicines Review
Non-HMR= a comprehensive medication management review that was not an HMR.
* Multiple reasons were identified for some reviews.
** Other reasons for conducting **an HMR** included sub-optimal response to medicines, uncontrolled conditions, patients requiring further education and support, and changes in medications or health care providers.
** Other reasons for conducting **a non-HMR** included patients requiring further education and support, deteriorating test results (in particular HbA1c), being pre-diabetic, IPAC pharmacist had concerns regarding medications and there had been changes in medications or health care providers.

Table 7. The number of Home Medicines Review (HMR) conducted by the IPAC pharmacist or external pharmacist during the intervention.

When the HMR was conducted, and by whom:	Number of *HMRs* (N=639)
IPAC pharmacist (n, %)	616 (96.4%)
External pharmacist (n, %)	23 (3.6%)
IPAC pharmacist (n=614)*:	
HMR conducted within IPAC hours	324 (52.8%)
HMR conducted outside IPAC project hours	290 (47.2%)

Source: Logbook
HMR= Home Medicines Review
*Data missing for two HMRs.

Table 8. Assistance provided by the IPAC pharmacists to an external pharmacist for the Home Medicines Review (HMR).

Assistance provided for the HMR*	Number of *HMRs* conducted by an external pharmacist (N=23) N (%)
Sharing clinical records and information	20 (87.0%)
Facilitating ACCHS staff involvement	20 (87.0%)
Transport support	2 (8.7%)
Other **	3 (13.0%)

Source: Logbook

HMR= Home Medicines Review

ACCHS= Aboriginal community-controlled health service

* Multiple types of assistance may have been provided on each occasion.

** Other included no assistance provided by the IPAC pharmacist.

Table 9. Reasons for referring the Home Medicines Review (HMR) to an external pharmacist. *

Reasons	Number of *HMRs* (N=23) N (%)
The ACCHS has an existing arrangement with an external independent pharmacist	19 (82.6%)
The ACCHS has an existing arrangement with community pharmacy	4 (17.4%)
Patient preference	0 (0%)
No time for the IPAC pharmacist to do the HMR	0 (0%)
The IPAC pharmacist has reached their maximal cap of 20 HMRs/month	0 (0%)
Other	0 (0%)

Source: Logbook
HMR= Home Medicines Review
ACCHS= Aboriginal community-controlled health service
*As reported by IPAC pharmacists.

Table 10: The location where IPAC pharmacists conducted the non-Home Medicines Review (non-HMR).

Locations	Number of non-HMRs (N=757) N (%)
Clinic	689 (91.0%)
The patient's home	39 (5.2%)
Community venue	6 (0.8%)
A house that was not the patient's home	1 (0.1%)
Other*	22 (2.9%)

Source: Logbook
HMR= Home Medicines Review
Non-HMR= a medication management review that was not an HMR.
* Other non-HMRs were conducted via phone call (with or without an interaction at the clinic) and in renal dialysis or rehabilitation units.

Table 11. Reasons for choosing a non-Home Medicines Review (non-HMR) over a HMR as reported by IPAC pharmacists.

Reasons for choosing a non-HMR over an HMR *	Number of reviews (N=757) N (%)
The patient is at risk of forgoing a HMR if it is not conducted opportunistically (e.g. unlikely to keep an appointment)	364 (48.1%)
No accredited pharmacist available	232 (30.6%)
Patient preference (eg does not want a HMR conducted in their home)	107 (14.1%)
The patient does not meet the criteria for a repeat HMR within 24 months	86 (11.4%)
Sub-optimal response to treatment	55 (7.3%)
An accredited pharmacist is available but the maximal capping of 20 HMRs/month has been reached	36 (4.8%)
An HMR is not appropriate for other reasons**	28 (3.7%)
Conducting a home visit is culturally inappropriate	25 (3.3%)
The patient lives far away or travel poses a risk due to distance or unsafe and difficult road conditions	22 (2.9%)
The patient has no fixed address	9 (1.2%)
There is a language communication barrier in the home setting (i.e. No-one at home to help translate)	2 (0.3%)
There is a need for visual or learning resources that are not accessible in a home visit situation.	2 (0.3%)

Source: Logbook
HMR= Home Medicines Review
Non-HMR= a medication management review that was not an HMR.
* More than one reason was identified for choice of review.
** Other reasons were predominantly not meeting HMR guidelines (no referral from GP, or low number of medications), opportunistic presentation by patient or a HMR not able to be done at home due to social issues or working.

Table 12: Pharmacist recommendations arising from Home Medicines Review (HMR) and non-HMR to prescribers.

Recommendations*	HMR (N=639 reviews)			Non-HMR (N=753 reviews)		
	Number of pharmacist recommendations (n, % of reviews)	Number of recommendations discussed with the prescriber (n,%)	Number of recommendations discussed and accepted by prescribers** (n,%)	Number of pharmacist recommendations (n, % of reviews)	Number of recommendations discussed with prescriber (n,%)	Number of recommendations discussed and accepted by prescribers** (n,%)
Referral for:						
An HMR	0	0	0	18 (2.4%)	14 (77.8%)	13 (92.9%)
A follow-up to an HMR	5 (0.8%)	4 (80.0%)	3 (75.0%)	3 (0.4%)	1 (33.3%)	0
A non-HMR	1 (0.2%)	1 (100.0%)	0	0	0	0
A follow-up to the non-HMR	0	0	0	56 (7.4%)	22 (39.3%)	6 (27.3%)
Allied health	9 (1.4%)	0	0	17 (2.3%)	9 (52.9%)	3 (33.3%)
A specialist	9 (1.4%)	6 (66.7%)	2 (33.3%)	12 (1.6%)	8 (66.7%)	7 (87.5%)
Case conference	3 (0.5%)	2 (66.7%)	1 (50.0%)	1 (0.1%)	0	0
Social services	1 (0.2%	0	0	1 (0.1%)	1 (100.0%)	1 (100.0%)
Internally (eg AHW)	3 (0.5%)	0	0	2 (0.3%)	0	0
Other type of referral	1 (0.2%)	0	0	3 (0.4%)	2 (66.7%)	1 (50.0%)
Cessation of any medicine	242 (37.9%)	160 (66.1%)	104 (65.0%)	196 (26.0%)	120 (61.2%)	63 (52.5%)
Change in the dose of any existing medicine	290 (45.4%)	170 (58.6%)	112 (65.9%)	265 (35.2%)	163 (61.5%)	91 (55.8%)
Addition of a new medicine/s	175 (27.4%)	106 (60.6%)	55 (51.9%)	168 (22.3%)	111 (66.1%)	46 (41.4%)
Change of one or more medicines to a different medicine	122 (19.1%)	80 (65.6%)	48 (60.0%)	129 (17.1%)	88 (68.2%)	49 (55.7%)
Correction to the medication list in the CIS	172 (26.9%)	90 (52.3%)	70 (77.8%)	130 (17.3%)	54 (41.5%)	39 (72.2%)
A dose-administration aid	73 (11.4%)	63 (86.3%)	49 (77.8%)	49 (6.5%)	38 (77.6%)	20 (52.6%)
Patient registration for CTG scripts	6 (0.9%)	5 (83.3%)	3 (60.0%)	0	0	0
Self-management and education advice to the patient	398 (62.3%)	229 (57.5%)	160 (69.9%)	434 (57.6%)	228 (52.5%)	128 (56.1%)
Advice to community pharmacy	200 (31.3%)	114 (57.0%)	83 (72.8%)	62 (8.2%)	41 (66.1%)	23 (56.1%)
Reporting an adverse drug reaction	3 (0.5%)	2 (66.7%)	1 (50.0%)	10 (1.3%)	3 (30.0%)	0
Pathology testing	180 (28.2%)	128 (71.1%)	81 (63.3%)	241 (32.0%)	149 (61.8%)	94 (63.1%)
Total number of recommendations	**1893 (100%)**	**1165 (61.5%)**	**773 (66.4%)**	**1797 (100%)**	**1052 (58.5%)**	**584 (55.5%)**

Source: Logbook

*More than one recommendation to prescribers may have been made by the pharmacist. If pharmacists reported that the recommendations were discussed with the prescriber, it was assumed that all the recommendations were discussed. Some pharmacist recommendations did not require discussion with the prescriber. Examples of recommendations that may not have required discussion with the prescriber included referring the patient to an AHW, and self-management and education advice to the patient.

** The denominator for proportions is the number of recommendations discussed with the prescriber.

HMR= Home Medicines Review

Non-HMR= a medication management review that was not an HMR.

AHW= Aboriginal Health Worker or Practitioner.

CIS= Clinical Information System.

CTG= Close the Gap prescriptions (for Aboriginal peoples and Torres Strait Islanders) that waive or reduce the Pharmaceutical Benefits Scheme (PBS) patient contribution (co-payment).

Prescriber = general practitioner.

Table 13: Number of Home Medicines Review (HMR) and non-HMR that involved pharmacist discussion with the prescriber.

Pharmacist recommendations discussed with prescriber:	HMR		Non-HMR	
a) Yes	**372**	**60.2%**	**408**	**54.2%**
b) No				
Reasons:				
Patient not returned or did not attend appointment	12	9.8%	0	0.0%
Patient appointment made	23	18.9%	39	19.4%
Case conference planned	0	0.0%	61	30.3%
GP not available or not contacted yet	51	41.8%	17	8.5%
Recommendations documented in the report or emailed or not yet reviewed	34	27.9%	78	38.8%
Recommendations not urgent, follow-up is opportunistic	2	1.6%	4	2.0%
Unable to make recommendations as the patient is non-compliant	0	0.0%	2	1.0%
Data missing	99	44.8%	0	0.0%
Subtotal	**221**	**35.8%**	**201**	**26.7%**
c) Not necessary	**25**	**4.0%**	**144**	**19.1%**
Data missing	21	3.3%	0	0.00%
Total	**639**	**100%**	**753**	**100%**

HMR= Home Medicines Review
Non-HMR= a medication management review that was not an HMR.
GP= general practitioner

Table 14. The locations where IPAC pharmacists conducted participant follow-up to a Home Medicines Review (HMR) or non-HMR.

Location of the follow-up assessment	Number of assessments (N=1,548) N (%)
Clinic	1,102 (71.2%)
Phone call	227 (14.7%)
The patient's home	180 (11.6%)
Community venue	23 (1.5%)
A house that was not the patient's home	8 (0.5%)
Other *	8 (0.5%)

Source: Logbook
HMR= Home Medicines Review
Non-HMR= a medication management review that was not an HMR.

* Other follow-up assessments were conducted during transportation of the patient, at the dialysis clinic, community pharmacy, women's group meetings, or by email.

Table 15: Pharmacist assessments arising from a patient follow-up to a Home Medicines Review (HMR) or non-HMR (n=1548) and recommendations to prescribers.

Recommendations discussed with the prescriber	Number of assessments (n=1548) N (%)	Recommendations accepted N (%)

Yes
 Were recommendations accepted? *
  Yes
  No
  Unsure
	715 (46.2%)	
		
		506 (70.9%)
		7 (1.0%)
		201 (28.2%)

No	179 (11.6%)	-
Not necessary**	654 (42.2%)	-

Source: Logbook
HMR= Home Medicines Review
Non-HMR= a medication management review that was not an HMR.
*Missing one assessment.
**Reasons were not collected.

Table 16: The number and type of Medication Related Problems (MRP) identified by IPAC pharmacists, by the type of medication management review.

Medication related problem (MRP) *	HMR (n=639, participants n=609)		non-HMR (n=757, participants n=719)		
	Number of MRPs N (%)	Number of participants with each MRP N (%)#	Number of MRPs N (%)	Number of participants with each MRP N (%)#	P-value
1) At least one medicine:					
a) was not indicated	176 (16.7%)	174 /537 (32.4%)	150 (15.0%)	148 /503 (29.4%)	0.561
b) had the wrong dosage:					
i. overdosage	59 (5.6%)	58 /537 (10.8%)	86 (8.6%)	86 /503 (17.1%)	**0.018**
ii. subtherapeutic dosage	74 (7.0%)	73 /537 (13.6%)	103 (10.3%)	101 /503 (20.1%)	0.296
c) was ineffective for the condition	75 (7.1%)	73 /537 (13.6%)	88 (8.8%)	87 /503 (17.3%)	0.290
d) was associated with an adverse drug reaction	103 (9.8%)	102 /537 (19.0%)	99 (9.9%)	98 /503 (19.5%)	0.903
e) had a 'drug to drug' interaction	57 (5.4%)	57 /537 (10.6%)	82 (8.2%)	81 /503 (16.1%)	0.394
f) had a 'drug to condition' interaction	52 (4.9%)	52 /537 (9.7%)	81 (8.1%)	80 /503 (15.9%)	0.181
2) There was an unnecessary duplication of drugs	59 (5.6%)	59 /537 (11.0%)	47 (4.7%)	46 /503 (9.2%)	0.640
3) The patient directions were incorrect	49 (4.6%)	49 /537 (9.1%)	37 (3.7%)	37 /503 (7.4%)	0.579
4) The patient directions were impractical	90 (8.5%)	86 /537 (16.0%)	53 (5.3%)	51 /503 (10.1%)	**0.032**
5) Other **	262 (24.8%)	251 /537 (46.7%)	174 (17.4%)	168 /503 (33.4%)	0.101
Total number of MRP's	**1,056 (100.0%)**	-	**1,000 (100.0%)**	-	-
No MRP's		74/609 (12.2%)		216/719 (30.0%)	**0.035**
Total number of participants *with at least one* MRP (as listed above, except for 'none')	-	**535/609 (87.85%)**	-	**503/719 (69.96%)**	**0.035**
Number of MRP per HMR/non-HMR recipient (with at least one MRP)	1.92	-	2.02	-	

Source: Logbook. **Bold= statistically significant at the 0.05 level.** P-value is cluster adjusted (ACCHS cluster) for comparison of the number of participants and determined using the . svy linearized : logit Stata command (data not paired).
HMR= Home Medicines Review
MRP= Medication related problem.
Non-HMR= medication review that was not an HMR.
* Some reviews have more than one MRP.
** Other MRPs are summarised in Table 17.
#Proportions are derived using the denominator for the total number of patients with at least one MRP.

Table 17: The number and type of 'other' Medication Related Problems (MRP) identified by IPAC pharmacists, by the type of medication management review.

Other types of MRPs identified by pharmacists	HMRs*		Non-HMRs*	
	Number	% of total 'Other MRPs' N=262	Number	% of total 'Other MRPs' N=174
Patient not adherent or ceased medications	67	25.6	53	30.5
Medications or dosage changed	53	20.2	54	31.0
Documentation or CIS incorrect	42	16.0	15	8.6
Patient needs education	30	11.5	21	12.1
Monitoring required (appointments, tests, pathology testing)	28	10.7	41	23.6
Prescribing omission	26	9.9	16	9.2
Changed medication regime (combined pills or times)	20	7.6	10	5.7
DAA packing errors, dispensing errors or changes required	18	6.9	10	5.7
Patient needs a new prescription because they 'run out'	17	6.5	2	1.1
Patient requires DAA or has issues with DAAs (eg. opening sachets)	10	3.8	2	1.1
Adverse effects	9	3.4	8	4.6
Referrals required to allied health	9	3.4	7	4.0
Medication not indicated	7	2.7	1	0.6
Patient issues not reported or not addressed yet	6	2.3	0	0
Patients medications at home need to be removed	5	1.9	0	0
No supply or no stock of medicine**	3	1.1	0	0
Patient needs or missed specialist appointments	2	0.8	5	2.9
Patient is 'doctor shopping'	2	0.8	0	0
Miscellaneous	4	1.5	5	2.9
Total	**358**	-	**250**	-

Source: Logbook
DAA= dose administration aid
HMR= Home Medicines Review
MRP= Medication related problem.
Non-HMR= medication review that was not an HMR.
CIS= clinical information system
* Some reviews had more than one type of MRP.
** No supply or stock may pertain to supply of medications from community pharmacy or from remote-area Aboriginal health services.

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