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Interprofessional collaboration between pharmacists and community health workers: a scoping review

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Abstract

Introduction Community health workers (CHWs) help bridge the cultural gap between health services and the communities they serve. CHWs work with physicians, nurses and social workers, but little is known about their collaboration with pharmacists. This scoping review aims to describe the interprofessional collaboration between CHWs and pharmacists, the types of interventions they deliver and CHWs' and pharmacists' specific roles within these interventions.

Method The scientific literature published in PubMed, Embase, MEDLINE, Scopus, Web of Science, PsycInfo, CINAHL and the grey literature were searched. Inclusion criteria were that the research (i) involved pharmacists and CHWs working collaboratively and (ii) included an intervention, service or program. One researcher screened all articles, and two reviewers screened 6% of articles (20/340) assessed for eligibility, using the software Covidence. After the discrepancies were resolved, data from the included articles were extracted using a customized template for data extraction and synthesized narratively.

Results Eighteen studies met the inclusion criteria. Most were conducted in the USA (14/18) and were published since 2020 (12/18). Most interventions involved medication reviews, support for medication adherence, disease prevention or addressing the social determinants of health. Pharmacists had primarily clinical roles (i.e., medication reconciliation and patient education), while the CHWs' roles consisted of collecting patient information, supporting patient self-management, bridging the cultural gap by translating information in the patient's language and ensuring patient follow-up. The collaborative practice occurred via interprofessional referral, ranging from the CHW facilitating the link between the patient and the pharmacist, and information sharing between the CHW and the pharmacist, to an interprofessional collaborative practice where CHWs and pharmacists delivered the intervention together.

Conclusion While CHWs and pharmacists had independent roles as part of the interventions, they also collaborated at various levels to deliver services to patients. CHWs have an important role to play in bridging the cultural gap between the patient and the pharmacist, in improving patient referral so that more patients can benefit from pharmaceutical services, and in identifying patients' social determinants of health. CHWs and pharmacists can work

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synergistically and collaboratively to tailor an intervention to the patient's needs, which can improve and optimize pharmaceutical services, and may ultimately positively impact health outcomes.

Keywords Pharmacists, Community health workers, Navigators, Community health navigators, Health coaches, Promotoras, Interprofessional collaboration, Collaborative practice, Multidisciplinary healthcare teams

Introduction

In 1978, the Alma-Ata international conference led by the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) called for the achievement of equity in health for all through primary health care [1]. The conference highlighted that community health workers (CHWs) have a key role to play to reach this goal [2]. CHWs are *frontline public health workers who serve as a liaison/link/intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery* [3]. CHWs can be identified by umbrella terms [4] (e.g., promotoras in the Latino population [5], kaders in Indonesia [6], village health volunteers in Thailand [7]). Their roles vary widely, ranging from disease prevention, improving access to health services, supporting healthy behaviours and delivering disease-related care [1, 4, 8]. Their area of practice ranges from maternal, newborn and child health to management of non-communicable and communicable diseases, public health protection, mental health or reproductive health [4]. In 2010, the Labor Standard Occupational Classification in the United States of America (USA) listed CHWs as an occupation in the health professionals group [4], which improved the recognition of their roles in the health system. More recently during the coronavirus disease (COVID-19) pandemic that occurred in 2020, CHWs have been acknowledged as crucial health workforce in supporting patients and health care teams especially where there were overwhelming shortages of health workers [9].

The evidence of the effectiveness of CHW interventions on improvement of patient health outcomes has been increasing in the past decade [1, 4, 10, 11], including in cancer screening [10, 12, 13], improvement of the use and access to primary care [10, 14], maternal and newborn health [15, 16], non-communicable diseases such as hypertension [17] and diabetes [18, 19], improvement of screening and disease control in tuberculosis [20, 21], malaria [22], or human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) [23], as well as supporting patient medication adherence [24–26].

The integration of CHWs in healthcare teams within hospital or ambulatory health centres is increasing globally, but little is known about the implementation strategies to foster this interprofessional practice, and the challenges that may arise from this collaborative work, or the impact on patients' health outcomes [27, 28]. In most of the interventions, CHWs work with physicians, nurses, dietitians or social workers [28], but rarely with pharmacists.

Providing a direct access to primary health care services for the population [29], pharmacists have an important role to play within the interprofessional team to support better health outcomes for people. There is growing evidence for the effectiveness of pharmacists-led interventions on patient outcomes (e.g., delivering medication reviews [30], medication therapy management [31], improving patient medication adherence and appropriate use of medicines, and patient counselling [32, 33]). As part of their daily practice, pharmacists need to consider patients' culture, beliefs and health literacy skills when supporting their medication adherence and clinical outcomes [34]. They also have to understand patients' social determinants of health, which can be very challenging in the short encounters in a community pharmacy. Collaborating with CHWs would significantly aid pharmacists in understanding patients' social and cultural characteristics [35] and enable targeted patient support. However, little is known about how CHWs and pharmacists collaborate to improve patient care.

This scoping review, therefore, aimed to describe (1) the interprofessional collaboration between pharmacists and CHWs as part of the interventions, services and programs implemented, (2) the types of interventions pharmacists and CHWs collaboratively deliver and (3) CHWs' and pharmacists' specific roles within these interventions.

Methods

Guidelines

This scoping review is reported in accordance with the *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR)* guidelines [36].

Definition of CHWs

In this scoping review, we considered CHWs as health workers trusted by their communities, typically bilingual and bicultural [37], who bridge the cultural gap to connect the patient and the healthcare team using culturally appropriate communication [4], help the patient to navigate the health system, and address social determinants of health. They may have a clinical role as well by monitoring patient clinical outcomes. CHWs do not typically

have a medical education background [38], but may have received education and training at different levels [39] (i.e., from informal training, secondary education, to formal training lasting several months [39]). We did not consider nurse navigators, peers, peer support specialists or social workers as CHWs. Social prescribing link workers were also not considered as CHWs as their primary role is to connect patients with non-clinical supports and services [40, 41].

We considered interprofessional collaborative practice as defined by the WHO, i.e., when several healthcare professionals from different backgrounds collaborate together with patients, their families, carers and the community, by providing clinical and non-clinical health-related services, managing cases and sharing knowledge [42].

Eligibility criteria

The study inclusion and exclusion criteria are presented in Table 1.

Information sources

The English and French language scientific literature published in PubMed, Embase, MEDLINE, Scopus, Web of Science, PsycInfo, CINAHL and the grey literature, including those in Google Scholar, were searched in May 2024.

Search strategy

The search strategy (Appendix 1) was built around two main themes: (1) CHWs, for which the umbrella terms were obtained from the research strategy built for the systematic review by Mistry et al. [10] and (2) pharmacists and pharmaceutical services.

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Research published in English or French*	Research published in another language other than English or French
The study is an intervention, service or program or a study that describes or evaluates a specific intervention.	The research is not an interventional study (i.e., a protocol, a commentary, a review, observational or cross-sectional study).
The research involves pharmacists and CHWs working collaboratively.	The research does not involve pharmacists and CHWs working collaboratively.
The research describes the collaborative practice between pharmacists and CHWs.	The research does not describe the collaborative practice between pharmacists and CHWs.
The article is fully available online or via the library of the University of Sydney.	The research is only reported as a conference abstract, and the full article is not published or available online or via the library of the University of Sydney.

*CB is able to read and understand French

Filters were added to select studies published in English or French. No restriction on the date of publication was applied. The search strategy was first built with keywords and Medical Subject Headings (MeSH) terms connected with Boolean operators to search the literature in PubMed, and it was then adapted for the other databases.

Selection process

The output references searched in the databases were imported into Covidence (Veritas Health Innovation, Melbourne, Australia), a web-based collaboration software platform that streamlines the production of systematic and other literature reviews [43]. The software automatically removed most of the duplicates, and the remainder was removed manually. In the first step of the screening process, irrelevant articles were excluded based on the screening of the titles and the abstracts. Then, the selected articles were assessed for eligibility after a full-text reading. In case additional information was needed to confirm the eligibility criteria and include the article, the authors of the articles were contacted by email.

The article selection process was carried out by one researcher (CB). As recommended by the literature [44], a calibration exercise was conducted with two independent reviewers (SKM and EH), who independently screened 6% of articles (20/340) assessed for eligibility. A high level of agreement was reached (90%), and discrepancies were discussed to reach consensus.

Data extraction process

The data from the included articles were extracted using a customized template for data extraction using Excel version 16 (Microsoft Corporation) [45]. The following information were extracted: first author, title, year of publication, country where the intervention was delivered, population included, types of interventions pharmacists and CHWs delivered, roles of CHWs and pharmacists in the intervention, interprofessional collaboration between pharmacists and CHWs, length of the intervention, type of pharmacists involved, setting of the intervention and outcomes measured as per the terminology used in the articles.

In case additional information was needed to complete data extraction, the authors of the included articles were contacted by email.

Data analysis

The PRISMA diagram describing the process of article selection was obtained from Covidence. Quantitative information from the included articles was presented using descriptive statistics. The results were synthesized narratively.

Results

Selection of sources of evidence

The PRISMA diagram (Fig. 1) shows the article selection process. After removal of duplicates, 1062 articles were screened, of which 722 were irrelevant and 340 were assessed for eligibility. Finally, 18 articles met the inclusion criteria [7, 37, 38, 46–60], from 15 different studies (i.e., four articles reported different outcomes from the same intervention [37, 58–60]). Of note, the authors of 25 articles were contacted by email, 21 responded and 10 articles were excluded based on the authors' feedback and clarification.

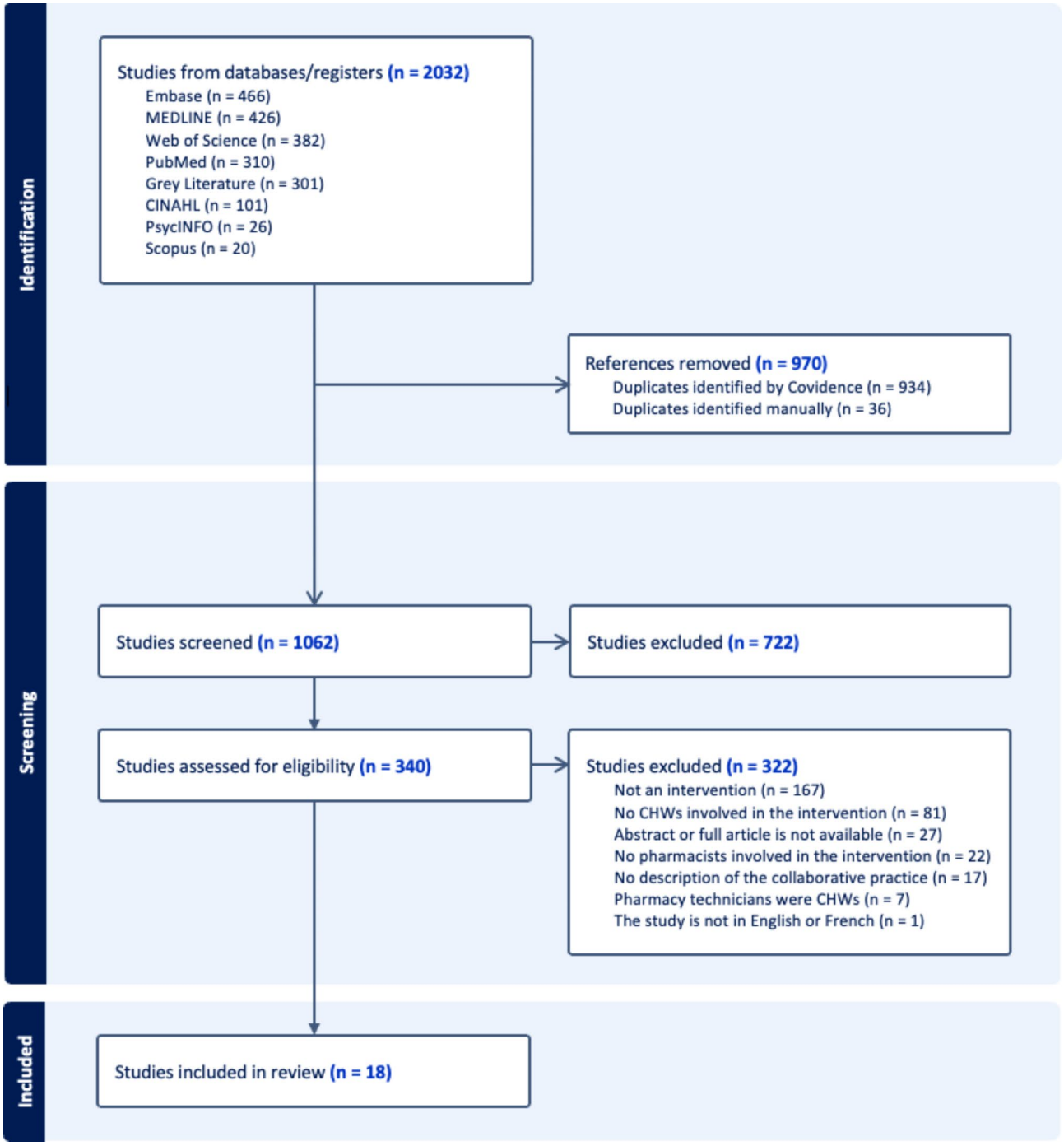

Fig. 1 PRISMA diagram showing the process for article selection. CHWs = community health workers

Included articles: quantitative results

Characteristics of the studies

Most of the interventions reported in the included studies were conducted in the USA (14/18, 78%) [37, 38, 47–49, 51, 53–60] – two were conducted in Australia [46, 52], one in Canada [50] and one in Thailand [7]. Of note, no articles from Europe were found and no articles written in French were identified. More than half (12/18, 67%) of the included studies were published since 2020 [7, 37, 38, 47, 48, 51, 53, 55, 56, 58–60], showing the growing interest in this field of research.

Participants included in the studies

The most common groups of patients included in the studies were those with hypertension or diabetes [38, 48, 49, 53, 54, 57]. Cambodian Americans were involved in 4 articles but from the same study [37, 58–60] and seniors aged 65 and older in two studies [50, 56]. Other populations involved indigenous participants [46], patients in rural areas [52], patients on oral anticancer medications [51], patients with congestive heart failure and/or chronic obstructive pulmonary disease [55], people addicted to cigarettes in a rural community [7] and clients in an independent pharmacy [47].

Setting and length of the interventions

The interventions were delivered mostly in the community setting (12/18, 67%) [7, 37, 38, 47, 49–52, 54, 58–60]. Three studies were conducted in ambulatory health centres [46, 48, 57], and three at the transition of care [53, 55, 56]. The length of the intervention varied, being of 1 month [55, 56], 2 months [51], 3 months [47, 50], 6 months [38, 52, 57], 12 months [7, 48, 49, 53], 15 months [37, 58–60] and 24 months [54]. One study was a 12-month retrospective analysis of an implemented program [46].

Type of pharmacists and CHWs

Clinical pharmacists were involved in most of the interventions (12/18, 67%) [7, 37, 48, 51, 53–60], community pharmacists in four studies [46, 47, 50, 52] and academic pharmacists in two studies [38, 49]. Most of the studies used the terminology "CHWs" (11/18, 61%) [7, 37, 38, 47, 49, 53–55, 58–60]. The other studies described CHWs as Aboriginal health workers [46, 52], health coaches [48, 56], medication navigators [51], health promotors [57], or volunteer peer health educators [50]. CHWs were also described as promotoras [49] or community health educators [58–60].

Outcomes measured

Medication adherence was reported as the primary outcome in 5 of 18 studies [37, 38, 51, 55, 57]. At least one clinical outcome as a main outcome was reported in 3 studies [48, 54, 59]. Return emergency department visits and/or hospitalizations or hospital readmissions as a primary outcome were measured in 2 studies [53, 56]. The other outcomes were specific to the studies, for example, the average number of daily cigarettes [7], number of interventions completed [46, 49, 52], number of subjects who completed the social needs screening [47], feasibility of the program [50], nutrition, physical activity and sleep [60] and process outcomes [58].

Table 2 describes key elements of the interventions, the roles of CHWs and pharmacists in the interventions, their interprofessional collaboration and the main study outcomes.

Interventions involving CHWs and pharmacists

The interventions

The interventions identified from the included studies consisted of home medicines review [46], medication therapy management [37, 49, 58–60], addressing social needs [47], supporting medication adherence [38, 51, 57], diabetes management support [48, 53, 54], blood pressure prevention [50], use of videophone to connect pharmacists, general practitioners, patients and aboriginal health workers [52], improving the transition of care from hospital to home [55, 56] and a smoking cessation program [7].

Bridging the cultural gap between the patient and the pharmacist

In most of the studies (14/18, 78%), the CHWs helped in bridging the cultural gap between the patient and the pharmacist by being a member of the patient community (Aboriginal health workers [46, 52], African or Native American and Latinx CHWs [38, 48, 49, 53, 54, 57], Chinese CHWs [51], Cambodian CHWs [37, 58–60] or CHWs embedded in a rural community in Northern Thailand [7]). The interventions delivered in these studies focused on home medicines review [46], medication therapy management [37, 49, 58–60], diabetes support care and education [48, 53, 54, 57], support for medication adherence [38, 51], connecting patients and pharmacists for diverse information and services [52] and a smoking cessation program [7]. The interventions were delivered in ambulatory centres [46, 57] or in the community (i.e., patient's home) [7, 37, 58–60], or both [48, 52, 54], through a university academic-community partnership [38, 49], in hospitals [51] or at the transition of care from hospital to the community [53].

Addressing the social determinants of health or measuring clinical data

In 4/18 (22%) studies, the primary role of the CHWs was to address the patients' social determinants of health or to measure patients' clinical data. In these studies,

Table 2 Data from included studies

Study (*n* = 18)	Types of interventions pharmacists and CHWs delivered	Roles of CHWs in the intervention	Roles of pharmacists in the intervention	Interprofessional collaboration between pharmacists and CHWs	Main study outcomes
Deidun et al., 2019 [46] (Australia)	Home Medicines Review (HMR) at an Aboriginal Medical Service	-Identified and referred patients for the intervention and intervention coordination -The aboriginal health worker (AHW) was present with the pharmacists during the intervention delivery	-Deliver home medicines review	-AHW bridged the cultural gap between the patient and the pharmacist.	Number of HMR completed during 12 months: 64 Issues identified: 348 Educational activities undertaken: 256 Recommendations made: 379 Recommendations implemented: 52%
Foster et al., 2023 [47] (USA)	Screening for health-related social needs by the pharmacy staff and referral to local resources by a CHW	-The CHW reviewed completed forms and assessed the need for referral and followed-up patients	-Pharmacy staff recruited patients and proposed them to complete the social needs screening form -Followed-up patients	-Collaboration and information sharing within the pharmacy between pharmacy staff and the CHW to assess health-related social needs.	Number of subjects who completed the social needs screening: 86. Number of subjects who had an intervention and referral: 21.
Gerber et al., 2010 [57] (USA)	Addressing patients' barriers to medication adherence	-Assessment of the patient's medication list and medication management at home to identify barriers to medication adherence -Assisted with the patient's needs (i.e., providing a pillbox, a medication list in Spanish, help with transportation needs) and delivered emotional support when needed -Education on insulin injection technique with the patient -The health promoter translated the information given by the pharmacists into Spanish	-Pharmacists assisted patients in cases of complex medication management, provided medication reconciliation, and linked with health providers -Pharmacist recommended medication changes to the general practitioner -Medical records were reviewed by the pharmacist	-Pharmacist, patient and health promoter met together, and the health promoter translated the information in Spanish -Health promoter discussed the collected information on the medication list, barriers to medication adherence and self-care with the pharmacist. -The health coaches alerted pharmacists to extremely high or low home glucose levels, patient questions, and discrepancies discovered in management. -Together they identified strategies to address medication barriers.	Medication management: 8/9 participants had medication adjustments (with a maximum of 7 adjustments per participant).

Table 2 (continued)

Study (*n* = 18)	Types of interventions pharmacists and CHWs delivered	Roles of CHWs in the intervention	Roles of pharmacists in the intervention	Interprofessional collaboration between pharmacists and CHWs	Main study outcomes
Gerber et al., 2023 [48] (USA)	The order of the intervention was randomized: one year of mHealth diabetes support, lifestyle and medication support, followed by 1 year of usual care.	-Health coaches conducted home visits and connected the patient with the pharmacists through videoconference. -Health coach addressed barriers to medication management, monitored blood pressure and glucose levels, provided diabetes education and assisted pharmacists to assess the medication list.	-Pharmacists provided medication reconciliation, evaluation of medication changes, reviewing clinical goals with patients' general practitioner, reviewed patient medical records, home glucose and blood pressure data, and provided a care plan. -Pharmacists delivered lifestyle and medication education (i.e., pill boxes, medication lists). -Pharmacists intensified therapy (i.e., increase in dose or number of therapeutic classes) using a protocol and communicated with general practitioners if needed.	-Health coaches facilitated the meeting between the patient and the pharmacists through videoconferencing. -Clinical information and questions from patients were collected by health coaches and shared with pharmacists -Health coaches reinforced pharmacists' recommendations.	HbA1c: over the initial 12 months, HbA1c improved by a mean of −0.79% in the intervention group compared with −0.24% in the waiting list control group (treatment effect, −0.62; 95% CI, −1.04 to −0.19; $P = 0.005$)
Johnson et al., 2018 [49] (USA)	Medication therapy management (MTM) provided by telephone by an academic pharmacist	-At one site, during the first intervention, when possible, the CHWs were present at the patient's home to ensure patient understanding, assist in medication reconciliation and document the intervention	-The pharmacists provided the MTM and sent recommendations to the community pharmacist or prescribers and provided a follow-up review	-CHWs facilitated the meeting between the patient and the pharmacist.	Number of interventions: 237 medication-related and 1,102 health promotion interventions were completed. Positive trends were observed in fasting blood glucose, postprandial glucose and diastolic blood pressure.
Jones et al., 2008 [50] (Canada)	Blood pressure information sessions delivered in six community pharmacies	-Volunteer peer health educators (VPHE) conducted the information sessions -They identified participants' cardiovascular risk factors, measured blood pressure and followed a management algorithm -They supported patients to use the device to measure their blood pressure	-Pharmacists provided a medication review and assessed medication adherence -Pharmacists assessed potential drug interactions with antihypertensive medications and assessed the cause of the elevated blood pressure and provided recommendations	-VPHE provided the intervention in the community pharmacy -VPHE referred patients to pharmacists and physicians according to the blood pressure values measured (they used a referral algorithm). -VPHE facilitated the encounter between the pharmacist and the patient, and/or the physician.	Feasibility of the program: VPHE assessed 406 seniors (approximately 40% of the seniors in the town) during the 3-month program. The mean (± SD) systolic blood pressure decreased by 16.9 ± 17.2 mmHg ($P < 0.05$, $n = 105$) compared with their first visit, and 56% of participants (59 of 105) reached Canadian targets for blood pressure.
Lin et al., 2021 [51] (USA)	Support adherence and understanding of oral anticancer medication (OAM) through 4 educational sessions	-The medication navigator was present during the 4 educational sessions -The navigator used the Multinational Association of Supportive Care in Cancer (MASCC) Oral Agent Teaching Tool (MOATT) teach-back with the patient to support OAM understanding and identify barriers to medication taking	The specialty oncology pharmacist led the first and the third educational sessions.	The pharmacist and the navigator conducted the first and the third session together.	Medication adherence: At study completion, all participants adequately understood OAM taking, but 41.0% had inadequate understanding of OAM handling.

Table 2 (continued)

Study (*n* = 18)	Types of interventions pharmacists and CHWs delivered	Roles of CHWs in the intervention	Roles of pharmacists in the intervention	Interprofessional collaboration between pharmacists and CHWs	Main study outcomes
Nissen et al., 2003 [52] (Australia)	Use of videophones to connect community pharmacists, general practitioners, patients and AHWs	The AHW was present during the video call	The pharmacists delivered information to the AHWs regarding availability of medications, patient or medicine information such as side effects.	The AHW facilitated the connection between the pharmacist and the patient by videophone.	Number of interventions: Various problems occurred and only 10 video phone interactions were recorded during the 6-month project.
Polomoff et al., 2022 [37] (USA) Wagner et al., 2021 [58] (USA) Wagner et al., 2023 [59] (USA) Wagner et al., 2023 [60] (USA)	Participants were randomized to one of 3 interventions: 1) CHW-delivered lifestyle intervention called Eat, Walk, Sleep (EWS) 2) EWS plus pharmacist/CHW-delivered medication therapy management (EWS + MTM) 3) social services (control).	-CHWs collected information on the patient's medication list -CHWs facilitated the meeting with the pharmacist via videoconferencing -CHWs translated the information to the patient, bridged the cultural gap, provided education to the patient -They supported patients with administrative tasks	-Pharmacists conducted MTM via videoconferencing and delivered a medication action plan that was sent to the participant -Pharmacists sent the medication report to the healthcare provider and made recommendations	-In one arm of this study, the CHW delivered the MTM with the pharmacist. -The presence of the CHW increased patient's confidence with the pharmacist recommendations. -During the first session, the CHW measured patient's blood pressure and heart rate and shared the data with the pharmacist in real time. -The medication action plan was discussed between the pharmacist, the CHW, and the patient.	Adherence (Polomoff et al., 2022): All 3 groups reported a significant decrease in barriers to taking medications. Process outcomes (Wagner et al., 2021): On a scale from 0 to 3, participants reported high EWS treatment satisfaction (mean = 2.9, SD = 0.2), group cohesion (mean = 2.9, SD = 0.3), and therapeutic alliance to CHWs (mean = 2.9, SD = 0.2) and to pharmacists (mean = 2.9, SD = 0.3). Attendance was challenging but highly successful. Retention was high, 95% at 12-month and 96% at 15-month assessments. Clinical outcomes (Wagner et al., 2023): Compared to the other arms, EWS + MTM showed a significant decrease in HbA1c and a trend for reduced inflammation and stress hormones. Nutrition, physical activity and sleep (Wagner et al., 2023): Participants in the two treatment groups that received the EWS intervention significantly increased their brown rice consumption and their moderate-to-vigorous activity. No intervention changed sleep duration, timing, efficiency or wake after sleep onset.
Rovner et al., 2023 [53] (USA)	Multidisciplinary behavioural diabetes education intervention	-CHWs provided diabetes education and supported behavioural activation at the patient's home -CHWs facilitated the connection with the primary care physician and nurses via telehealth.	-Pharmacists reviewed patient's medications, discussed the treatment plan with the primary care physician and provided recommendations to reduce potentially inappropriate medications.	CHWs shared collected information with the pharmacist.	Hospital readmission: 68 (69.4%) intervention participants and 69 (67.6%) control participants had at least 1 incident emergency department visit/hospitalization over 12 months. The adjusted incidence rate ratio for the intervention versus control was 1.11 (95% CI 0.79–1.56; $P = 0.54$).

Table 2 (continued)

Study (*n* = 18)	Types of interventions pharmacists and CHWs delivered	Roles of CHWs in the intervention	Roles of pharmacists in the intervention	Interprofessional collaboration between pharmacists and CHWs	Main study outcomes
Sharp et al., 2018 [54] (USA)	Diabetes management support	-CHWs provided diabetes education, supported self-management (i.e., encouraged patients in monitoring home glucose and blood pressure) at home. -They provided social support, supported health care navigation and referred patients to resources. -CHW provided translation for Spanish-speaking patients and accompanied and supported patients to primary care physician and pharmacist appointments.	-Pharmacists delivered medication reconciliation and a plan of care approved by the primary care provider. -They reviewed medication interactions and side-effects -They supported medication adherence. -They delivered health promotion and education.	-CHWs translated information for Spanish-speaking patients during the encounters between the patient and the pharmacist. -CHWs and pharmacists communicated about the patient case before or after the appointments. -Together they discussed barriers to medication adherence.	Clinical outcome: Similar HbA1c declines were noted after receiving the 1-year of CHW support: −0.45% [95% CI − 0.96, 0.05] with CHW versus − 0.42% [95% CI − 0.93, 0.08] without CHW support.
Sokan et al., 2022 [55] (USA)	Improving the transition of care from hospital to home by evaluating medical and social determinants of health.	-CHWs identified eligible patients with complex medical and social needs who would benefit from the intervention. -CHWs collected relevant patient information -CHWs coordinated actions and followed up on patient's social determinants of health needs, i.e., supported transportation, scheduled appointments.	-Pharmacists provided medication reconciliation, patient education, assessed barriers to medication adherence and developed a care plan. -Pharmacists communicated with the discharge or primary care team to address medication-related problems.	-CHWs and pharmacists worked together to address medication-related problems.	Medication adherence was higher among patients enrolled in the program compared with control during the first 30 days post-discharge, specifically among patients diagnosed with congestive heart failure and chronic obstructive pulmonary disease, although neither result achieved statistical significance.
Sorensen et al., 2021 [56] (USA)	Improving the transition of care from hospital to home	-Health coaches enrolled patients -Health coaches visited patients at home, recorded all patient medications and their use -They collected clinical information (i.e., falls, symptoms, vital signs) and promoted patient self-management. -They helped in scheduling appointments with primary care provider -They called patients to follow them up	-Pharmacists provided medication reconciliation and assessed medication safety. -Pharmacists communicated with patients and the primary care provider to optimize medication management.	-Health coaches shared collected information with the pharmacist.	Hospital readmission: patients who received this intervention had a significantly lower predicted probability of being readmitted within 30 days compared with matched-control patients (10.6% [CI 7.9–13.2] versus 21.4% [19.8–23.0], p-value < 0.001).

Table 2 (continued)

Study (*n* = 18)	Types of interventions pharmacists and CHWs delivered	Roles of CHWs in the intervention	Roles of pharmacists in the intervention	Interprofessional collaboration between pharmacists and CHWs	Main study outcomes
Umnuaypornlert et al., 2021 [7] (Thailand)	A smoking cessation program	-CHWs screened people addicted to cigarettes to participate. -CHWs collected data on the patient's smoking habits, they advised patients on resources to help them quit smoking. -They linked the patient and the hospital staff for patient assessment. -CHWs ensured patient follow-up.	Pharmacists supported patients to quit smoking and provided treatment upon needs (e.g., nicotine replacement therapy).	-CHWs coordinated with pharmacists to schedule patients for assessment at the clinic. -Pharmacists and CHWs collaborated to follow up treatment effectiveness.	Number of daily cigarettes: On average, patients reduced their cigarettes/day by 7.2% and 29% of patients were completely cigarette free at a 1-year follow-up.
Wheat et al., 2020 [38] (USA)	Addressing medication adherence barriers	-CHWs collected patient information (i.e., medication refill dates) -CHWs supported patients to meet their health goals, connected the patient to relevant health care resources and followed them up.	Based on the barriers to medication adherence identified, the pharmacist provided the relevant intervention in partnership with the CHW.	-CHWs and pharmacists collaborated to develop the patient's "action plan" to address barriers to medication adherence. -CHWs and pharmacists collaborated to follow up patients and monitor progress. -CHW-pharmacist teams referred patients to their local pharmacist or physician.	Medication adherence: by the final visits, 75.6% of the barriers related to antihypertensive medications and 63.9% of the barriers related to antidiabetic medications were resolved.

AHWs: aboriginal health workers; CHWs: community health workers; CI: confidence interval, EWS: Eat, Walk, Sleep; HbA1c: glycated haemoglobin, HMR: Home Medicines Review; MOATT: Multinational Association of Supportive Care in Cancer (MASCC) Oral Agent Teaching Tool; MTM: medication therapy management; OAM: oral anticancer medication; SD: standard deviation, VPHE: volunteer peer health educators

bridging a cultural gap was not the goal of the CHWs. CHWs delivered blood pressure information sessions [50] or addressed the social determinants of health in patients with congestive heart failure or chronic obstructive pulmonary disease [55], adults aged 65 or older [56], or for clients at a pharmacy [47].

The interventions were delivered at the transition of care after hospital discharge [55, 56] or directly in a community pharmacy where the CHW worked [47, 50].

The roles of CHWs

The CHWs mostly delivered the intervention jointly with pharmacists, to ensure the intervention was provided in a culturally safe environment, built trust with patients, facilitated the link between the patient and the pharmacist (remote or face-to-face) and ensured patient understanding.

CHWs also conducted interventions and follow-up visits, mostly at the patient's home, in the absence of the pharmacist. These were for glucose and blood pressure monitoring [48, 54, 57], to provide diabetes self-care education [53], to support adherence and self-management [38, 51, 56], to collect the patient medication history [37, 58], provide social and healthcare navigation support [54, 55] or motivate people to quit smoking [7].

CHWs documented clinical and non-clinical information to address medication management-related issues [56], social and environmental needs [55] and followed-up on the patient's needs regarding transportation and housing [55]. CHWs shared the collected information with pharmacists to tailor the intervention individually to the patient's needs [37, 38, 47, 48, 53, 54, 56–60]. While supporting pharmacists' recommendations, CHWs provided the link with the pharmacist in case of patient questions [48]. The CHWs had frequent follow-up contacts with patients by face-to-face meetings, phone calls or text messages [7, 38, 48, 53, 54, 56, 57].

In two studies [47, 50], the CHWs were embedded in the community pharmacy. In one study, they delivered blood pressure information sessions and measured patients' blood pressure, along with collecting information on patients' cardiovascular risk factors [50]. In the other study, CHWs collected information regarding the social determinants of health and social needs, reviewed patient cases, assessed the resources needed, and when needed, connected the patient with a local community organization [47].

CHWs also managed the logistic aspects of the intervention: they identified eligible patients and recruited them [7, 46, 55, 56], scheduled appointments for the

patient with the pharmacist [7, 48], the primary care providers or the field team [55, 56], and provided educational materials to patients [50, 57].

The roles of pharmacists

The pharmacists' roles were primarily clinical, conducting medication review [46, 50], and medication therapy management [37, 49, 58–60]. They provided medication reconciliation, identified drug-related problems, such as, potentially inappropriate medications, drug interactions and side-effects [48, 50, 52–57]. They delivered patient education sessions on medication management and adherence [37, 48, 51, 57–59]. They assessed medication adherence [46, 49, 50], supported adherence by addressing adherence barriers [38, 48, 53–56] and delivering medication adherence aids (e.g., pillboxes, list of medications in lay language) [48, 54]. The pharmacists also delivered information to the aboriginal health workers regarding availability of medications, patient or medicine information [52].

Using the clinical data provided by the CHWs, pharmacists communicated with the patient's healthcare providers (i.e., mainly with the patient's primary care physician) to discuss therapeutic goals and make suggestions about the treatment plan [37, 48, 49, 53–60]. Pharmacists were also involved in supporting patients to quit smoking by delivering relevant treatments and counselling [7]. They also followed up patients' social needs after the CHW had connected them with local community resources [47].

The collaborative practice

Connection between the patient, CHW, and pharmacist

The CHW was the liaison between the patient and the pharmacist during the intervention. Pharmacists and CHWs worked synergistically before, during and after the intervention by sharing relevant information on the patient's non-clinical or clinical condition, discussing patient cases and together reviewing the medication plan [48, 53, 55, 57]. Pharmacists and CHWs referred patients to one another: pharmacists referred patients to the embedded CHWs [47] to address social needs, and the CHWs referred patients with high blood pressure [50] or with medication adherence barriers [38] to a pharmacist or physician.

The CHWs and pharmacists communicated by phone [37, 38, 46, 48, 49, 51, 52, 54, 55], email [37, 38, 46, 48, 51, 52, 54], face-to-face discussions [46–48, 50, 51, 54], videoconferencing [37, 48, 52], a secure messaging platform [55], specific forms [38, 47, 52, 53, 56], or through the patient's electronic medical record [48, 55, 56].

Pharmacists training CHWs

Pharmacists also trained CHWs, e.g., in medication therapy management [37, 38], medication education and triaging of medication-related issues [51], or on the harms of smoking and techniques to help people quit smoking [7]. In one study that aimed to identify and address patient medication adherence barriers, pharmacists trained CHWs on motivational interviewing, communication skills, ways to identify medication adherence barriers, and how to collaborate with a pharmacist [38]. Pharmacists also supervised CHWs, e.g., CHWs were supervised for some medication review sessions delivered with participants [37]. CHWs also shadowed pharmacists to observe pharmacist-patient interactions and routine clinical pharmacist activities [62].

Discussion

Based on the findings, there were a number of roles that both CHWs and pharmacists played as part of the interprofessional collaborative services that were delivered to patients.

Firstly, patient identification and mutual referrals occurred between the CHWs and pharmacists, (i) either during the recruitment process, to refer patients to the intervention, or (ii) during the intervention, to refer patients to relevant resources, including the referral to CHWs, pharmacists or physicians. For instance, the aboriginal health worker identified patients and referred them for home medicine review to the pharmacist [46], health coaches alerted pharmacists to extreme patient glucose levels [48], or volunteer peer health educators referred patients to pharmacists and physicians according to the blood pressure values measured (they used a referral algorithm) [50]. CHWs encouraged patients to see pharmacists, and pharmacists relied on this link provided by the CHW to maintain contact with the patient. If CHWs collaborated with pharmacists, CHWs would identify patients who needed support from a pharmacist and pharmacists would identify patients in need of a CHW. CHWs would act as facilitators in increasing the number of patients who would benefit from pharmaceutical services, and pharmacists would facilitate patient access to CHW's services, which could ensure the continuity of care and ultimately improve patient health outcomes. This referral process could be facilitated by CHWs and pharmacists being co-located within the same workplace. Foster et al. published an innovative model where CHWs were embedded in community pharmacies to address social determinants of health by navigating the patient to local community resources, and pharmacists followed up on the patients after the intervention [61]. This referral process could also be optimized by implementing a standardized referral software or a shared medical record, that could be used by CHWs,

pharmacists, and broader healthcare team. The communication and sharing of information between CHWs and pharmacists could be improved through this main communication channel.

Secondly, CHWs facilitated the link between the patient and the pharmacist by coordinating appointments, and by being a cultural, social and health literacy bridge during the intervention delivered by the pharmacist. A recent systematic review showed that this navigation role improved the use of primary care for chronic disease management [10]. The CHW could support the patient in receiving a service from the pharmacist and ensure patient follow-up or bring the patient back to the pharmacy when needed.

Thirdly, CHWs and pharmacists collaborated by sharing information with each other. The CHW gained the patient's trust, which allowed CHWs to collect and document comprehensive and reliable information on the patient's self-management behaviour that the patient may not have shared with the pharmacist. The pharmacist relied on the CHW to collect this information, while the CHW relied on the pharmacist to integrate the collected information to tailor the intervention to the patient's needs. The expertise of the CHW regarding the patient's cultural background is crucial to better understand the patient's needs, so the service delivered by the pharmacist is improved by the presence of, and the information collected by, the CHW.

The training that pharmacists delivered to CHWs in some of the included studies was also part of the collaborative practice. The literature reports that the mode and duration of training and supervision of CHWs is often heterogeneous between the interventions and programs implemented globally [4, 10, 63]. While in the included studies, pharmacists trained and supervised CHWs, CHWs can also train pharmacists and cross-training can occur. For instance, in an Australian study, after pharmacists received cultural awareness training by an experienced aboriginal trainer, pharmacists trained aboriginal health workers on a cardiovascular medication education program [64]. Moreover, pharmacy technicians can be trained and work as CHWs [65–70] or CHWs can be trained as pharmacy technicians [71]. For instance, in the SafeMed program, pharmacy technicians trained as CHWs identified eligible patients and connected them with the pharmacist who would deliver the medication therapy management services [65]. In another intervention, the pharmacy technician had the role of navigators and pharmacy liaisons to support patient medication adherence [66]. Pharmacists can also be trained to be CHWs: pharmacists can take CHW core competencies courses so that they can provide additional services to patients from their community, beyond the pharmaceutical services they usually provide [72].

Fourthly, after receiving specific training, CHWs were able to assist pharmacists, and work synergistically together to deliver the clinical interventions. While pharmacists have the clinical expertise, the CHWs understand and advocate for the patient. When the intervention is delivered by the CHW and the pharmacist, the patients better understand what is being said, and patients may be more keen to be involved in their care. The most common primary outcome reported in the included studies was medication adherence, and Segal et al. proposed a collaboration between pharmacists and CHWs to improve medication adherence in minority populations [73]. The CHW bridges the communication gap between the patient and the pharmacist, collects information regarding any medication adherence barriers the patient may experience, and share the information with the pharmacist who will assess and develop an action plan. The CHW will then implement the pharmacist's recommendation with the patient and follow-up the progress [73].

While the 18 included studies described the collaborative practice between CHWs and pharmacists, other studies involving CHWs and pharmacists did not report how they worked together: they seemed to deliver the intervention separately without communicating or sharing information [5, 74–89]. For instance, in one study, CHWs provided home visits to patients to assess medication management and health status, and pharmacists supported patients' medication adherence and dispensed their medications [84]. However, no information was reported on how CHWs and pharmacists shared patient information [84]. Similarly, in a feasibility study to administer antiretroviral therapy, the pharmacy was involved in delivering medications whereas CHWs observed patients swallowing the medication, but no collaborative practice between the pharmacy and CHWs was reported [85]. In another study, pharmacists prepared the medication that was requested by a nurse, who collaborated with CHWs who introduced the medication to the patients, but no communication occurred between CHWs and pharmacists [88]. Finally, an intervention reported that pharmacists and CHWs were part of a multidisciplinary team of healthcare and wellness providers, who visited patients together to provide them with individualized goals based on their needs, but no information was given on the collaborative practice between pharmacists and CHWs [81].

The small number of studies included and the lack of a comprehensive description of the collaborative practice may be due to challenges in the interprofessional collaboration. The lack of clarity of the respective roles and responsibilities may prevent trust and communication between CHWs and pharmacists [73, 90], and the information sharing between the patient, and the CHW and the pharmacist can be challenging. Indeed, the patients trust CHWs, who must respect patient's confidentiality,

but the CHWs also share relevant information with pharmacists [90]. While challenges may arise in the communication between CHWs and pharmacists [91], the communication and relationship between CHWs and patients may be challenging as well. Indeed, patients may not be aware of CHW role and may be reluctant to collaborate. Thus, awareness of CHW roles and responsibilities should be promoted amongst pharmacists and the public, so that they have trust and are ready to collaborate and share information with CHWs [92]. Clarification of roles and effective communication are two key components of a collaborative practice [93]. Further studies should explore the barriers and facilitators to the interprofessional collaboration between pharmacists and CHWs, as well as potential implications for policy and practice.

Research should be conducted to explore the implementation strategies and outcomes of programs, interventions and models of care, so that the interventions can be adapted to each healthcare system context. Research in this field is in its infancy, as most of the included studies were published since 2020. It is possible that the growing interest in this area may be related to the COVID-19 pandemic and the integration of CHWs in the clinical teams fostered by the workforce shortage [94].

There are some limitations in this review. Many of the papers did not clearly define CHWs and their roles as part of the interventions delivered. Contact with the authors of selected articles was necessary to confirm the roles of the stakeholders in the intervention and select only the studies that involved a CHW working in collaborative practice with a pharmacist. Only articles published in English or French were included, and some potentially important studies published in other languages (e.g., studies conducted in Brazil and published in Portuguese, where promotoras de salud play a major role to support Latino populations) might have been missed. No articles published in French were identified. This may be because no French words were used as keywords in the research strategy. However, the abstract of the French-language scientific literature is often translated into English. It is possible that no studies have been conducted in French-speaking countries. Interestingly, European programs involving CHWs have been routinely implemented only in the UK [8]. Finally, publication bias cannot be excluded, as studies without statistical significance or negative findings may be less likely published especially in peer reviewed publications [95]. To minimize potential publication bias, we searched all potentially relevant publication sources using a broad terminology, including relevant peer-reviewed publications and grey literature, with no restriction applied to the date of publication, and the PRISMA-ScR guidelines were followed to report the findings.

Conclusion

The interprofessional collaboration between pharmacists and CHWs fell into three categories: mutual interprofessional patient referral and interprofessional assistance by the CHW in facilitating the link with the pharmacist, so that the pharmacist can connect with the patient and deliver the service; information sharing between the CHW and the pharmacist to tailor the intervention to the patient's needs; and an interprofessional collaborative practice where CHWs and pharmacists delivered the intervention together. CHWs and pharmacists can work synergistically through bridging the cultural gap between pharmacist and patients, identifying patients' social determinants of health, and tailoring interventions to the patient's needs. This interprofessional collaboration can improve and optimize the pharmaceutical services delivered, and ultimately have a positive impact on health outcomes.

Abbreviations

AHWs	aboriginal health workers
AIDS	acquired immunodeficiency syndrome
CI	confidence interval
CHWs	community health workers
COVID-19	coronavirus disease
EWS	Eat, Walk, Sleep
HbA1c	glycated haemoglobin
HIV	human immunodeficiency virus
HMR	home medicines review
MeSH	Medical Subject Headings
MOATT	Multinational Association of Supportive Care in Cancer (MASCC) Oral Agent Teaching Tool
MTM	medication therapy management
OAM	oral anticancer medication
PRISMA-ScR	Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for scoping reviews (ScR)
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America
VPHE	volunteer peer health educators
SD	standard deviation
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1

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Author contributions

CB and PA designed the study, CB screened and selected articles with the guidance of PA, SKM, EH and MH. SKM and EH screened independently 10 articles. CB and PA analysed the data, and CB, PA, SKM, EH and MH interpreted the data. CB drafted the manuscript, PA reviewed and revised the manuscript, and SKM, EH and MH reviewed the manuscript.

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Declarations

Competing interests
The authors declare no competing interests.

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References

1. Perry HB, Zulliger R, Rogers MM. Community Health Workers in Low-, Middle-, and high-income countries: an overview of their history, recent evolution, and current effectiveness. Annu Rev Public Health. 2014;35(1):399–421.
2. World-Health-Organization. *Report of the International Conference on Primary Health Care Alma-Ata 6–12 September 1978*. 1978.
3. American-Public-Health-Association. Community Health Workers. 2024 [cited 2024 14.08.2024]; Available from: https://www.apha.org/apha-communities/member-sections/community-health-workers
4. World-Health-Organization. *WHO guideline on health policy and system support to optimize community health worker programmes*. 2018.
5. Matthews PH, Darbisi C, Sandmann L, Galen R, Rubin D. Disseminating health information and diabetes care for latinos via electronic information kiosks. J Immigr Minor Health. 2009;11(6):520–6.
6. Dewi A, Pisani E, Ihsan BRP, Hariadini AL, Patel A, Palagyi A, Praveen D, Sujarwoto, Lyrawati D. Continuity of CVD treatment during the COVID-19 pandemic: evidence from East Java, Indonesia. J Pharm Policy Pract. 2023;16(1):50.
7. Umnuaypornlert A, Dede AJO, Pangtri S. Community Health Workers Improve Smoking Cessation when they Recruit patients in their home villages. J Prim Care Community Health. 2021;12:21501327211048363.
8. Van Iseghem T, Jacobs I, Vanden Bossche D, Delobelle P, Willems S, Masquillier C, Decat P. The role of community health workers in primary healthcare in the WHO-EU region: a scoping review. Int J Equity Health. 2023;22(1):134.
9. Dudley L, Couper I, Kannangarage NW, Naidoo S, Ribas CR, Koller TS, Young T. COVID-19 preparedness and response in rural and remote areas: a scoping review. PLOS Glob Public Health. 2023;3(11):e0002602.
10. Mistry SK, Harris E, Harris M. Community Health Workers as Healthcare Navigators in Primary Care Chronic Disease Management: a systematic review. J Gen Intern Med. 2021;36(9):2755–71.
11. Viswanathan M, Kraschnewski JL, Nishikawa B, Morgan LC, Honeycutt AA, Thieda P, Lohr KN, Jonas DE. Outcomes and costs of community health worker interventions: a systematic review. Med Care. 2010;48(9):792–808.
12. Braun KL, Thomas WL Jr, Domingo J-LB, Allison AL, Ponce A, Haunani Kamakana P, Brazzel SS, Emmett N, Aluli, Tsark JU. Reducing Cancer Screening disparities in Medicare beneficiaries through Cancer Patient Navigation. J Am Geriatr Soc. 2015;63(2):365–70.
13. Wells KJ, Luque JS, Miladinovic B, Vargas N, Asvat Y, Roetzheim RG, Kumar A. Do community health worker interventions improve rates of screening mammography in the United States? A systematic review. Cancer Epidemiol Biomarkers Prev. 2011;20(8):1580–98.
14. Battaglia TA, McCloskey L, Caron SE, Murrell SS, Bernstein E, Childs A, Jong H, Walker K, Bernstein J. Feasibility of chronic disease patient navigation in an urban primary care practice. J Ambul Care Manage. 2012;35(1):38–49.
15. Gilmore B, McAuliffe E. Effectiveness of community health workers delivering preventive interventions for maternal and child health in low- and middle-income countries: a systematic review. BMC Public Health. 2013;13(1):847.
16. Lewin S, Munabi-Babigumira S, Glenton C, Daniels K, Bosch-Capblanch X, van Wyk B.E., Odgaard-Jensen J., Johansen M., Aja G.N., Zwarenstein M., Scheel I.B. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. Cochrane Database Syst Rev. 2010;20103:pCd004015.
17. Anand TN, Joseph LM, Geetha AV, Prabhakaran D, Jeemon P. Task sharing with non-physician health-care workers for management of blood pressure in low-income and middle-income countries: a systematic review and meta-analysis. Lancet Glob Health. 2019;7(6):e761–71.
18. McDermott RA, Schmidt B, Preece C, Owens V, Taylor S, Li M, Esterman A. Community health workers improve diabetes care in remote Australian indigenous communities: results of a pragmatic cluster randomized controlled trial. BMC Health Serv Res. 2015;15:68.
19. Collinsworth AW, Vulimiri M, Schmidt KL, Snead CA. Effectiveness of a community health worker-led diabetes self-management education program and implications for CHW involvement in care coordination strategies. Diabetes Educ. 2013;39(6):792–9.
20. Potty RS, Kumarasamy K, Adepu R, Reddy RC, Singarajipura A, Siddappa PB, Sreenivasa PB, Thalinja R, Lakkappa MH, Swamickan R, Shah A, Panibatla V, Dasari R, Washington R. Community health workers augment the cascade of TB detection to care in urban slums of two metro cities in India. J Glob Health. 2021;11:04042.
21. Ospina JE, Orcau À, Millet J-P, Sánchez F, Casals M, Caylà JA. Community health workers improve contact tracing among immigrants with tuberculosis in Barcelona. BMC Public Health. 2012;12(1):158.
22. Das A, Friedman J, Kandpal E, Ramana GNV, Gupta RKD, Pradhan MM, Govindaraj R. Strengthening malaria service delivery through supportive supervision and community mobilization in an endemic Indian setting: an evaluation of nested delivery models. Malar J. 2014;13(1):482.
23. Mwai GW, Mburu G, Torpey K, Frost P, Ford N, Seeley J. Role and outcomes of community health workers in HIV care in sub-saharan Africa: a systematic review. J Int AIDS Soc. 2013;16(1):18586.
24. Tolley A, Hassan R, Sanghera R, Grewal K, Kong R, Sodhi B, Basu S. Interventions to promote medication adherence for chronic diseases in India: a systematic review. Front Public Health. 2023;11:1194919.
25. Kenya S, Chida N, Symes S, Shor-Posner G. Can community health workers improve adherence to highly active antiretroviral therapy in the USA? A review of the literature. HIV Med. 2011;12(9):525–34.
26. Newman PM, Franke MF, Arrieta J, Carrasco H, Elliott P, Flores H, Friedman A, Graham S, Martinez L, Palazuelos L, Savage K, Tymeson H, Palazuelos D. Community health workers improve disease control and medication adherence among patients with diabetes and/or hypertension in Chiapas, Mexico: an observational stepped-wedge study. BMJ Glob Health. 2018;3(1):e000566.
27. Washburn DJ, Callaghan T, Schmit C, Thompson E, Martinez D, Lafleur M. Community health worker roles and their evolving interprofessional relationships in the United States. J Interprof Care. 2022;36(4):545–51.
28. Franklin CM, Bernhardt JM, Lopez RP, Long-Middleton ER, Davis S. Interprofessional Teamwork and Collaboration between Community Health Workers and Healthcare Teams: an integrative review. Health Serv Res Manag Epidemiol. 2015;2:2333392815573312.
29. Tsuyuki RT, Beahm NP, Okada H, Al YN, Hamarneh. Pharmacists as accessible primary health care providers: review of the evidence. Can Pharm J (Ott). 2018;151(1):4–5.
30. Al-babtain B, Cheema E, Hadi MA. Impact of community-pharmacist-led medication review programmes on patient outcomes: a systematic review and meta-analysis of randomised controlled trials. Res Social Administrative Pharm. 2022;18(4):2559–68.
31. Marupuru S, Roether A, Guimond AJ, Stanley C, Pesqueira T, Axon DR. A systematic review of clinical outcomes from Pharmacist provided medication Therapy Management (MTM) among patients with diabetes, hypertension, or Dyslipidemia. Healthc (Basel), 2022. 10(7).
32. Rajiah K, Sivarasa S, Maharajan MK. Impact of Pharmacists' Interventions and Patients' Decision on Health Outcomes in Terms of Medication Adherence and Quality Use of Medicines among Patients Attending Community Pharmacies: A Systematic Review. Int J Environ Res Public Health, 2021. 18(9).
33. Bandiera C, Dotta-Celio J, Locatelli I, Nobre D, Wuerzner G, Pruijm M, Lamine F, Burnier M, Zanchi A, Schneider MP. The differential impact of a 6-versus 12-month pharmacist-led interprofessional medication adherence program on medication adherence in patients with diabetic kidney disease: the randomized PANDIA-IRIS study. Front Pharmacol, 2024. 15.
34. Vallis M, Lee-Baggley D, Sampalli T, Ryer A, Ryan-Carson S, Kumanan K, Edwards L. Equipping providers with principles, knowledge and skills to

successfully integrate behaviour change counselling into practice: a primary healthcare framework. Public Health. 2018;154:70–8.

35. Singh P, LeBlanc P, King-Shier K. Interventions to improve Medication Adherence in ethnically diverse patients: a narrative systematic review. J Transcult Nurs. 2021;32(5):600–13.
36. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, Hempel S, Akl EA, Chang C, McGowan J, Stewart L, Hartling L, Aldcroft A, Wilson MG, Garritty C, Lewin S, Godfrey CM, Macdonald MT, Langlois EV, Soares-Weiser K, Moriarty J, Clifford T, Tunçalp Ö, Straus SE. PRISMA Extension for scoping reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169(7):467–73.
37. Polomoff CM, Bermudez-Millan A, Buckley T, Buxton OM, Feinn R, Kong S, Kuoch T, Lim M, Scully M, Wagner J. Pharmacists and community health workers improve medication-related process outcomes among Cambodian americans with depression and risk for diabetes. J Am Pharm Assoc (2003). 2022;62(2):496–504. e1.
38. Wheat L, Roane TE, Connelly A, Zeigler M, Wallace J, Kim JH, Segal R. Using a pharmacist-community health worker collaboration to address medication adherence barriers. J Am Pharm Assoc (2003). 2020;60(6):1009–14.
39. Olaniran A, Smith H, Unkels R, Bar-Zeev S, van den Broek N. Who is a community health worker? - a systematic review of definitions. Glob Health Action. 2017;10(1):1272223.
40. Kiely B, Croke A, O'Shea M, Boland F, O'Shea E, Connolly D, Smith SM. Effect of social prescribing link workers on health outcomes and costs for adults in primary care and community settings: a systematic review. BMJ Open. 2022;12(10):e062951.
41. Muhl C, Mulligan K, Bayoumi I, Ashcroft R, Godfrey C. Establishing internationally accepted conceptual and operational definitions of social prescribing through expert consensus: a Delphi study. BMJ Open. 2023;13(7):e070184.
42. WorldHealthOrganization. Framework for action on interprofessional education and collaborative practice. Switzerland: Geneva; 2010.
43. Covidence. Covidence systematic review software. Veritas Health Innovation: Melbourne, Australia; 2024.
44. Mak S, Thomas A. Steps for conducting a scoping review. J Grad Med Educ. 2022;14(5):565–7.
45. MicrosoftCorporation. *Microsoft Excel*. 2018; Available from: https://office.microsoft.com/excel
46. Deidun D, Ali M, Madden A, O'Brien M. Evaluation of a home medicines review program at an Aboriginal Medical Service in the Northern Territory. J Pharm Pract Res. 2019;49(5):486–92.
47. Foster AA, Daly CJ, Leong R, Stoll J, Butler M, Jacobs DM. *Integrating community health workers within a pharmacy to address health-related social needs.* J Am Pharm Assoc (2003), 2023. 63(3): pp. 799–806.e3.
48. Gerber BS, Biggers A, Tilton JJ, Smith Marsh DE, Lane R, Mihailescu D, Lee J, Sharp LK. Mobile Health Intervention in patients with type 2 diabetes: a Randomized Clinical Trial. JAMA Netw Open. 2023;6(9):e2333629.
49. Johnson M, Jastrzab R, Tate J, Johnson K, Hall-Lipsy E, Martin R, Taylor AM, Warholak T. Evaluation of an academic-Community Partnership to Implement MTM Services in Rural communities to improve Pharmaceutical Care for patients with diabetes and/or hypertension. J Managed Care Specialty Pharm. 2018;24(2):132–41.
50. Jones C, Simpson SH, Mitchell D, Haggarty S, Campbell N, Then K, Lewanczuk RZ, Sebaldt RJ, Farrell B, Dolovitch L, Kaczorowski J, Chambers LW. Enhancing hypertension awareness and management in the elderly: lessons learned from the Airdrie Community Hypertension Awareness and Management Program (A-CHAMP). Can J Cardiol. 2008;24(7):561–7.
51. Lin M, Hackenyos D, Savidge N, Weidner RA, Murphy-Banks R, Fleckner T, Parsons SK, Rodday AM. Enhancing patients' understanding of and adherence to oral anticancer medication: results of a longitudinal pilot intervention. J Oncol Pharm Pract. 2021;27(6):1409–21.
52. Nissen L, Tett S. Can telepharmacy provide pharmacy services in the bush? J Telemed Telecare, 2003. 9 Suppl 2: pp. S39–41.
53. Rovner BW, Casten R, Chang AM, Hollander JE, Leiby BE, Nightingale G, Pizzi L, Herres J, White N, Kelley M, Rising K. Interprofessional Intervention to Reduce Emergency Department Visits in Black Individuals with diabetes. Popul Health Manage. 2023;26(1):46–52.
54. Sharp LK, Tilton JJ, Touchette DR, Xia Y, Mihailescu D, Berbaum ML, Gerber BS. Community Health workers supporting clinical pharmacists in Diabetes Management: a Randomized Controlled Trial. Pharmacotherapy. 2018;38(1):58–68.
55. Sokan O, Stryckman B, Liang Y, Osotimehin S, Gingold DB, Blakeslee WW, Moore MJ, Banas CA, Landi CT, Rodriguez M. Impact of a mobile integrated healthcare and community paramedicine program on improving medication adherence in patients with heart failure and chronic obstructive pulmonary disease after hospital discharge: a pilot study. Exploratory Res Clin Social Pharm. 2022;8:100201.
56. Sorensen A, Grotts JF, Tseng CH, Moreno G, Maranon R, Whitmire N, Viramontes O, Atkins S, Sefilyan E, Simmons JW, Mangione CM. A collaboration among primary care–based clinical pharmacists and community-based Health coaches. J Am Geriatr Soc. 2021;69(1):68–76.
57. Gerber BS, Cano AI, Caceres ML, Smith DE, Wilken LA, Michaud JB, Ruggiero LA, Sharp LK. A pharmacist and health promoter team to improve medication adherence among latinos with diabetes. Ann Pharmacother. 2010;44(1):70–9.
58. Wagner J, Bermudez-Millan A, Buckley T, Buxton OM, Feinn R, Kong S, Kuoch T, Nahmod NG, Scully M. A randomized trial to decrease risk for diabetes among Cambodian americans with depression: intervention development, baseline characteristics and process outcomes. CONTEMPORARY CLINICAL TRIALS; 2021. p. 106.
59. Wagner JA, Bermúdez-Millán A, Buckley TE, Buxton OM, Feinn RS, Kong S, Kuoch T, Scully MF. Community-based diabetes prevention randomized controlled trial in refugees with depression: effects on metabolic outcomes and depression. Volume 13. SCIENTIFIC REPORTS; 2023. 1.
60. Wagner JA, Bermúdez-Millán A, Buckley TE, Buxton OM, Feinn RS, Kong S, Kuoch T, Master L, Scully MF. Secondary analysis of a randomized trial testing community health educator interventions for diabetes prevention among refugees with depression: effects on nutrition, physical activity and sleep. Int J Behav Nutr Phys Activity. 2023;20(1):1–11.
61. Foster AA, Daly CJ, Logan T, Logan R Jr., Jarvis H, Croce J, Jalal Z, Trygstad T, Bowers D, Clark B, Moore S, Jacobs DM. *Addressing social determinants of health in community pharmacy: Innovative opportunities and practice models.* J Am Pharm Assoc (2003), 2021. 61(5): pp. e48-e54.
62. Sharp LK, Biggers A, Perez R, Henkins J, Tilton J, Gerber B. A pharmacist and Health Coach-Delivered Mobile Health Intervention for type 2 diabetes: protocol for a randomized controlled crossover study. Volume 10. JMIR RESEARCH PROTOCOLS; 2021. 3.
63. Scott K, Beckham SW, Gross M, Pariyo G, Rao KD, Cometto G, Perry HB. What do we know about community-based health worker programs? A systematic review of existing reviews on community health workers. Hum Resour Health. 2018;16(1):39.
64. McRae M, Taylor SJ, Swain L, Sheldrake C. Evaluation of a pharmacist-led, medicines education program for Aboriginal Health workers. Rural Remote Health. 2008;8(4):946.
65. Bailey JE, Surbhi S, Bell PC, Jones AM, Rashed S, Ugwueke MO. SafeMed: using pharmacy technicians in a novel role as community health workers to improve transitions of care. J Am Pharm Assoc (2003). 2016;56(1):73–81.
66. Buitron de la Vega P, Ashe EM, Xuan Z, Gast V, Saint-Phard T, Brody-Fialkin J, Okonkwo F, Power J, Wang N, Lyons C, Silverstein M, Lasser KE. A Pharmacy Liaison–Patient Navigation intervention to reduce Inpatient and Emergency Department utilization among primary care patients in a Medicaid Accountable Care Organization: a Nonrandomized Controlled Trial. JAMA Netw Open. 2023;6(1):e2250004–2250004.
67. Gerrish K, Laker S, Wright S, Stainrod W. Medicines reablement in intermediate health and social care services. Prim Health Care Res Dev. 2017;18(4):305–15.
68. Lau G, Alwan L, Chi M, Lentz M, Hone K, Segal E. Expanding pharmacy practice through the use of pharmacy technicians as process navigators to facilitate patient access of oral anticancer agents. J Am Pharm Assoc (2003). 2019;59(4):586–92.
69. Yoon HS, Teshome BF, Eisenbeis A, Micek ST. Pharmacy technicians trained as community health workers: a prospective multicenter cohort study. Journal of the American Pharmacists Association: JAPhA,; 2023.
70. Triyasakorn K, Nguyen E. *Cross-training Pharmacy Personnel as Community Health Workers.* J Am Pharm Assoc (2003), 2023.
71. Coe AB, Rowell BE, Whittaker PA, Ross AT, Nguyen KTL, Bergman N, Farris KB. Impact of an Area Agency on Aging pharmacist-led Community Care Transition Initiative. Volume 63. JOURNAL OF THE AMERICAN PHARMACISTS ASSOCIATION; 2023. pp. 1230–. 4.
72. Somerville P, Lindsay R, Nguyen E. *Cross-Training Pharmacy Professionals as Community Health Workers.* Pharmacy (Basel, Switzerland), 2023. 11(5).
73. Segal R, Angaran DM, Odedina FT, Zeigler ML, Wallace JL. Opportunities and responsibilities for pharmacists to improve their effectiveness in addressing medication adherence through culturally sensitive collaborations with community health workers. J Am Pharm Assoc (2003). 2020;60(4):e25–30.
74. Austin EJ, Gojic AJ, Bhatraju EP, Pierce KA, Pickering EI, Tung EL, Scott JD, Hansen RN, Glick SN, Stekler JD, Connolly NC, Villafuerte S, McPadden M, Deutsch

S, Ninburg M, Kubiniec R, Williams EC, Tsui JI. Barriers and facilitators to implementing a pharmacist, physician, and Patient Navigator-Collaborative Care Model (PPP-CCM) to treat hepatitis C among people who inject drugs. Int J Drug Policy. 2023;111:103924.
75. Hunt BR, Cetrone H, Sam S, Glick NR. Outcomes of a Pharmacist-Led Hepatitis C Virus Treatment Program in an Urban Safety-Net Health System, Chicago, 2017–2019. Public Health Rep (Washington D C: 1974). 2022;137(4):702–10.
76. Featherstone A. Developing a holistic, multidisciplinary community service for frail older people. Nurs Older People. 2018;30(7):34–40.
77. Vu TM, Toribio W, Riazi F, Ciprian G, Gibbs N, Giardina M, Camacho JA, Parrella K, Cambe J, Amory C, Chasan R, Sigel KM, Weiss JJ. Increasing Access to Hepatitis C Virus medications: a Program Model using patient navigators and Specialty Pharmacy to obtain prior authorization approval. J Manag Care Spec Pharm. 2018;24(4):329–33.
78. Chapman AE, Swartz K, Schoppe J, Arenson C. Development of a comprehensive multidisciplinary geriatric oncology center, the Thomas Jefferson University experience. J Geriatric Oncol. 2014;5(2):164–70.
79. Brey Z, Mash R, Goliath C, Roman D. Home delivery of medication during coronavirus disease 2019, Cape Town, South Africa: short report. Afr J Prim Health Care Fam Med. 2020;12(1):e1–4.
80. Chan B, Edwards ST, Srikanth P, Mitchell M, Devoe M, Nicolaidis C, Kansagara D, Korthuis PT, Solotaroff R, Saha S. Ambulatory Intensive Care for Medically Complex Patients at a Health Care Clinic for individuals experiencing homelessness: the SUMMIT Randomized Clinical Trial. JAMA Netw Open. 2023;6(11):e2342012.
81. Montgomery AH, Best LR, Kitzman H, Khan M. Effect of Comprehensive Multiprovider Primary Care visits in type 2 diabetes management in a primarily uninsured, ethnic Minority Population: the Comprehensive Care Initiative (CCI) program. J Prim Care Community Health. 2022;13:1–4.
82. Chukwudozie IB, Fitzgibbon ML, Schiffer L, Berbaum M, Gilmartin C, David P, Ekpo E, Fischer MJ, Porter AC, Aziz-Bradley A, Hynes DM. Facilitating primary care provider use in a patient-centered medical home intervention study for chronic hemodialysis patients. Transl Behav Med. 2018;8(3):341–50.
83. Habib MA, Soofi S, Sadiq K, Samejo T, Hussain M, Mirani M, Rehmatullah A, Ahmed I, Bhutta ZA. A study to evaluate the acceptability, feasibility and impact of packaged interventions (Diarrhea Pack) for prevention and treatment of childhood diarrhea in rural Pakistan. BMC PUBLIC HEALTH; 2013. p. 13.
84. Achieng L, Musangi H, Ong'uti S, Ombegoh E, Bryant L, Mwiindi J, Smith N, Keiser P. An observational cohort comparison of facilitators of retention in care and adherence to anti-eetroviral therapy at an HIV treatment center in Kenya. PLoS ONE. 2012;7(3):e32727.
85. Wohl AR, Garland WH, Squires K, Witt M, Larsen R, Kovacs A, Hader S, Weidle PJ. The feasibility of a community-based directly administered antiretroviral therapy program. Clin Infect Diseases: Official Publication Infect Dis Soc Am. 2004;38:S388–92.
86. Liang AC, Sanders NS, Anderson ES, Heeney ME, Hirschmann CM, Kane AR, Wills CP. ContraceptED: a multidisciplinary Framework Contraception. Volume 81. ANNALS OF EMERGENCY MEDICINE; 2023. pp. 630–6. 5.
87. Collins JC, Hu J, McMillan SS, O'Reilly CL, El-Den S, Kelly F, Spinks J, Riley T, Wheeler AJ. Medication-related problems identified by community pharmacists: a descriptive case study of two Australian populations. J Pharm Policy Pract. 2023;16(1):133.
88. Dahinten AP, Malkin RA. The Pratt Pouch provides a three-fold Access increase to Antiretroviral Medication for Births outside Health Facilities in Southern Zambia. open Biomedical Eng J. 2016;10:12–8.
89. Hynes DM, Fischer MJ, Schiffer LA, Gallardo R, Chukwudozie IB, Porter A, Berbaum M, Earheart J, Fitzgibbon ML. Evaluating a novel health system intervention for chronic kidney disease care using the RE-AIM framework: insights after two years. Contemp Clin Trials. 2017;52:20–6.
90. Rojas E, Gerber BS, Tilton J, Rapacki L, Sharp LK. Pharmacists' perspectives on collaborating with community health workers in diabetes care. J Am Pharm Assoc (2003). 2015;55(4):429–33.
91. Hall-Lipsy E, Anderson EJ, Taylor AM, Warholak T, Axon DR, Faqeeri Z, Jastrzab R. Community health worker perspectives of an academic community medication therapy management collaboration. J Am Pharm Assoc (2003). 2020;60(3):475–80. e1.
92. Lewis CM, Gamboa-Maldonado T, Belliard JC, Nelson A, Montgomery S. Preparing for Community Health Worker Integration into Clinical Care teams through an understanding of patient and Community Health Worker readiness and intent. J Ambul Care Manage. 2019;42(1):37–46.
93. Wise M, Harris E, Finlay P, Nutbeam D. Working together: collaboration for health. A practical guide. Sydney: Sydney Local Health District; 2022.
94. Ballard M, Bancroft E, Nesbit J, Johnson A, Holeman I, Foth J, Rogers D, Yang J, Nardella J, Olsen H, Raghavan M, Panjabi R, Alban R, Malaba S, Christiansen M, Rapp S, Schechter J, Aylward P, Rogers A, Sebisaho J, Ako C, Choudhury N, Westgate C, Mbeya J, Schwarz R, Bonds MH, Adamjee R, Bishop J, Yembrick A, Flood D, McLaughlin M, Palazuelos D. Prioritising the role of community health workers in the COVID-19 response. BMJ Global Health. 2020;5(6):e002550.
95. Dalton JE, Bolen SD, Mascha EJ. Publication Bias: The Elephant in the Review. Anesth Analg. 2016;123(4):812–3.

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