

# Tiltak for å bedre for å bedre farmasøytjenesten

Notat fra Kunnskapssenteret  
Systematisk litteratursøk med sortering  
Juni 2014

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Notat: ISBN 978-82-8121-877-2

**Juni 2014**

 kunnskapssenteret

**Tittel** Tiltak for å bedre farmasøyttjenesten  
**English title** Interventions to improve pharmaceutical services  
**Institusjon** Nasjonalt kunnskapssenter for helsetjenesten  
**Ansvarlig** Magne Nylenna, direktør  
**Forfattere** Berg, Rigmor C, prosjektleder, *forsker, Kunnskapssenteret*  
Pike, Eva, *forsker, Kunnskapssenteret*  
**ISBN** 978-82-8121-877-2  
**Notat** Juni – 2014  
**Prosjektnummer** 1008  
**Publikasjonstype** Notat - Systematisk litteratursøk med sorterte referanser  
**Antall sider** 24 (61 inklusiv vedlegg)  
**Oppdragsgiver** Helsedirektoratet  
**Emneord (MeSH)** Pharmacist; Pharmaceutical Services  
**Sitering** Berg RC, Pike E. Tiltak for å bedre farmasøyttjenesten. Notat.  
Oslo: Nasjonalt kunnskapssenter for helsetjenesten, 2014.

Kunnskapssenteret vil takke Gyri H. Straumann for å ha bidratt med sin ekspertise i dette prosjektet.

Nasjonalt kunnskapssenter for helsetjenesten fremskaffer og formidler kunnskap om effekt av metoder, virkemidler og tiltak og om kvalitet innen alle deler av helsetjenesten. Målet er å bidra til gode beslutninger slik at brukerne får best mulig helsetjenester. Kunnskapssenteret er formelt et forvaltningsorgan under Helse- direktoratet, men har ingen myndighetsfunksjoner og kan ikke instrueres i faglige spørsmål.

Nasjonalt kunnskapssenter for helsetjenesten  
Oslo, juni 2014

# Hovedfunn

Nasjonalt kunnskapssenter for helsetjenesten fikk i oppdrag fra Helse- direktoratet å utføre et systematisk litteratursøk med påfølgende sor- tering av mulig relevante publikasjoner. Oppdraget var å finne syste- matiske oversikter om effekten av tiltak for å bedre farmasøytjenes- ten.

## Metode

Vi utarbeidet søkestrategi for et systematisk litteratursøk. Det ble søkt i syv internasjonale litteraturl databaser. Søket ble utført i april 2014. To forskere gikk uavhengig av hverandre gjennom identifiserte publikasjoner/referanser og vurderte relevans i forhold til inklusjonskriteriene.

## Resultater

Vi identifiserte totalt 3759 referanser. Av disse var 74 vurdert som mulig relevante.

Vi sorterte oversiktene i kategorier ut fra tiltak. Vi fant én oversikt som omhandlet tiltak gitt til farmasøyter. De resterende oversiktene om- handlet tiltak utført av farmasøyter for å bedre farmasøytjenesten.

Det var seks kategorier av tiltak benyttet for å bedre farmasøyt- tjenesten:

- Tiltak gitt til farmasøyter (1 oversikt)
- Medikamentgjennomgang utført av farmasøyter (3 oversikter)
- Samhandlingstiltak med farmasøyter (2 oversikter)
- Andre tiltak gitt av farmasøyter (18 oversikter)
- Ulike tiltak gitt av farmasøyter for spesifikk sykdom (30 oversikter)
- Tiltak som kan utføres av farmasøyter (20 oversikter)

### Tittel:

Tiltak for å bedre farmasøyt- tjenesten

### Publikasjonstype:

Systematisk litteratursøk med sortering

Systematisk litteratursøk med sortering er resultatet av å

- søke etter relevant litteratur ifølge en søkestrategi og
- eventuelt sortere denne litteraturen i grupper presentert med referanser og vanligvis sammendrag

### Svarer ikke på alt:

- Ingen kritisk vurdering av studienes kvalitet
- Ingen analyse eller sammenfatning av studiene
- Ingen anbefalinger

### Hvem står bak denne publikasjonen?

Kunnskapssenteret har gjennomført oppdraget etter forespørsel fra Helsedirektoratet

### Når ble litteratursøket utført?

Søk etter studier ble avsluttet april 2014

# Key messages

The Norwegian Knowledge Centre for the Health Services was commissioned by the Health Directorate to conduct a systematic literature search with subsequent sorting of possible relevant publications. The aim was to identify systematic reviews on the effect of interventions designed to improve pharmaceutical services.

## Methods

We developed a search strategy for a systematic literature search. The search was carried out in seven international literature databases in April 2014. Two researchers independently screened the identified publications / references and assessed their relevance relative to the inclusion criteria.

## Results

We identified a total of 3759 references, of which there were 74 relevant publications.

We sorted the publications into categories, based on intervention. We identified one review which addressed interventions given to pharmacists. The remaining reviews addressed intervention provided by pharmacists to improve pharmaceutical services.

There were six categories of interventions used to improve pharmaceutical services:

- Interventions given to pharmacists (1 review)
- Medication review by pharmacists (3 reviews)
- Pharmacists in healthcare teams (2 reviews)
- Other interventions provided by pharmacists (18 reviews)
- All types of interventions provided by pharmacists for specific diseases (30 reviews)
- Interventions that may involve pharmacists as providers (20 reviews)

### Title:

Interventions to improve pharmaceutical services

### Type of publication:

Systematic reference list

A systematic reference list is the result of a search for relevant literature according to a specific search strategy. The references resulting from the search are then grouped and presented with their abstracts.

### Doesn't answer everything:

- No critical evaluation of study quality
- No analysis or synthesis of the studies
- No recommendations

### Publisher:

Norwegian Knowledge Centre for the Health Services

### Updated:

Last search for studies: April, 2014.

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# Innhold

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# Forord

Nasjonalt kunnskapssenter for helsetjenesten fikk i oppdrag fra Helsedirektoratet å utføre et systematisk litteratursøk med påfølgende sortering av mulig relevante publikasjoner («søk og sorter»). Oppdraget var å finne systematiske oversikter om effekten av tiltak for å bedre farmasøytjenesten. Denne informasjonen skal brukes som støtte til Helse- og omsorgsdepartementets (HOD) utforming av en Stortingsmelding om legemidler.

Prosjektgruppen har bestått av:

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- Eva Pike, forsker, Kunnskapssenteret

Gro Jamtvedt  
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Gunn E. Vist  
*Seksjonsleder*

Rigmor C Berg  
*Prosjektleder*

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# Innledning

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## Bakgrunn

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Helse- og omsorgsdepartementet (HOD) er i ferd med å utarbeide en Stortingsmelding om legemidler. Ett av de legemiddelpolitiske målene er riktig legemiddelbruk. Farmasøyter bidrar til riktig legemiddelbruk gitt sin tradisjonelle rolle med å tilberede og utlevere legemidler på ordre fra leger, medisineringsovervåking og legemiddelopplysning. Farmasøyter har spesialkompetanse på legemidler som utfyller legens kunnskap, og kan bidra med unik breddekompetanse om interaksjoner, forebygging av bivirkninger, dosering, doseringstidspunkt og andre praktiske spørsmål knyttet til legemiddelbruk.

Mange farmasøyter jobber på apotek, slik at de utgjør et lavterskeltilbud i helsetjenesten. I Norge fins det over 700 apotek, 90 % av befolkningen bor i en kommune med apotek, apotek har ofte lengre åpningstider enn fastlegene, og der får man tilgang til høyt utdannet helsepersonell uten å bestille time (1).

Samtidig fortsetter farmasøytjenestene å utvikle seg og de blir stadig mer spesialiserte, både når det gjelder tjenestene rettet mot pasienter og de rettet mot helsetjenesten. Den farmasøytiske kompetansen utnyttes på flere ulike måter og det fins en rekke modeller for farmasøytjenester. I England utfører farmasøytene oppgaver utover den tradisjonelle legemiddeldistributør-rollen. Der utfører de blant annet diverse screeninger (Chlamydia, KOLS, diabetes), farmasøytrekvirering av legemidler for mindre alvorlige lidelser og influensavaksinering (innbefattet rekvirering av vaksinen). Den norske apotekforeningen mener myndighetene bør vurdere hvorvidt slike oppgaver kan gjøres på norske apotek for å avlaste fastlegene (1).

Eksperimentelle forsøk som undersøker effekten av ulike tiltak for å bedre farmasøytjenesten vil kunne gi et pålitelig svar på hvilke tiltak som er mest hensiktsmessige.

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## Styrker og svakheter ved litteratursøk med sortering

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Ved litteratursøk gjennomfører vi systematiske litteratursøk for en gitt problemstilling. Resultatene fra søket blir i sin helhet overlevert oppdragsgiver, eller vi kan



gjennomgå søkeresultatet før overleveringen og sortere ut ikke-relevante artikler. Dette gjøres basert på tittel og eventuelt sammendrag. Artiklene innhentes ikke i fulltekst. Det gjør at vi kan ha inkludert titler som ville vist seg ikke å være relevante ved gjennomlesning av fulltekst. Vi benytter kun databaser for identifisering av litteratur og kan derfor ha gått glipp av potensielt relevante studier. Andre måter å identifisere studier på, som søk i referanselister, kontakt med eksperter på fagfeltet og upublisert litteratur, er ikke utført i søk og sorter oppdrag. Vi gjennomfører ingen kvalitetsvurdering av artikler.

Ved en full forskningsoppsummering ville vi ha innhentet artiklene i fulltekst for endelig vurdering opp mot inklusjonskriteriene. Inkluderte studier ville så blitt kvalitetsvurdert i henhold til våre sjekklister og resultater sammenstilt og diskutert.

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## **Begrunnelse for valg av søkestrategi**

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Med bakgrunn i oppdraget har vi søkt i elektroniske kilder, men ikke etter grå litteratur eller liknende. Søket er gjort for tidsperioden 2009-2014 da systematiske oversikter er mindre nyttige jo eldre de er. I søkene er det benyttet filter på systematiske oversikter for å begrense til dette studiedesignet.

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## **Problemstilling**

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I prosjektet har vi søkt etter litteratur som skal belyse problemstillingen knyttet til effekten av tiltak for å bedre farmasøytjenesten. Målet med prosjektet var å utføre et «søk og sorter» etter systematiske oversikter. Spørsmålet som skulle besvares var: Hvilken systematisk oppsummert dokumentasjon fins om effekten av ulike tiltak / 'modeller' for å bedre farmasøytjenesten?

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# Metode

Bakgrunnen for valg av metoden litteratursøk med sortering var tidspress og at vi allerede kjente til at det fins flere mulige relevante systematiske oversikter når det gjelder farmasøytjenester. I denne publikasjonen har vi utført et systematisk litteratursøk, valgt ut systematiske oversikter etter forhåndsbestemte kriterier og med påfølgende sortering av mulig relevante publikasjoner. Som del av denne bestillingen vil vi også vurdere å formidle enkelte nyere Cochrane-oversikter i egne omtaler publisert på Kunnskapssenterets nettsider.

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## Litteratursøking

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Vi søkte systematisk etter litteratur i følgende syv internasjonale databaser:

- Cinahl
- Cochrane Database of Systematic Reviews (CDSR)
- Centre for Reviews and Dissemination (CRD)
- Embase
- Medline
- PsycInfo
- Web of Knowledge (ISI)

Forskningsbibliotekar Gyri H. Straumann planla samtlige søk i samarbeid med prosjektgruppen. Straumann utførte søkene 28.-29. april 2014. Søkene i samtlige syv databaser ble avgrenset til systematiske oversikter publisert f.o.m. 2009 t.o.m. søkedato. Vi la bestillingen til grunn ved utarbeiding av litteratursøket og søkte etter systematiske oversikter som oppfylte våre inklusjonskriterier. Det ble brukt filter for systematiske oversikter i søkene. De fullstendige søkestrategiene benyttet i de syv databasene fins i vedlegg 1.

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## Inklusjonskriterier

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### **Populasjon:**

Farmasøyter/farmasøytjenester i direkte kontakt med pasienter, i alle deler av helsetjenesten, individuelt eller i tverrfaglige team.

<b>Tiltak:</b>	Tiltak som har som mål å bedre farmasøyttjenesten. Dette inkluderte, men var ikke begrenset til, tiltak eller modeller på farmasøyttjenesten som for eksempel: farmasøytrevirering, farmasøytiske tjenester utført i tverrfaglige team, skifte av omsorgsnivå, bruk av farmasøyter i helseforetak.
<b>Sammenlikning:</b>	Vanlig praksis, annen farmasøyttjeneste. Det var ingen begrensninger når det gjelder sammenlikning.
<b>Utfall:</b>	Alle utfallsmål. Dette inkluderte utfallsmål for pasienter (f.eks. overlevelse, symptomkontroll, livskvalitet, grad av tilfredshet med farmasøyttjenesten, opplevelse av sykdomsmestring, riktig legemiddelbruk) og helsetjenesten (f.eks. korrekt forskrivning av legemidler, antall kontakter med allmennlege/ spesialist, antall henvisninger til spesialist, antall akutte innleggelser, kostnadseffektivitet av tiltaket).
<b>Studiedesign</b>	Systematiske oversikter. Vi definerer systematiske oversikter slik: oversikt som beskriver litteratursøk, har kriterier for inklusjon og eksklusjon av studier og metodisk kvalitetsvurdering av studier. Vi inkluderte ikke protokoller eller konferanseabstrakt.
<b>Språk:</b>	Engelsk, skandinaviske språk (dansk, norsk, svensk), tysk.

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## Artikkelutvelging

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To forskere gikk gjennom alle titler og sammendrag identifisert via litteratursøket for å vurdere relevans i henhold til inklusjonskriteriene. Vurderingene ble først utført uavhengig av hverandre og deretter sammenlignet. Ved uenighet ble inklusjonsvurderingen avgjort ved konsensus. Dersom det hadde vært vedvarende uenighet ville prosjektansvarlig fattet en beslutning om inklusjon/eksklusjon, men dette ble ikke nødvendig. Et inkluderingskjema ble utarbeidet av prosjektleder og benyttet i utvelgelsen. Utvelging av litteratur ble gjort basert på tittel og sammendrag. Vi bestilte ikke fulltekst av artiklene.

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## Sortering

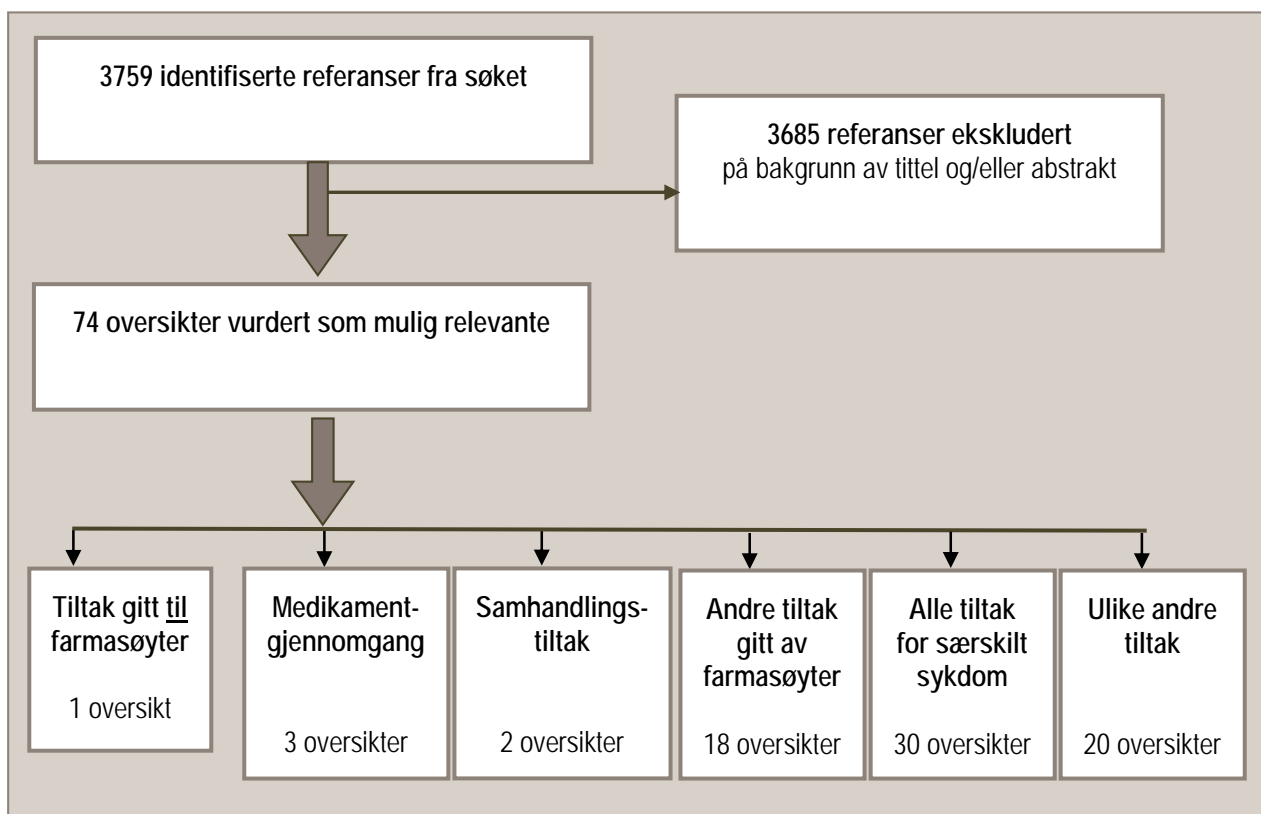
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Vi lagde en liste over alle mulig relevante oversikter og sorterte dem i henhold til tiltak. Der det var relevant ble tiltakene videre sortert i henhold til helseproblem, utfallsmål og lignende. Det ble ikke foretatt innhenting av oversiktene i fulltekst, og derfor heller ikke kvalitetsvurdering eller analyser.

# Resultat

## Resultat av søk

Søket resulterte i 3759 referanser (figur 1). Vi vurderte 74 av de identifiserte referansene til å være mulig relevante i henhold til inklusjonskriteriene.



Figur 1. Flytskjema over identifisert litteratur

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## Resultat av sorteringen

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De mulig relevante systematiske oversiktene ble sortert i kategorier i henhold til type tiltak (tabell 1).

Av de 74 mulig relevante systematiske oversiktene var det to hovedkategorier av strategier eller tiltak som kan bedre farmasøytjenesten:

- tiltak gitt til farmasøyter
- tiltak utført av, eller som kan involvere, farmasøyter

Vi identifiserte kun én oversikt som omhandlet tiltak gitt til farmasøyter for å bedre farmasøytjenesten. Vi klassifiserte de resterende oversiktene i fire kategorier av tiltak som utføres av, eller involverer, farmasøyter: 1) medikamentgjennomgang, 2) samhandlingstiltak, 3) andre tiltak utført av farmasøyter og 4) alle tiltak gitt av farmasøyter for en spesifikk helsetilstand. Til slutt identifiserte vi én kategori av alle typer tiltak som kan utføres av farmasøyter men også av annet helsepersonell. De seks kategoriene er oppsummert i tabell 1.

**Tabell 1:** Antall oversiktsartikler sortert etter tiltak

Tiltak	Antall oversikter: 74
Tiltak gitt <u>til</u> farmasøyter	1
Medikamentgjennomgang utført av farmasøyter	3
Samhandlingstiltak med farmasøyter	2
Andre tiltak gitt av farmasøyter	17
Alle tiltak gitt av farmasøyter for spesifikk sykdom	31
Tiltak utført av farmasøyter og annet helsepersonell	20

I vedlegg 2 presenterer vi de 74 referansene fordelt i henhold til våre seks sorteringskategorier. Vi oppgir forfattere, tittel på publikasjonen, publikasjonssted og sammendrag av artikkelen slik de fremkom i de elektroniske databasene.

### Tiltak gitt til farmasøyter

Vi identifiserte kun én systematiske oversikt som omhandlet effekten av tiltak gitt til farmasøyter for å bedre farmasøytjenesten. Tiltakene oppsummert i oversikten tok sikte på å bedre farmasøytenes kognitive ferdigheter i møte med brukere (tabell 2).

**Tabell 2:** Oversiktsartikkel som omhandlet tiltak gitt til farmasøyter (n=1)

Forfatter, årstall (ref)	Tittel
Amin 2012 (2)	Interventions to enhance community pharmacists' cognitive services: A systematic review

Sammendraget til denne oversikten fins i vedlegg 2 (side 29).

### **Medikamentgjennomgang utført av farmasøyter**

Vi identifiserte tre systematiske oversikter som omhandlet effekten av medikamentgjennomgang utført av farmasøyter. Som det fremgår i tabell 3, tok disse oversiktene for seg henholdsvis medikamentgjennomgang i sykehus, medikamentgjennomgang blant personer med kroniske smerter og medikamentgjennomgang av farmasøyter som betaling for tjenester («fee for service»).

**Tabell 3:** Oversiktsartikler som omhandlet medikamentgjennomgang (n=3)

Forfatter, årstall (ref)	Tittel
Graabaek 2013 (3)	Medication reviews by clinical pharmacists at hospitals lead to improved patient outcomes: a systematic review
Hadi 2013 (4)	Systematic review of pharmacist-led medication review in chronic pain management: Preliminary findings
Hatah 2014 (5)	A systematic review and meta-analysis of pharmacist-led fee-for-services medication review

Sammendragene til disse oversiktene fins i vedlegg 2 (fra side 29).

### **Samhandlingstiltak med farmasøyter**

To systematiske oversikter omhandlet effekten av samhandlingstiltak mellom farmasøyter og annet helsepersonell (tabell 4). Oversikten av Geurts og medforfattere (6) sammenfattet effekten av samhandling mellom farmasøyter og leger. Lee og medforfatteres oversikt (7) tok for seg samhandling mellom farmasøyter og annet helsepersonell i tverrfaglige team.

**Tabell 4:** Oversiktsartikler som omhandlet samhandlingstiltak (n=2)

Forfatter, årstall (ref)	Tittel
Geurts 2012 (6)	Medication review and reconciliation with cooperation between pharmacist and general practitioner and the benefit for the patient: a systematic review
Lee 2013 (7)	Geriatric patient care by U.S. pharmacists in healthcare teams: systematic review and meta-analyses

Sammendragene til disse oversiktene er tilgjengelige i vedlegg 2 (fra side 31).

### Andre tiltak gitt av farmasøyter

Vi identifiserte 18 systematiske oversikter som omhandlet andre typer tiltak (enn de angitt ovenfor) gitt av farmasøyter (tabell 5). Blant disse oversiktene var det syv spesifikke tiltak gitt av farmasøyter:

- Opplæring: Bennett 2011 (8)
- Skifte av omsorgsnivå: Dennis 2009 (9)
- Utvidet/Sammensatt ansvarsområde («pharmacy compounding»): Giam 2011 (10)
- Chlamydia screening: Gudka 2013 (11)
- Ordning hvor farmasøyt behandler mindre sykdomsplager («minor ailment schemes»): Paudyal 2013 (12)
- Databaserte beslutningsstøtteverktøy: Robertson 2010 (13)
- Behandling med Warfarin (et legemiddel med blodfortynnende effekt for forebygging og behandling av bl.a. blodpropp): Soakaew 2010 (14)

De andre 11 oversiktene vi vurderte som mulig relevante var svært generelle, slik at de omhandlet alle typer tiltak gitt av farmasøyter (15-24). Blant disse oversiktene spesifiserte fem utfallsmålene, henholdsvis utskrivning av medikamenter, tilgjengelighet av nødvendige medikamenter, medikamentbruk og ikke-planlagte sykehusinnleggelses (16, 17, 19, 23, 24). Tre av oversiktene spesifiserte geografisk område av interesse, henholdsvis USA og lav-og-middelinntektsland (18, 20, 22). Én av oversiktene spesifiserte at tiltakene skulle være utført i akuttmottak (25), mens de siste to oversiktene ikke spesifiserte inklusjonskriteriene nærmere enn at tiltakene skulle være utført av farmasøyter (15, 21).

**Tabell 5:** Oversiktsartikler som omhandlet ulike typer tiltak gitt av farmasøyter, sortert alfabetisk etter forfatter (n=18)

Forfatter, årstall (ref)	Tittel
Bennett 2011 (8)	Educational interventions by pharmacists to patients with chronic pain: systematic review and meta-analysis
Blalock 2013 (15)	The effect of community pharmacy-based interventions on patient health outcomes: a systematic review
Chisholm-Burns 2010 (20)	US pharmacists' effect as team members on patient care: systematic review and meta-analyses
Cohen 2009 (25)	Effect of clinical pharmacists on care in the emergency department: a systematic review
Dennis 2009 (9)	What evidence is there to support skill mix changes between GPs, pharmacists and practice nurses in the care of elderly people living in the community?

Giam 2011 (10)	Community pharmacy compounding - impact on professional status
Gudka 2013 (11)	Chlamydia screening interventions from community pharmacies: a systematic review
Kharat 2011 (21)	Literature review of randomized, controlled studies of the impact of pharmacists' interventions to improve patient outcomes
Nkansah 2010 (16)	Effect of outpatient pharmacists' non-dispensing roles on patient outcomes and prescribing patterns
Nunan 2011 (17)	Effectiveness of pharmacy interventions in improving availability of essential medicines at the primary healthcare level
Pande 2013 (18)	The effect of pharmacist-provided non-dispensing services on patient outcomes, health service utilisation and costs in low- and middle-income countries
Paudyal 2013 (12)	Are pharmacy-based minor ailment schemes a substitute for other service providers? A systematic review
Rickles 2010 (22)	Adherence: A review of education, research, practice, and policy in the United States
Robertson 2010 (13)	The impact of pharmacy computerised clinical decision support on prescribing, clinical and patient outcomes: a systematic re-view of the literature
Saokaew 2010 (14)	Effectiveness of pharmacist-participated warfarin therapy management: a systematic review and meta-analysis
Smith 2010 (19)	A systematic review to identify specific pharmacists' interventions and outcomes associated with drug therapy
Thomas 2014 (23)	Pharmacist-led interventions to reduce unplanned admissions for older people: a systematic review and meta-analysis of randomised controlled trials
Verrue 2009 (24)	Pharmacists' interventions for optimization of medication use in nursing homes : a systematic review

Sammendragene til disse 18 oversiktene fins i vedlegg 2 (fra side 32).

### **Alle tiltak gitt av farmasøyter for spesifikk sykdom**

Totalt var det 30 systematiske oversikter som omhandlet enhver type tiltak gitt av farmasøyter for å bedre en spesifikk sykdomssituasjon eller et helseproblem (tabell 6). Oversiktene tok altså ikke for seg et spesielt type tiltak, men oppsummerte i stedet enhver type tiltak som ble gitt av farmasøyter for å bedre et særskilt helseproblem. Slike tiltak var betegnet som «pharmacist interventions», «pharmaceutical care», «pharmacy-based interventions» og lignende. Alt i alt var tiltak for 18 ulike sykdommer eller helsetilstander oppsummert. Det fantes flest systematiske oversikter for høyt blodtrykk, diabetes, astma, depresjon, hjertekarsykdom, kronisk nyresykdom og røyking. Alle de systematiske oversiktene som omhandlet tiltak for å bedre et helseproblem er listet nedenfor i alfabetisk rekkefølge i henhold til sykdom eller helseproblem:



- Astma: Adunlin 2012 (26); Benavides 2009 (27)
- Depresjon: Al-Jumah 2012 (28); Rubio-Valera 2011 (29)
- Diabetes: Collins 2011 (30); Evans 2011 (31); Li 2010 (32); Omran 2012 (33); Santschi 2012 (34)
- Dyslipidemia: Charrois 2012 (35)
- Hiv: Saberi 2012 (36)
- Hjertekarsykdom: Altowaijri 2013 (37); Santschi 2011 (38)
- Høyt blodtrykk: Aguiar 2012 (39); Morgado 2011 (40); Ni 2009 (41); Sabater-Hernandez 2010 (42); Santschi 2014 (43)
- Koronar hjertesykdom: Cai 2013 (44)
- Kronisk nyresykdom: Salgado 2012 (45); Stemer 2011 (46)
- Kronisk luftveissykdom: Fathima 2013 (47)
- Mental uhelse: Richardson 2013 (48)
- Organtransplantasjon: Stemer 2010 (49)
- Osteoporose: Elias 2011 (50)
- Overvekt/Fedme: Gordon 2011 (51)
- Røyking: Rakestraw 2013 (52); Saba 2014 (53)
- Slag: Basaraba 2013 (54)

Vi nevner også at det var én systematiske oversikter som omhandlet tiltak for å forebygge uønsket graviditet (55).

**Tabell 6:** Oversiktsartikler som omhandlet alle typer tiltak gitt av farmasøyter for ulike sykdommer, sortert alfabetisk etter forfatter (n=30)

Forfatter, årstall (ref)	Tittel
Adunlin 2012 (26)	The effectiveness of pharmacist interventions on asthma management: A systematic review
Aquiar 2012 (39)	Pharmaceutical care in hypertensive patients: a systematic literature review
Al-Jumah 2012 (28)	Impact of pharmacist interventions on patients' adherence to antidepressants and patient-reported outcomes: a systematic review
Altowaijri 2013 (37)	A systematic review of the clinical and economic effectiveness of clinical pharmacist intervention in secondary prevention of cardiovascular disease
Basaraba 2013 (54)	Pharmacists as care providers for stroke patients: A systematic review
Benavides 2009 (27)	Pharmacist involvement in improving asthma outcomes in various healthcare settings: 1997 to present
Cai 2013 (44)	Pharmacist care and the management of coronary heart disease: a systematic review of randomized controlled trials
Charrois 2012 (35)	A systematic review of the evidence for pharmacist care of patients with dyslipidemia

Collins 2011 (30)	Effect of pharmacist intervention on glycemic control in diabetes
Elias 2011 (50)	The impact of pharmacist interventions on osteoporosis management: a systematic review
Evans 2011 (31)	Diabetes and cardiovascular disease interventions by community pharmacists: a systematic review
Farris 2010 (55)	Preventing unintended pregnancy: Pharmacists' roles in practice and policy via partnerships
Fathima 2013 (47)	The role of community pharmacists in screening and subsequent management of chronic respiratory diseases: a systematic review
Gordon 2011 (51)	Lightening the load? A systematic review of community pharmacy-based weight management interventions
Li 2010 (32)	Effect of pharmaceutical care programs on glycemic control in patients with diabetes mellitus: A meta-analysis of randomized controlled trials
Morgado 2011 (40)	Pharmacist interventions to enhance blood pressure control and adherence to antihypertensive therapy: Review and meta-analysis
Ni 2009 (41)	The effect of pharmaceutical care programs on blood pressure control in individuals with hypertension: A meta-analysis
Omran 2012 (33)	Systematic review of pharmacist interventions to improve adherence to oral antidiabetic medications in people with type 2 diabetes
Rakestraw 2013 (52)	A systematic review of community pharmacy-based interventions for smoking cessation
Richardson 2014 (48)	A comprehensive review of the impact of clinical pharmacy services on patient outcomes in mental health
Rubio-Valera 2011 (29)	Effectiveness of pharmacist care in the improvement of adherence to antidepressants: a systematic review and meta-analysis
Saba 2014 (53)	Meta-analysis of the effectiveness of smoking cessation interventions in community pharmacy
Sabater-Hernandez 2010 (42)	Clinical value of blood pressure measurement in the community pharmacy
Saberi 2012 (36)	The impact of HIV clinical pharmacists on HIV treatment outcomes: a systematic review
Salgado 2012 (45)	Pharmacists' interventions in the management of patients with chronic kidney disease: a systematic review
Santschi 2011 (38)	Impact of pharmacist care in the management of cardiovascular disease risk factors: a systematic review and meta-analysis of randomized trials
Santschi 2014 (43)	Improving blood pressure control through pharmacist interventions: a meta-analysis of randomized controlled trials
Santschi 2012 (34)	Pharmacist interventions to improve cardiovascular disease risk factors in diabetes: a systematic review and meta-analysis of randomized controlled trials
Stemer 2010 (49)	Clinical pharmacy services and solid organ transplantation: a literature review
Stemer 2011 (46)	Clinical pharmacy activities in chronic kidney disease and end-stage renal disease patients: a systematic literature review

Sammendragene til disse 30 oversiktene fins i vedlegg 2 (fra side 40).

### **Tiltak som kan utføres av farmasøyter**

Vi identifiserte 20 systematiske oversikter som omhandlet effekten av ulike typer tiltak som kan utføres av farmasøyter (tabell 7). Det var ikke et inklusjonskrav i de systematiske oversiktene at tiltakene var utført av farmasøyter, men av abstraktene fremgikk det at også tiltak med farmasøyter var inkludert i oversiktene. I alle abstraktene vi plasserte i denne kategorien var farmasøyter nevnt. Blant oversiktene var det for eksempel tiltak for å bedre blodtryksregulering hos personer med høyt blodtrykk, tiltak for å bedre medikamentell etterlevelse og tiltak for å bedre utskriving av legemidler.

**Tabell 7:** Oversiktsartikler som omhandlet tiltak som kan involvere farmasøyter, sortert alfabetisk etter forfatter (n=20)

Forfatter, årstall (ref)	Tittel
Bayoumi 2009 (56)	Interventions to improve medication reconciliation in primary care
Carter 2009 (57)	The potency of team-based care interventions for hypertension: a meta-analysis
Cutrona 2010 (58)	Modes of delivery for interventions to improve cardiovascular medication adherence
Dolovich 2010 (59)	A systematic review of interventions that optimize medication prescribing and use in Canada
Glynn 2010a (60)	Self-monitoring and other non-pharmacological interventions to improve the management of hypertension in primary care: a systematic review
Glynn 2010b (61)	Interventions used to improve control of blood pressure in patients with hypertension
Golubev 2011 (62)	Compliance measurement-guided medication management programs in hypertension: A systematic review
Gorman 2012 (63)	Systematic review of diabetes disease management interventions
Hall 2010 (64)	Effectiveness of interventions designed to promote patient involvement to enhance safety: a systematic review
Hiligsmann 2013 (65)	Interventions to improve osteoporosis medication adherence and persistence: a systematic review and literature appraisal by the ISPOR Medication Adherence & Persistence Special Interest Group
Hu 2014 (66)	Interventions to increase medication adherence in African-American and Latino populations: a literature review
Kaur 2009 (67)	Interventions that can reduce inappropriate prescribing in the elderly: a systematic review
Kucukarslan 2011 (68)	Integrating medication therapy management in the primary care medical home: A review of randomized controlled trials
Kwan 2013 (69)	Medication reconciliation during transitions of care as a patient safety strategy: a systematic review

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Lainer 2013 (70)	Information technology interventions to improve medication safety in primary care: a systematic review
Loganathan 2011 (71)	Interventions to optimise prescribing in care homes: systematic review
Maeda 2009 (72)	Systematic review of the effects of improvement of prescription to reduce the number of medications in the elderly with polypharmacy
Manias 2012 (73)	Interventions to reduce medication errors in adult intensive care: a systematic review
Patterson 2012 (74)	Interventions to improve the appropriate use of polypharmacy for older people
Press 2012 (75)	Interventions to improve outcomes for minority adults with asthma: a systematic review

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**I vedlegg 2 (fra side 52) presenteres sammendragene til disse 20 oversiktene.**

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# Vedlegg 1: Søkestrategier

## Database: Cinahl

Dato for søk: 29.04.2014

#	Searches	Results
1	(MH "Pharmacists")	4463
2	TI pharmacist* OR AB pharmacist*	4695
3	TI pharmaceutical service* OR AB pharmaceutical service*	143
4	TI pharmaceutical care OR AB pharmaceutical care	363
5	TI pharmaceutical health care service* OR AB pharmaceutical health care service*	10
6	TI pharmaceutical healthcare service* OR AB pharmaceutical healthcare service*	1
7	TI pharmaceutical health service* OR AB pharmaceutical health service*	22
8	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7	7254
9	(MH "Systematic Review")	17438
10	(MH "Meta Analysis")	14309
11	TI ( ((systematic or literature) N3 (review* or overview or search*)) ) OR AB ( ((systematic or literature) N3 (review* or overview or search*)) )	55982
12	AB medline or embase or pubmed	28917
13	S9 OR S10 OR S11 OR S12	75575
14	S8 AND S13 Limiters - Exclude MEDLINE records	81
10	S8 AND S13 Limiters - Exclude MEDLINE records; Published Date: 20090101-20141231	38

## Database: Cochrane Database of Systematic Reviews

Dato for søk: 29.04.2014

#	Searches	Results
#1	MeSH descriptor: [Pharmacists] explode all trees	431
#2	MeSH descriptor: [Pharmaceutical services] explode all trees	1269
#3	(pharmacist* or (pharmaceutical service*) or (pharmaceutical care) or (pharmaceutical health service*) or (pharmaceutical health care service*) or (pharmaceutical healthcare service*)):ti,ab,kw	2121
#4	#1 or #2 or #3 Publication Date from 2009 to 2014, in Cochrane Reviews (Reviews and Protocols)	114

## Database: Centre for Reviews and Dissemination

Dato for søk: 29.04.2014

#	Searches	Results
1	MeSH DESCRIPTOR Pharmacists EXPLODE ALL TREES FROM 2009 TO 2014	70
2	MeSH DESCRIPTOR Pharmaceutical Services EXPLODE ALL TREES FROM 2009 TO 2014	167
3	((pharmacist* or (pharmaceutical service*) or (pharmaceutical care) or (pharmaceutical health service*) or (pharmaceutical health care service*) or (pharmaceutical healthcare service*))) FROM 2009 TO 2014	195
4	1 or 2 or 3	291

## Database: Embase 1974 to 2014 April 28

Dato for søk: 29.04.2014

#	Searches	Results
1	pharmacist/	47126
2	pharmaceutical service*.ti,ab.	1132
3	pharmaceutical health care service*.ti,ab.	1
4	pharmaceutical healthcare service*.ti,ab.	1
5	pharmaceutical health service*.ti,ab.	3
6	exp pharmacy/	53128
7	pharmaceutical care.ti,ab.	3189
8	1 or 2 or 3 or 4 or 5 or 6 or 7	86450

9	(medline or embase or pubmed or search*).ab.	287613
10	((systematic or literature) adj3 (review or overview)).ti,ab.	227555
11	meta analys*.mp.	117463
12	9 or 10 or 11	531489
13	8 and 12	2091
14	limit 13 to yr="2009 -Current"	1428

**Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily, Ovid MEDLINE(R) and Ovid OLDMEDLINE(R) 1946 to Present**

Dato for søk: 29.04.2014

#	Searches	Results
1	Pharmacists/	10582
2	pharmacist*.ti,ab.	20456
3	exp Pharmaceutical Services/	48791
4	pharmaceutical care.ti,ab.	1326
5	pharmaceutical service*.ti,ab.	748
6	pharmaceutical health care service*.ti,ab.	0
7	pharmaceutical healthcare service*.ti,ab.	0
8	pharmaceutical health service*.ti,ab.	1
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8	64038
10	(medline or embase or pubmed or search*).ab.	238719
11	((systematic or literature) adj3 (review or overview)).ti,ab.	193502
12	meta analysis.pt.	47320
13	10 or 11 or 12	406622
14	9 and 13	1999
15	limit 14 to yr="2009 -Current"	937

**Database: PsycINFO 1806 to April Week 4 2014**

Dato for søk: 28.04.2014

#	Searches	Results
1	pharmacists/	863
2	pharmacist*.ti,ab.	1862
3	pharmaceutical service*.ti,ab.	33
4	pharmaceutical care.ti,ab.	93
5	pharmaceutical health service*.ti,ab.	1

6	pharmaceutical health care service*.ti,ab.	1
7	pharmaceutical healthcare service*.ti,ab.	1
8	1 or 2 or 3 or 4 or 5 or 6 or 7	2013
9	limit 8 to yr="2009 -Current"	919

### Database: Web of Knowledge

Dato for søk: 29.04.2014

#	Searches	Results
1	TOPIC: ((pharmacist* or (pharmaceutical service*) or (pharmaceutical care) or (pharmaceutical health service*) or (pharmaceutical health care service*) or (pharmaceutical healthcare service*))) Timespan=2009-2014 Search language=English	24817
2	TOPIC: (((systematic or literature) NEAR/3 (review* or overview or search*)) or (meta analys*)) Timespan=2009-2014 Search language=English	261788
3	1 and 2	1362

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# Vedlegg 2: Abstrakter til inkluderte oversikter

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## Tiltak gitt til farmasøyter

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**Amin M, Patwardhan P, Chewning B. Interventions to enhance community pharmacists' cognitive services: A systematic review. J Am Pharm Assoc (2003) 2012;52 (2):263-264.**

Abstract: Objective: We examine studies which formally measure and report the fidelity of intended pharmacists' behavior when implementing interventions. Our objective is to identify and describe their key study design choices. Hopefully, this will contribute to setting agendas for future research that aims to enhance pharmacist cognitive roles. Methods: Empirical articles in English published through December 2010 were searched using PubMed, Web of Science, International Pharmaceutical Abstracts, PsycINFO, CINAHL and Cochrane Reviews. Bibliographies of articles eligible for review were searched along with authors' and colleagues' libraries. We included studies that: (1) reported findings on pharmacist behavior, (2) employed an experimental or quasi-experimental design, (3) were conducted in community-based pharmacies; (4) focused on practicing pharmacists rather than students. Theoretical framework, intervention to facilitate pharmacists' patient care behavior(s), health problem, study design, sample characteristics, response rate, and outcome measure(s) were summarized for each article. Results: 19 studies met the inclusion criteria. 12 were randomized controlled trials. Participation rates varied from 8% to 100%; retention rates were high (84% to 100%). Asthma and tobacco cessation were targeted by nine studies. Only five studies reported using a theoretical framework. All studies employed pharmacist training which usually involved multimodal components. Only five studies used practice role playing in training pharmacists. Almost half of the studies used subjective outcome measures for pharmacist behavior while several used objective measures including simulated clients (n = 7), claims / faxes related to pharmacist services or referrals (n = 3), and medical record/ pharmacy profiles or electronic intervention documentation systems (n = 3). Conclusion: There is a need for more research to evaluate the impact of specific facilitators on implementation of cognitive services delivery in community pharmacies. In addition to conducting more studies on interventions to enhance pharmacist cognitive services, studies focusing on patient outcomes would be strengthened if they incorporate pharmacist behavior as part of their intervention fidelity measure.

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## Medikamentgjennomgang utført av farmasøyter

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**Graabaek T, Kjeldsen LJ. Medication reviews by clinical pharmacists at hospitals lead to improved patient outcomes: a systematic review. Basic Clin Pharmacol Toxicol 2013;112(6):359-373.**

Abstract: Suboptimal medication use may lead to morbidity, mortality and increased costs. To reduce unnecessary patient harm, medicines management including medication reviews can be provided by clinical pharmacists. Some recent studies have indicated a positive effect of this service, but the quality and outcomes vary among studies. Hence, there is a need for compiling the evidence within this area. The aim of this systematic MiniReview was to identify, assess and summarize the literature investigating the effect of pharmacist-led medication reviews in hospitalized patients. Five databases (MEDLINE, EMBASE, CINAHL, Web of Science and the Cochrane Library) were searched from their inception to 2011 in

addition to citation tracking and hand search. Only original research papers published in English describing pharmacist-led medication reviews in a hospital setting including minimum 100 patients or 100 interventions were included in the final assessment. A total of 836 research papers were identified, and 31 publications were included in the study: 21 descriptive studies and 10 controlled studies, of which 6 were randomized controlled trials. The pharmacist interventions were well implemented with acceptance rates from 39% to 100%. The 10 controlled studies generally show a positive effect on medication use and costs, satisfaction with the service and positive as well as insignificant effects on health service use. Several outcomes were statistically insignificant, but these were predominantly associated with low sample sizes or low acceptance rates. Therefore, future research within this area should be designed using rigorous design, large sample sizes and includes comparable outcome measures for patient health outcomes.

**Hadi MA, Alldred DP, Closs SJ, Briggs M. Systematic review of pharmacist-led medication review in chronic pain management: Preliminary findings. *Int J Pharm Pract* 2013;21:13-14.**

Abstract: Chronic pain is a common problem affecting more than half of the UK's adult population.[1] Medicines remain the cornerstone of chronic pain management but are often used inappropriately.[ 2] Pharmacists can play a vital role in chronic pain management by ensuring the safe and effective use of medicines. The aim of this systematic review was to evaluate the effectiveness of pharmacist-led medication review for chronic pain management among adult patients. MEDLINE (1946 to June 2012), EMBASE (1947 to April 2012), PsycINFO (1806 to June 2012), CINAHL (1960 to June 2012), CENTRAL (Issue 6 of 12, June 2012) and International Pharmaceutical Abstracts (1970 to June 2012) and reference lists of retrieved articles were searched for randomised controlled trials (RCTs) published only in the English language. In addition, websites of the American, Canadian and Royal (British) pharmaceutical associations were hand-searched to identify other relevant studies. Studies were included if one of the intervention arms had received pharmacist-led medication review independently or as part of a multidisciplinary intervention. Study titles and abstracts were screened independently by two authors (MAH, DPA), using pre-defined inclusion criteria. Risk of bias was assessed using the Cochrane risk of bias assessment tool by one author (MAH) and checked by another author (SJC). Data were extracted using a standardized form by MAH and checked by MB. To ensure transparency and avoid duplication, the systematic protocol was registered with PROSPERO, an international prospective register of systematic reviews. The database search resulted in 664 hits (578 after deduplication), with an additional 5 papers retrieved through reference and website searching. Five RCTs including two cluster randomised and three individually randomised trials, involving 1035 patients in total, met the inclusion criteria. Two trials originated from the UK and one each from the USA, Canada and Germany. Two RCTs involved patients with osteoarthritis, two chronic pain of multiple aetiologies and one trial involved chronic headache/migraine patients. Two trials were conducted in community pharmacies, two in general practice surgeries and one in a university pain clinic. Pharmacists delivering interventions in four of the trials received formal training in pain management. There was low or unclear risk of bias in almost all the domains except for blinding of participants (receiving intervention) and personnel (delivering intervention) domains, where there was a high risk of bias across all the trials due to the nature of the intervention. All trials except one reported a significant reduction in mean pain intensity in the intervention arm compared with the control. The research evidence evaluating the role of pharmacists in chronic pain management is growing. The search strategy was effective in identifying RCTs involving pharmacist-led medication review in chronic pain. In general, the trials were of adequate quality. Meta-analysis will be conducted if prespecified conditions of clinical and statistical homogeneity are met and, if conducted, meta-analysis will increase the power and precision of the effect size (if any) of the pharmacist-led reviews in chronic pain management.

**Hatah E, Braund R, Tordoff J, Duffull SB. A systematic review and meta-analysis of pharmacist-led fee-for-services medication review. *Br J Clin Pharmacol* 2014;77(1):102-115.**

Abstract: AIM: The aim was to examine the impact of fee-for-service pharmacist-led medication review on patient outcomes and quantify this according to the type of review undertaken, e.g. adherence support and clinical medication review. METHODS: Relevant published studies were identified from Medline, Embase and International Pharmaceutical Abstract databases (from inception to February 2011). Study inclusion criteria were fee-for-service medication review, presence of a control group and pre-specified patient outcomes. Outcomes were grouped into primary (changes in biomarkers, hospitalization, and mortality) and secondary outcomes (medication adherence, economic implications and quality of life). Meta-analyses for primary outcomes were conducted using random effects models and secondary outcomes were summarized using descriptive statistics. RESULTS: Of the 135 relevant articles



located, 21 studies met the inclusion criteria for primary outcomes and 32 for secondary outcomes. Significant results favouring pharmacists' intervention were found for blood pressure (OR 3.50, 95% CI 1.58, 7.75,  $P = 0.002$ ) and low density lipoprotein (OR 2.35, 95% CI 1.17, 4.72,  $P = 0.02$ ). Outcomes on hospitalization (OR 0.69, 95% CI 0.39, 1.21,  $P = 0.19$ ) and mortality (OR 1.50, 95% CI 0.65 to 3.46,  $P = 0.34$ ) indicated no differences between the groups. On subgroup analysis, clinical medication review (OR 0.46, 95% CI 0.26, 0.83,  $P = 0.01$ ) but not adherence support review (OR 0.88, 95% CI 0.59, 1.32,  $P = 0.54$ ) reduced hospitalization. CONCLUSIONS: The majority of the studies (57.9%) showed improvement in medication adherence. Fee-for-service pharmacist-led medication reviews showed positive benefits on patient outcomes. Interventions that include a clinical review had a significant impact on patient outcomes by attainment of target clinical biomarkers and reduced hospitalization.

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## **Samhandlingstiltak med farmasøyter**

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**Geurts MM, Talsma J, Brouwers JR, de Gier JJ. Medication review and reconciliation with cooperation between pharmacist and general practitioner and the benefit for the patient: a systematic review. *Br J Clin Pharmacol* 2012;74(1):16-33.**

Abstract: This article systematically reviews the literature on the impact of collaboration between pharmacists and general practitioners and describes its effect on patients' health. A systematic literature search provided 1041 articles. After first review of title and abstract, 152 articles remained. After review of the full text, 83 articles were included. All included articles are presented according to the following variables: (i) reference; (ii) design and setting of the study; (iii) inclusion criteria for patients; (iv) description of the intervention; (v) whether a patient interview was performed to involve patients' experiences with their medicine-taking behaviour; (vi) outcome; (vii) whether healthcare professionals received additional training; and (viii) whether healthcare professionals received financial reimbursement. Many different interventions are described where pharmacists and general practitioners work together to improve patients' health. Only nine studies reported hard outcomes, such as hospital (re)admissions; however, these studies had different results, not all of which were statistically significant. Randomized controlled trials should be able to describe hard outcomes, but large patient groups will be needed to perform such studies. Patient involvement is important for long-term success.

**Lee JK, Slack MK, Martin J, Ehrman C, Chisholm-Burns M. Geriatric patient care by U.S. pharmacists in healthcare teams: systematic review and meta-analyses. *J Am Geriatr Soc* 2013;61(7):1119-1127.**

Abstract: OBJECTIVES: To conduct a systematic review and meta-analyses to examine the effects of pharmacists' care on geriatric patient-oriented health outcomes in the United States (U.S.). DESIGN: Studies examining U.S. pharmacists' patient care services from inception of the databases through July 2012 were searched. The databases searched include PubMed/MEDLINE, Ovid/MEDLINE, ABI/INFORM, Health Business Fulltext Elite, Academic Search Complete, International Pharmaceutical Abstracts, PsycINFO, Cochrane Database, and Clinical Trials.gov. Studies reporting pharmacists' intervention for geriatric patients, comparison groups, and patient-oriented outcomes were assessed. Dual review for inclusion and data extraction were performed. SETTING: University of Arizona College of Pharmacy. MEASUREMENTS: Study and participant characteristics, pharmacist intervention, and outcomes with data for meta-analyses were collected. A forest plot was constructed to obtain a pooled standardized mean difference using a random effects model. RESULTS: One hundred fifty-two articles were reviewed, with 20 resulting studies included in the final meta-analyses. Study sample size ranged from 36 to 4,218, with mean age of subjects being 65 and older. The studies were most frequently conducted in ambulatory care clinics, followed by inpatient settings; the majority focused on multiple diseases and conditions. Pharmacist activities varied widely, with technical interventions used most often. Favorable results were found in all outcome categories, and meta-analyses conducted for therapeutic, safety, hospitalization, and adherence were significant ( $P < .001$ ), favoring pharmacist care over comparison. Some identifiable variability existed between included studies. CONCLUSION: Pharmacist intervention has favorable effects on therapeutic, safety, hospitalization, and adherence outcomes in older adults. Pharmacists should be involved in team-based care of older adults.

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## Andre tiltak gitt av farmasøyter

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**Bennett MI, Bagnall AM, Raine G, Closs SJ, Blenkinsopp A, Dickman A, et al. Educational interventions by pharmacists to patients with chronic pain: systematic review and meta-analysis. Clin J Pain 2011;27(7):623-630.**

Abstract: OBJECTIVE: We hypothesized that educational interventions delivered by pharmacists to patients with chronic pain might improve pain-related outcomes and sought to establish "proof of concept" for this hypothesis. METHODS: We searched electronic databases and published literature for randomized studies that examined an educational intervention in relation to the management of chronic pain that was delivered by a pharmacist to an adult patient. Four studies were included that randomized 400 patients with chronic pain and which followed up patients between 1 and 16 weeks. RESULTS: Patients receiving these interventions experienced statistically significant benefits in the following outcomes compared with controls: a reduction in average pain intensity of 0.5 on a 0 to 10 rating scale, a reduction in adverse effects by more than 50%, and an improvement in satisfaction with treatment equivalent to approximately 1 point on a 0 to 10 rating scale. The interventions neither had effect on reducing interference from pain on daily life, nor on improving self-efficacy. DISCUSSION: Pharmacist-delivered educational interventions seem to reduce adverse events and improve satisfaction, but their clinical benefit on pain intensity is debatable. Our analysis suggests that the role of pharmacists may be important but a deeper understanding and evaluation of the active components of these interventions is needed within clinical trials before wider implementation into clinical practice can be recommended.

**Blalock SJ, Roberts AW, Lauffenburger JC, Thompson T, O'Connor SK. The effect of community pharmacy-based interventions on patient health outcomes: a systematic review. Med Care Res Rev 2013;70(3):235-266.**

Abstract: Many studies have demonstrated the beneficial effects that pharmacist-provided patient care services can have on patient health outcomes. However, the effectiveness of patient care services delivered by pharmacists in community pharmacy settings, where organizational barriers may affect service implementation or limit effectiveness, remains unclear. The authors systematically reviewed the literature on the effectiveness of pharmacist-delivered patient care services in community pharmacy settings in the United States. Of the 749 articles retrieved, 21 were eligible for inclusion in the review. Information concerning 134 outcomes was extracted from the included articles. Of these, 50 (37.3%) demonstrated statistically significant, beneficial intervention effects. The percentage of studies reporting favorable findings ranged from 50% for blood pressure to 0% for lipids, safety outcomes, and quality of life. Our findings suggest that evidence supporting the effectiveness of pharmacist-provided direct patient care services delivered in the community pharmacy setting is more limited than in other settings.

**Chisholm-Burns MA, Kim Lee J, Spivey CA, Slack M, Herrier RN, Hall-Lipsy E, et al. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. Med Care 2010;48(10):923-933.**

Abstract: BACKGROUND: One approach postulated to improve the provision of health care is effective utilization of team-based care including pharmacists. OBJECTIVE: The objective of this study was to conduct a comprehensive systematic review with focused meta-analyses to examine the effects of pharmacist-provided direct patient care on therapeutic, safety, and humanistic outcomes. METHODS: The following databases were searched from inception to January 2009: NLM PubMed; Ovid/MEDLINE; ABI/INFORM; Health Business Fulltext Elite; Academic Search Complete; International Pharmaceutical Abstracts; PsycINFO; Cochrane Database of Systematic Reviews; National Guideline Clearinghouse; Database of Abstracts of Reviews of Effects; ClinicalTrials.gov; LexisNexis Academic Universe; and Google Scholar. Studies selected included those reporting pharmacist-provided care, comparison groups, and patient-related outcomes. Of these, 56,573 citations were considered. Data were extracted by multidisciplinary study review teams. Variables examined included study characteristics, pharmacists' interventions/services, patient characteristics, and study outcomes. Data for meta-analyses were extracted from randomized controlled trials meeting meta-analysis criteria. RESULTS: A total of 298 studies were included. Favorable results were found in therapeutic and safety outcomes, and meta-analyses conducted for hemoglobin A1c, LDL cholesterol, blood pressure, and adverse drug events were significant ( $P < 0.05$ ), favoring pharmacists' direct patient care over comparative services. Results for humanistic outcomes were favorable with variability. Medication adherence, patient knowledge, and quality of life-

general health meta-analyses were significant ( $P < 0.05$ ), favoring pharmacists' direct patient care. CONCLUSIONS: Pharmacist-provided direct patient care has favorable effects across various patient outcomes, health care settings, and disease states. Incorporating pharmacists as health care team members in direct patient care is a viable solution to help improve US health care.

**Cohen V, Jellinek SP, Hatch A, Motov S. Effect of clinical pharmacists on care in the emergency department: a systematic review. Am J Health Syst Pharm 2009;66(15):1353-1361.**

Abstract: PURPOSE: A systematic literature review was conducted to ascertain the scope of involvement of clinical pharmacists in the emergency department (ED); summarize economic, humanistic, and clinical outcomes data; describe current limitations of these data; and identify areas for future research. METHODS: A search of MEDLINE, The Cochrane Library, International Pharmaceutical Abstracts, and CINAHL Plus databases was conducted. Articles were included in this review if the title and abstract indicated that the article's content addressed the scope of involvement of pharmacists in the ED or pharmacist interventions in the ED and their associated outcomes, such as humanistic outcomes, cost avoidance, or improved quality. Qualitative analyses were conducted to characterize pharmacists' activities and effects in the ED. RESULTS: Of the 533 returned citations, only 17 met the inclusion criteria. Each provided a description of clinical pharmacy services at 12 different institutions. Descriptions of these institutions and job responsibilities of the ED pharmacists are described. Six studies reported information about pharmacist interventions, including the number and types of interventions, time spent per intervention, and acceptance rate of interventions. Four studies reported cost-related outcomes data. CONCLUSION: A review of the literature revealed that pharmacists have been involved in the ED for decades. Services provided by pharmacists in the ED included traditional clinical pharmacy services, responding to medical emergencies, providing consultations on medication issues, identifying and reducing medication errors, and conducting medication histories at hospital admission. Some services were shown to be cost saving or cost avoiding.

**Dennis S, May J, Perkins D, Zwar N, Sibbald B, Hasan I. What evidence is there to support skill mix changes between GPs, pharmacists and practice nurses in the care of elderly people living in the community? Aust New Zealand Health Policy 2009;6:23.**

Abstract: BACKGROUND: Workforce shortages in Australia are occurring across a range of health disciplines but are most acute in general practice. Skill mix change such as task substitution is one solution to workforce shortages. The aim of this systematic review was to explore the evidence for the effectiveness of task substitution between GPs and pharmacists and GPs and nurses for the care of older people with chronic disease. Published, peer reviewed (black) and non-peer reviewed (grey) literature were included in the review if they met the inclusion criteria. RESULTS: Forty-six articles were included in the review. Task substitution between pharmacists and GPs and nurses and GPs resulted in an improved process of care and patient outcomes, such as improved disease control. The interventions were either health promotion or disease management according to guidelines or use of protocols, or a mixture of both. The results of this review indicate that pharmacists and nurses can effectively provide disease management and/or health promotion for older people with chronic disease in primary care. While there were improvements in patient outcomes no reduction in health service use was evident. CONCLUSION: When implementing skill mix changes such as task substitution it is important that the health professionals' roles are complementary otherwise they may simply duplicate the task performed by other health professionals. This has implications for the way in which multidisciplinary teams are organised in initiatives such as the GP Super Clinics.

**Giam JA, McLachlan AJ, Krass I. Community pharmacy compounding-impact on professional status. Int J Clin Pharm 2011;33(2):177-182.**

Abstract: AIM OF THE REVIEW: Extemporaneous compounding has been a core function for pharmacists and was the basis of pharmacy's claim to professional status. The re-emergence of compounding as a specialised practice warrants investigation regarding the influence of this practice on pharmacy's professional status. The aim of this study was to investigate the contribution of extemporaneous compounding to the professional status of pharmacists in community practice. METHOD: A search of the literature was conducted using MEDLINE, EMBASE, IPA, ISI WEB OF KNOWLEDGE, PROQUEST SOCIAL SCIENCE JOURNALS, JSTOR and SOCIOLOGICAL ABSTRACTS databases to identify relevant original research articles, reviews or commentaries. RESULTS: Compounding was an important part of pharmacy's claim to professional status. The expansion of the pharmaceutical industry and decline in demand for compounded medications led to a view that pharmacy suffered a loss of professional status. In recent decades patient centred services have been introduced as a reprofessionalisation strategy. Evidence

suggests that compounding, as a specialty practice based on a patient centred approach, is increasingly provided in Australia and the United States. **CONCLUSION:** Compounding has emerged as a specialised area of pharmacy practice in Australia and the United States, and when practiced as a patient centred activity may be a strategy for reprofessionalisation. The extension of compounding beyond mere supply and distribution of a pharmaceutical product to become a platform for development of collaborative professional relationships may also lead to enhanced professional status of pharmacists.

**Gudka S, Afuwape FE, Wong B, Yow XL, Anderson C, Clifford RM. Chlamydia screening interventions from community pharmacies: a systematic review. Sex Health 2013;10(3):229-239.**

**Abstract:** **BACKGROUND:** Chlamydia (*Chlamydia trachomatis*) is the most commonly notified sexually transmissible infection in Australia. Increasing the number of people aged 16-25 years being tested for chlamydia has become a key objective. The strategy recommends that chlamydia screening sites should be easy to access. Community pharmacies are conveniently located and easily accessible. This review aimed to determine the different types of pharmacy-based chlamydia screening interventions, describe their uptake rates, and understand issues around the acceptability of and barriers to testing.

**METHODS:** Seven electronic databases were searched for peer-reviewed articles published up to 30 October 2011 for studies that reported chlamydia screening interventions from community pharmacies, or had qualitative evidence on acceptability or barriers linked with interventions. **RESULTS:** Of the 163 publications identified, 12 met the inclusion criteria. Nine reported chlamydia screening interventions in a pharmacy setting, whereas three focussed on perspectives on chlamydia screening. Pharmacists could offer a chlamydia test to consumers attending the pharmacy for a sexual health-related consultation, or consumers could request a chlamydia test as part of a population-based intervention. Participating consumers said pharmacies were accessible and convenient, and pharmacists were competent when offering a chlamydia test. Pharmacists reported selectively offering tests to women they thought would be most at risk, undermining the principles of opportunistic interventions. **CONCLUSION:** Chlamydia screening from community pharmacies is feasible, and can provide an accessible, convenient venue to get a test. Professional implementation support, alongside resources, education and training programs, and incentives may overcome the issue of pharmacists selectively offering the test.

**Kharat AA, Borrego M, Raisch DW. Literature review of randomized, controlled studies of the impact of pharmacists' interventions to improve patient outcomes. Value Health 2011;14 (3):A152.**

**Abstract:** **OBJECTIVES:** The objective was to summarize the impact of pharmacists' interventions on patient outcomes as reported in studies utilizing a randomized controlled trial (RCT) design. **METHODS:** A comprehensive literature search was conducted utilizing PubMed and International Pharmaceutical Abstracts for the years 1979-2009. Studies were included if they evaluated pharmacist-provided interventions, utilized RCT designs with control groups, and were conducted in the United States. Studies were summarized by 1) publication year; 2) study setting; 3) disease/health condition; and 4) type of intervention provided and whether performed by a pharmacist alone or a pharmacist with other health care professionals, 5) primary outcome variables and 6) study findings. Patient outcome results were categorized as 'positive', if they found a statistically significant improvement in the patient outcomes when compared to the control group, or 'no difference' if no significant difference was found. **RESULTS:** Of the 552 citations reviewed, 100 studies met the inclusion criteria. The numbers of pharmacists' intervention studies conducted using RCT designs increased from 1979 to 2009, with 64% conducted after 2000. The majority of the studies were conducted in clinic setting (65%) followed by community pharmacies (19%), hospitals (12%), home-care (2%), and multiple settings (2%). Chronic conditions were studied in 56% of the studies. Studies of interventions delivered by pharmacists alone comprised 64%, while 36% involved pharmacists working with other health care providers. Overall, 'positive' patient outcomes were demonstrated in 73% of the studies. When interventions were delivered by pharmacists working with other health care providers, however, 97.2% had positive outcomes. **CONCLUSIONS:** 'Positive' patient outcomes were demonstrated in the majority of the studies, supporting increased pharmacists' roles in the health care system to improve patient outcomes. When working alongside other health care providers, the positive impact was most likely.

**Nkansah N, Mostovetsky O, Yu C, Chheng T, Beney J, Bond CM, et al. Effect of outpatient pharmacists' non-dispensing roles on patient outcomes and prescribing patterns. *Cochrane Database Syst Rev* 2010 (7):CD000336.**

Abstract: BACKGROUND: The roles of pharmacists in patient care have expanded from the traditional tasks of dispensing medications and providing basic medication counseling to working with other health professionals and the public. Multiple reviews have evaluated the impact of pharmacist-provided patient care on health-related outcomes. Prior reviews have primarily focused on in-patient settings. This systematic review focuses on services provided by outpatient pharmacists in community or ambulatory care settings. This is an update of the Cochrane review published in 2000. OBJECTIVES: To examine the effect of outpatient pharmacists' non-dispensing roles on patient and health professional outcomes. SEARCH STRATEGY: This review has been split into two phases. For Phase I, we searched the Cochrane Effective Practice and Organisation of Care (EPOC) Group Specialised Register (January 1966 through March 2007). For Phase II, we searched MEDLINE/EMBASE (January 1966 through March 2008). The Phase I results are reported in this review; Phase II will be summarized in the next update. SELECTION CRITERIA: Randomized controlled trials comparing 1. Pharmacist services targeted at patients versus services delivered by other health professionals; 2. Pharmacist services targeted at patients versus the delivery of no comparable service; 3. Pharmacist services targeted at health professionals versus services delivered by other health professionals; 4. Pharmacist services targeted at health professionals versus the delivery of no comparable service. DATA COLLECTION AND ANALYSIS: Two authors independently reviewed studies for inclusion, extracted data, and assessed risk of bias of included studies. MAIN RESULTS: Forty-three studies were included; 36 studies were pharmacist interventions targeting patients and seven studies were pharmacist interventions targeting health professionals. For comparison 1, the only included study showed a significant improvement in systolic blood pressure for patients receiving medication management from a pharmacist compared to usual care from a physician. For comparison 2, in the five studies evaluating process of care outcomes, pharmacist services reduced the incidence of therapeutic duplication and decreased the total number of medications prescribed. Twenty-nine of 36 studies reported clinical and humanistic outcomes. Pharmacist interventions resulted in improvement in most clinical outcomes, although these improvements were not always statistically significant. Eight studies reported patient quality of life outcomes; three studies showed improvement in at least three subdomains. For comparison 3, no studies were identified meeting the inclusion criteria. For comparison 4, two of seven studies demonstrated a clear statistically significant improvement in prescribing patterns. AUTHORS' CONCLUSIONS: Only one included study compared pharmacist services with other health professional services, hence we are unable to draw conclusions regarding comparisons 1 and 3. Most included studies supported the role of pharmacists in medication/therapeutic management, patient counseling, and providing health professional education with the goal of improving patient process of care and clinical outcomes, and of educational outreach visits on physician prescribing patterns. There was great heterogeneity in the types of outcomes measured across all studies. Therefore a standardized approach to measure and report clinical, humanistic, and process outcomes for future randomized controlled studies evaluating the impact of outpatient pharmacists is needed. Heterogeneity in study comparison groups, outcomes, and measures makes it challenging to make generalised statements regarding the impact of pharmacists in specific settings, disease states, and patient populations.

**Nunan M, Duke T. Effectiveness of pharmacy interventions in improving availability of essential medicines at the primary healthcare level. *Trop Med Int Health* 2011;16(5):647-658.**

Abstract: OBJECTIVE: To assess the effectiveness of pharmaceutical systems interventions in improving the availability of essential medicines at the primary care level. METHODS: Literature search for examples of pharmaceutical systems interventions in low and middle income countries that evaluated the impact of specific interventions on medicines' availability. Qualitative and quantitative studies were included. RESULTS: Seventeen studies were included, on privatisation of drug distribution, user-fees, revolving drug funds (RDFs), supervisory visitation programmes, staff training initiatives, community-directed interventions (CDIs) and disease-specific drug programmes. We found no studies on non-monetary staff incentives or the use of national pharmacy standards. Generally, the quantity and quality of evidence was low; evidence was strongest for supervisory visitation programmes and CDIs. CONCLUSION: Several interventions have the potential for improving medicines' availability without requiring large-scale international cooperation or global policy change. The absence of evidence in this field does not prove lack of effect. There is a need for more systematic studies of multi-faceted pharmaceutical interventions to improve drug availability in the context of difficult health systems, such as structured supervision of remote health facilities, CDIs, staff training, integration of

disease-specific programmes, implementation of national pharmacy standards, non-monetary staff incentives and measures to ensure cost is not a barrier to access. A standardised approach to measuring the availability of essential medicines is needed.

**Pande S, Hiller JE, Nkansah N, Bero L. The effect of pharmacist-provided non-dispensing services on patient outcomes, health service utilisation and costs in low- and middle-income countries. *Cochrane Database Syst Rev* 2013;2:CD010398.**

Abstract: BACKGROUND: The role of pharmacists has expanded beyond dispensing and packaging over the past two decades, and now includes ensuring rational use of drugs, improving clinical outcomes and promoting health status by working with the public and other healthcare professionals.

OBJECTIVES: To examine the effect of pharmacist-provided non-dispensing services on patient outcomes, health service utilisation and costs in low- and middle-income countries.

SEARCH METHODS: Studies were identified by electronically searching the Cochrane Central Register of Controlled Trials (CENTRAL) in The Cochrane Library (February 2010), MEDLINE (1949 to February 2010), Scopus (1960 to March 2010) and International Pharmaceutical Abstracts (1970 to January 2010) databases. An update of this review is currently ongoing. The search was re-run September 2012 and the potentially relevant studies are awaiting classification. SELECTION CRITERIA: Randomised controlled trials, non-randomised controlled trials, controlled before-after studies and interrupted time series analyses comparing 1. pharmacist-provided non-dispensing services targeted at patients versus (a) the same services provided by other healthcare professionals, (b) the same services provided by untrained health workers, and (c) usual care; and 2. pharmacist-provided non-dispensing services targeted at healthcare professionals versus (a) the same services provided by other healthcare professionals, (b) the same services provided by untrained health workers, and (c) usual care in low- and middle-income countries. The research sites must have been located in low or middle income countries according to World Bank Group 2009 at the time of the study, regardless of the location or the origin of the researchers. DATA COLLECTION AND ANALYSIS: Two authors independently reviewed studies for inclusion in the review. Two review authors independently extracted data for each study. Risk of bias of the included studies was also assessed independently by two authors. MAIN RESULTS: Twelve studies comparing pharmacist-provided services versus usual care were included in this review. Of the 12 studies, seven were from lower middle income countries and five were from upper middle income countries. Eleven studies examined pharmacist-provided services targeted at patients and one study evaluated pharmacist interventions targeted at healthcare professionals. Pharmacist-provided services targeting patients resulted in a small improvement of clinical outcomes such as blood pressure (-25 mm Hg/-6 mm Hg and -4.56 mm Hg/-2.45 mm Hg), blood glucose (-39.84 mg/dl and -16.16 mg/dl), blood cholesterol (-25.7 mg/dl)/ triglyceride levels (-80.1 mg/dl) and asthma outcomes (peak expiratory flow rate 1.76 l/min). Moreover, there was a small improvement in the quality of life, although four studies did not report the effect size explicitly. Health service utilisation, such as rate of hospitalisation and general practice and emergency room visits, was also found to be reduced by the patient targeted pharmacist-provided services. A single study examined the effect of patient targeted pharmacist interventions on medical expenses and the cost was found to be reduced. A single study that examined pharmacist services that targeted healthcare professionals demonstrated a very small impact on asthma symptom scores. No studies assessing the impact of pharmacist-provided non-dispensing services that targeted healthcare professionals reported health service utilisation and cost outcomes. Overall, five studies did not adequately report the numerical data for outcomes but instead reported qualitative statements about results, which prevented an estimation of the effect size. Studies for the comparison of patient targeted services provided by pharmacists versus the same services provided by other healthcare professionals or untrained healthcare workers were not found. Similarly, studies for the comparison of healthcare professional targeted services provided by pharmacists versus the same services provided by other healthcare professionals or untrained healthcare workers were not found. AUTHORS' CONCLUSIONS: Pharmacist-provided services that target patients may improve clinical outcomes such as management of high glucose levels among diabetic patients, management of blood pressure and cholesterol levels and may improve the quality of life of patients with chronic conditions such as diabetes, hypertension and asthma. Pharmacist services may reduce health service utilisation such as visits to general practitioners and hospitalisation rates. We are uncertain about the effect of educational sessions by pharmacists for healthcare professionals due to the imprecision of a single study included in this review. Similarly, conclusions could not be drawn for health service utilisation and costs due to lack of evidence on interventions delivered by pharmacists to healthcare professionals. These results were heterogenous in the types of outcomes measured, clinical conditions and approaches to measurement

of outcomes, and require cautious interpretation. All eligible studies were from middle income countries and the results may not be applicable to low income countries.

**Paudyal V, Watson MC, Sach T, Porteous T, Bond CM, Wright DJ, et al. Are pharmacy-based minor ailment schemes a substitute for other service providers? A systematic review. *Br J Gen Pract* 2013;63(612):e472-481.**

Abstract: BACKGROUND: Pharmacy-based minor ailment schemes (PMASs) have been introduced throughout the UK to reduce the burden of minor ailments on high-cost settings, including general practice and emergency departments. AIM: This study aimed to explore the effect of PMASs on patient health- and cost-related outcomes; and their impact on general practices. DESIGN AND SETTING: Community pharmacy-based systematic review. METHOD: Standard systematic review methods were used, including searches of electronic databases, and grey literature from 2001 to 2011, imposing no restrictions on language or study design. Reporting was conducted in the form recommended in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and checklist. RESULTS: Thirty-one evaluations were included from 3308 titles identified. Reconsultation rates in general practice, following an index consultation with a PMAS, ranged from 2.4% to 23.4%. The proportion of patients reporting complete resolution of symptoms after an index PMAS consultation ranged from 68% to 94%. No study included a full economic evaluation. The mean cost per PMAS consultation ranged from 1.44 to 15.90. The total number of consultations and prescribing for minor ailments at general practices often declined following the introduction of PMAS. CONCLUSION: Low reconsultation and high symptom-resolution rates suggest that minor ailments are being dealt with appropriately by PMASs. PMAS consultations are less expensive than consultations with GPs. The extent to which these schemes shift demand for management of minor ailments away from high-cost settings has not been fully determined. This evidence suggests that PMASs provide a suitable alternative to general practice consultations. Evidence from economic evaluations is needed to inform the future delivery of PMASs.

**Rickles NM, Brown TA, McGivney MS, Snyder ME, White KA. Adherence: A review of education, research, practice, and policy in the United States. *Pharm Pract (Granada)* 2010;8(1):1-17.**

Abstract: Objective: To describe the education, research, practice, and policy related to pharmacist interventions to improve medication adherence in community settings in the United States. Methods: Authors used MEDLINE and International Pharmaceutical Abstracts (since 1990) to identify community and ambulatory pharmacy intervention studies which aimed to improve medication adherence. The authors also searched the primary literature using Ovid to identify studies related to the pharmacy teaching of medication adherence. The bibliographies of relevant studies were reviewed in order to identify additional literature. We searched the tables of content of three US pharmacy education journals and reviewed the American Association of Colleges of Pharmacy website for materials on teaching adherence principles. Policies related to medication adherence were identified based on what was commonly known to the authors from professional experience, attendance at professional meetings, and pharmacy journals. Results: Research and Practice: 29 studies were identified: 18 randomized controlled trials; 3 prospective cohort studies; 2 retrospective cohort studies; 5 case controlled studies; and one other study. There was considerable variability in types of interventions and use of adherence measures. Many of the interventions were completed by pharmacists with advanced clinical backgrounds and not typical of pharmacists in community settings. The positive intervention effects had either decreased or not been sustained after interventions were removed. Although not formally assessed, in general, the average community pharmacy did not routinely assess and/or intervene on medication adherence. Education: National pharmacy education groups support the need for pharmacists to learn and use adherence-related skills. Educational efforts involving adherence have focused on students' awareness of adherence barriers and communication skills needed to engage patients in behavioral change. Policy: Several changes in pharmacy practice and national legislation have provided pharmacists opportunities to intervene and monitor medication adherence. Some of these changes have involved the use of technologies and provision of specialized services to improve adherence. Conclusions: Researchers and practitioners need to evaluate feasible and sustainable models for pharmacists in community settings to consistently and efficiently help patients better use their medications and improve their health outcomes.

**Robertson J, Walkom E, Pearson SA, Hains I, Williamsons M, Newby D. The impact of pharmacy computerised clinical decision support on prescribing, clinical and patient outcomes: a systematic review of the literature. *Int J Pharm Pract* 2010;18(2):69-87.**

Abstract: OBJECTIVES: Computerised clinical decision support systems (CDSSs) are being used increasingly to support evidence-based decision-making by health care professionals. This systematic review evaluated the impact of CDSSs targeting pharmacists on physician prescribing, clinical and patient outcomes. We compared the impact of CDSSs addressing safety concerns (drug interactions, contraindications, dose monitoring and adjustment) and those focusing on medicines use in line with guideline recommendations (hereafter referred to as Quality Use of Medicines, or QUM). We also examined the influence of clinical setting (institutional versus ambulatory care), system- or user-initiation of CDSS, prescribing versus clinical outcomes reported and use of multi-faceted versus single interventions on system effectiveness. METHODS: We searched Medline, Embase, CINAHL and PsycINFO (1990-2009) for methodologically adequate studies (experiments and strong quasi-experiments) comparing a CDSS with usual pharmacy care. Individual study results are reported as positive trends or statistically significant results in the direction of the intentions of the CDSS being tested. Studies are aggregated and compared as the proportions of studies showing the effectiveness of the CDSS on the majority (> or = 50%) of outcomes reported in the individual study. KEY FINDINGS: Of 21 eligible studies, 11 addressed safety and 10 QUM issues. CDSSs addressing safety issues were more effective than CDSSs focusing on QUM (10/11 versus 4/10 studies reporting statistically significant improvements in favour of CDSSs on > or = 50% of all outcomes reported;  $P = 0.01$ ). A number of QUM studies noted the limited contact between pharmacists and physicians relating to QUM treatment recommendations. More studies demonstrated CDSS benefits on prescribing outcomes than clinical outcomes (10/10 versus 0/3 studies;  $P = 0.002$ ). There were too few studies to assess the impact of system- versus user-initiated CDSS, the influence of setting or multi-faceted interventions on CDSS effectiveness. CONCLUSIONS: Our study demonstrated greater effectiveness of safety-focused compared with QUM-focused CDSSs. Medicine safety issues are traditional areas of pharmacy activity. Without good communication between pharmacists and physicians, the full benefits of QUM-focused CDSSs may not be realised. Developments in pharmacy-based CDSSs need to consider these inter-professional relationships as well as computer-system enhancements.

**Smith A, Pinto S. A systematic review to identify specific pharmacists' interventions and outcomes associated with drug therapy. *J Am Pharm Assoc* (2003) 2010;50 (2):303-304.**

Abstract: Objective: To (1) conduct a systematic review of literature to identify important pharmacists' interventions used in management of drug therapy and (2) determine the clinical outcomes resulting from pharmacists' interventions and subsequent patient and physician responses. Methods: A complete search of PubMed, Medline, and International Pharmaceutical Abstracts was performed to identify original articles about specific pharmacists' interventions and resulting responses and outcomes. Combinations of the keywords pharmacist, intervention, medication adherence, patient compliance, medication therapy management, drug therapy, and pharmaceutical care were used. The studies evaluated must have taken place between 1999 and 2009 in the United States and have been written in English. If a study contained information about the specific interventions, responses, and outcomes resulting from practitioners' care, it met the criteria for consideration. A comprehensive review table was compiled on the basis of the results of the systematic review. Results: A total of 23 studies were included in the resulting review table. Each of the interventions, responses, and outcomes were encoded using a predetermined set of definitions used by a larger, prospective, and longitudinal study. Of the studies reviewed, 21 concluded that pharmacists may improve patient outcomes. Furthermore, 7 studies concluded that pharmacists' interventions led to statistically significant improvement in clinical outcomes. One study concluded that there was no difference between pharmacist-led care and usual care by a physician. The interventions observed in the studies could be classified into 1 of the 12 encoded definitions of interventions. These intervention, response, outcome chains can be used to create a comprehensive decision model to which statistics can be applied to estimate cost savings resulting from specific pharmacists' interventions. Conclusion: A systematic review of literature from 1999-2009 indicated that most studies evaluated showed improvement in clinical outcomes. About 30% of the time, this improvement, resulting from pharmacists' interventions, was statistically significant.



**Saokaew S, Permsuwan U, Chaiyakunapruk N, Nathisuwan S, Sukonthasarn A. Effectiveness of pharmacist-participated warfarin therapy management: a systematic review and meta-analysis. *J Thromb Haemost* 2010;8(11):2418-2427.**

Abstract: OBJECTIVE: Although pharmacist-participated warfarin therapy management (PWTM) has been accepted and implemented in various parts of the world, the evidence demonstrating the effects of PWTM compared with usual care on clinical outcomes is lacking. We performed a systematic review and meta-analysis to compare the effects of PWTM with usual care on bleeding and thromboembolic outcomes. METHODS: We searched MEDLINE, SCOPUS, EMBASE, IPA, CINAHL, Cochrane CENTRAL, Thai Index Medicus and Thai Medical Index, and reference lists of studies, without language restriction. Databases were searched from their inception to July 2009. The studies using warfarin as an anticoagulant with sufficient data for compilation of 2 x 2 tables were included. Both randomized controlled trials (RCTs) and non-RCTs were considered. Two authors independently reviewed each study, assigned quality scores and extracted data for all outcomes using a standardized form. Pooled effect estimates (risk ratio; RR) were obtained using a random effects model.

RESULT: Of 661 articles identified, 24 studies with 728,377 patients were included. In the random-effects meta-analysis of RCTs, the PWTM group had statistically significant effects on the prevention of total bleeding [RR, 0.51; 95% confidence interval (CI), 0.28-0.94]. However, the effects on major bleeding (RR, 0.64; 95% CI, 0.18-2.36), thromboembolic events (RR, 0.79; 95% CI, 0.33-1.93), all-cause mortality (RR, 0.93; 95% CI, 0.41-2.13) and warfarin-related mortality (RR, 0.65; 95% CI, 0.18-2.42) were not significant. CONCLUSION: Pharmacist's participation in the management of warfarin therapy significantly reduces total bleeding, with a non-significant trend towards decreases in other warfarin-related complications.

**Thomas R, Huntley AL, Mann M, Huws D, Elwyn G, Paranjothy S, et al. Pharmacist-led interventions to reduce unplanned admissions for older people: a systematic review and meta-analysis of randomised controlled trials. *Age Ageing* 2014;43(2):174-187.**

Abstract: PURPOSE: medication problems are thought to cause between 10 and 30% of all hospital admissions in older people. This systematic review aimed to evaluate the effectiveness of interventions led by hospital or community pharmacists in reducing unplanned hospital admissions for older people.

METHODS: eighteen databases were searched with a customised search strategy. Relevant websites and reference lists of included trials were checked. Randomised controlled trials were included that evaluated pharmacist-led interventions compared with usual care, with unplanned admissions or readmissions as an outcome. Two authors independently extracted data and assessed methodological quality. RESULTS: twenty-seven randomised controlled trials (RCTs) were identified; seven trials were excluded. The 20 included trials comprised 16 for older people and 4 for older people with heart failure. Interventions led by hospital pharmacists (seven trials) or community pharmacists (nine trials) did not reduce unplanned admissions in the older population (risk ratios 0.97 95% CI: 0.88, 1.07; 1.07 95% CI: 0.96, 1.20). Three trials in older people with heart failure showed that interventions delivered by a hospital pharmacist reduced the relative risk of admissions. However, these trials were heterogeneous in intensity and duration of follow-up. One trial had a high risk of bias. CONCLUSIONS: evidence from three randomised controlled trials suggests that interventions led by hospital pharmacists reduce unplanned hospital admissions in older patients with heart failure, although these trials were heterogeneous. Data from 16 trials do not support the concept that interventions led by hospital or community pharmacists for the general older population reduces unplanned admissions.

**Verrue CL, Petrovic M, Mehuys E, Remon JP, Vander Stichele R. Pharmacists' interventions for optimization of medication use in nursing homes: a systematic review. *Drugs Aging* 2009;26(1):37-49.**

Abstract: The elderly use more medications than younger adults. In addition, the prevalence of inappropriate prescribing is high in nursing homes. The aim of this review was to collect and interpret the results of clinical studies of interventions involving pharmacists aimed at improving the quality of prescribing in nursing homes, and to identify the key elements for a successful intervention. To this end, we searched MEDLINE, International Pharmaceutical Abstracts and EMBASE from January 1987 to May 2008. Studies were selected that (i) involved a pharmacist; (ii) took place in the nursing home setting; (iii) involved residents aged > or =65 years; (iv) included residents with a range of diseases (not targeted at a specific pathology); (v) were controlled trials (randomized or not). The search strategy retrieved eight controlled studies that fitted the inclusion criteria. A meta-analysis was not possible because of the difference in outcomes chosen in the publications. We found mixed evidence for the effectiveness of various interventions by pharmacists on pharmacotherapy in the nursing home setting.

Pharmacists can have different roles in the nursing home such as performing regular medication reviews, being an active member of a multidisciplinary team and/or educating physicians, nurses and other nursing home staff about medication use. Our review shows that the available evidence is mixed concerning the effectiveness of interventions by pharmacists on pharmacotherapy in the nursing home setting. At the same time, greater pharmacist involvement has been shown in published studies to increase physicians' and nurses' knowledge and awareness about medication. Evidence is scarce, however, and there is a need for large, well conducted randomized controlled trials in the nursing home setting. Attention should be paid to the choice of outcome measures and to multidisciplinary collaboration when assessing the effects of pharmacists' interventions on medication use in nursing homes.

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## **Alle tiltak gitt av farmasøyter for spesifikk sykdom**

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### **Adunlin G, Mahdavian S. The Effectiveness of Pharmacist Interventions on Asthma Management: A Systematic Review. *Journal of Asthma and Allergy Educators* 2012;3(6):264-273.**

**Background.** In recent years, pharmacists have become more active in patient care and can demonstrate a positive impact on the outcomes of drug therapy in asthma patients. **Objective.** The primary objective of this systematic review was to assess the impact of asthma improvement strategies used by pharmacists. The secondary objective was to ascertain if these strategies improve the control and other direct outcomes for patients with asthma compared with no intervention. **Methods.** Electronic databases were searched from January 2006 to February 2012. Data abstracted from publications included publication details, participants/setting, intervention study design, outcome measures, and key findings. **Results.** Forty-seven studies were initially identified; 8 matched our inclusion criteria. Four were US studies and 4 were Canadian. Published studies provided evidence of the clinical effectiveness of pharmacy services in asthma interventions. The role of pharmacists in disease diagnosis, access to private area for consultation, time, and staff support were highlighted as the key barriers to asthma intervention. Reimbursement for consulting services provided a unique opportunity for pharmacists to provide direct patient care. **Conclusion.** The review demonstrated the contribution of pharmacy-based services to the monitoring, counseling, and educating in asthma care. The evidence supports the wider provision of asthma intervention through pharmacy services. Well-designed studies on the effectiveness of pharmacists' interventions to improve outcomes of patients with asthma need to be performed. In addition, further research is needed regarding the contribution of pharmacy services to disease detection as part of local public health strategies.

### **Aguiar PM, Balisa-Rocha BJ, Brito Gde C, da Silva WB, Machado M, Lyra DP, Jr. Pharmaceutical care in hypertensive patients: a systematic literature review. *Res Social Adm Pharm* 2012;8(5):383-396.**

**Abstract:** **BACKGROUND:** Since the conception of pharmaceutical care in 1990, many studies have been published purported to implement and/or evaluate interventions under this aegis; however, most have been criticized in methodological approach. As such, there is a need to assess the scientific rigor of the published studies and examine the biases that may compromise the hardiness of their findings. **OBJECTIVES:** The aim of this review is to describe and appraise published research on the management of patients diagnosed with essential hypertension under the guise of pharmaceutical care. **METHODS:** MEDLINE, EMBASE, Scopus, and LILACS databases from January 1990 to July 2011 were searched using the keywords "pharmaceutical care," "hypertension," and "blood pressure." Included were clinical trials assessing the impact of pharmaceutical care on outcomes for hypertensive patients. Two independent reviewers abstracted data on descriptive characteristics, research design and outcomes, and study limitations. **RESULTS:** The literature search identified 917 articles, of which 16 satisfied the inclusion criteria. The studies were conducted primarily in North America (8) and in ambulatory settings (9). Sample sizes ranged from 24 to 235 patients, with most studies reporting a 6-month patient follow-up period. Many studies (9) were randomized clinical trials but generally had a low-quality methods score according to the Jadad scale. Blood pressure (BP) (15), medication adherence (11), and quality of life (9) were the most common outcome measures. As expected, systolic BP was the outcome most positively impacted by the pharmaceutical intervention. **CONCLUSIONS:** This database search revealed that most of the included studies evaluated the impact of pharmaceutical care on clinical and humanistic outcomes and few studies showed statistically significant improvement in BP. However, a lack of hardiness and many important limitations were common in the studies analyzed. As such, recommendations are made to improve in research design and to demonstrate the effectiveness of the intervention.

**Al-Jumah KA, Qureshi NA. Impact of pharmacist interventions on patients' adherence to antidepressants and patient-reported outcomes: a systematic review. Patient Prefer Adherence 2012;6:87-100.**

Abstract: BACKGROUND: Pharmacist intervention in improving patient adherence to antidepressants is coupled with better outcomes. AIMS: The aim of this investigation was to systematically examine the published literature to explore different types of pharmacist interventions used for enhancing patient adherence to antidepressant medications. Three specific questions guided the review: what is the impact of pharmacist interventions on adherence to antidepressant medication? What is the impact of pharmacist interventions on patient-reported outcomes and patient satisfactions? What are the types of interventions used by pharmacists to enhance patients' adherence to antidepressants? SEARCH STRATEGIES: A systematic review of the literature was conducted during August–November 2010 using PubMed, BIOSIS Previews() Web of Science, ScienceDirect, the Cochrane Library, PsycINFO(), Ingenta-Connect, Cambridge Journals Online, and Medscape databases. Key text words and medical subject headings included pharmacist intervention, medication intervention, depression, medication adherence, health-related quality of life, patient-reported outcomes, and antidepressants. RESULTS: A total of 119 peer-reviewed papers were retrieved; 94 were excluded on the basis of abstract review and 13 after full-text analysis, resulting in twelve studies suitable for inclusion and intensive review. The most common intervention strategy that pharmacists utilized was a combination of patient education and drug monitoring. A cumulative patient adherence improvement in this review ranged from 15% to 27% attributed to utilization of different interventions and different combinations of interventions together with patient satisfaction with the treatment when depression improved. CONCLUSION: This review suggests that pharmacist intervention is effective in the improvement of patient adherence to antidepressants. This may be a basis for more studies examining the effectiveness of innovative interventions by pharmacists to enhance patient adherence to antidepressant medications.

**Altowajri A, Phillips CJ, Fitzsimmons D. A systematic review of the clinical and economic effectiveness of clinical pharmacist intervention in secondary prevention of cardiovascular disease. J Manag Care Pharm 2013;19(5):408-416.**

Abstract: BACKGROUND: Cardiovascular disease (CVD) is considered to be the main cause of death and one of the most common diseases affecting health care systems worldwide. Many methods have been used to improve CVD outcomes, one of which is to involve clinical pharmacists in the direct care of patients with CVD. OBJECTIVE: To perform a systematic review assessing the effectiveness of clinical pharmacist interventions within a multidisciplinary team in the secondary prevention of CVD, using studies conducted on patients with heart failure, coronary heart disease, or those with CVD risk factors. METHODS: Extensive searches of 13 databases were performed--with no time limitation--to identify randomized controlled trials (RCT) in English that evaluated clinical pharmacist intervention in patients with CVD or with CVD risk factors. Two independent reviewers evaluated 203 citations that were the result of this search. Studies were included if they reported direct care from a clinical pharmacist in CVD or CVD-related therapeutic areas such as disease-led management or in collaboration with other health care workers; if they were RCTs; if they were inpatients, outpatients, or in the community setting; and if they included the following outcomes: CVD control or mortality, CVD risk factor control, patient-related outcomes (knowledge, adherence, or quality of life), and cost related to health care systems. RESULTS: A total of 59 studies were identified: 45 RCT, 6 non-RCT, and 8 economic studies. 68% of the outcomes reported showed that clinical pharmacy services were associated with better improvement in patients' outcomes compared with the control group. CONCLUSION: The involvement of a pharmacist demonstrated an ability to improve CVD outcomes through providing educational intervention, medicine management intervention, or a combination of both. These interventions resulted in improved CVD risk factors, improved patient outcomes, and reduced number of drug-related problems with a direct effect on CVD control. These improvements may lead to an improvement in patient quality of life, better use of health care resources, and a reduced rate of mortality.

**Basaraba J, George-Phillips K, Mysak T. Pharmacists as care providers for stroke patients: A systematic review. Stroke 2013;44 (12):e201.**

Abstract: Background: The role of the pharmacist has expanded to a more clinically oriented practice in a variety of healthcare settings. Although evidence supporting their role in the care of patients with other disease states is well established, minimal literature has been published evaluating pharmacist interventions in stroke patients. The purpose of this systematic review is to summarize the evidence

evaluating the impact of pharmacist interventions on stroke patient outcomes. Methods: Study abstracts and full-text articles evaluating the impact of any pharmacist intervention on outcomes in patients with an acute stroke/TIA or a history of an acute stroke/ TIA were identified. A meta-analysis was not performed. Results: Twenty-six abstracts and full-text studies were included. The included studies provided evidence supporting pharmacist interventions in multiple settings including: emergency departments, inpatient, outpatient, community pharmacy, and long-term care settings. In the majority of the studies, pharmacist care was collaborative with other healthcare professionals. Some of the pharmacist interventions included participation in a stroke response team, assessment for thrombolytic use, medication reconciliation, participation in patient rounds, identification and resolution of drug therapy problems, risk factor reduction, and patient education. Examples of outcomes include a reduction in time to thrombolytic administration, increased medication adherence, patient satisfaction, and blood pressure and/or lipid control. Conclusions: The available evidence suggests that a variety of pharmacist interventions can have a positive impact on stroke patient outcomes. Further research should be conducted to add to the current body of literature.

**Benavides S, Rodriguez JC, Maniscalco-Feichtl M. Pharmacist involvement in improving asthma outcomes in various healthcare settings: 1997 to present. *Ann Pharmacother* 2009;43(1):85-97.**

Abstract: OBJECTIVE: To evaluate pharmacists' impact on asthma management outcomes in various healthcare settings on the basis of updated guidelines set by the National Heart, Lung, and Blood Institute (NHLBI). DATA SOURCES: A search of MEDLINE (1997-April 2008) and International Pharmaceutical Abstracts (1997-April 2008) was conducted using the MeSH terms asthma, community pharmacy services, pharmacists, pharmacies, clinic, hospital, disease state management, medication therapy management, emergency department, and community. STUDY SELECTION AND DATA EXTRACTION: Articles were included if pharmacists participated in the intervention and the report measured outcomes of asthma as defined by symptoms, pulmonary function, asthma severity, quality of life (QOL), or healthcare utilization. DATA SYNTHESIS: Since January 1997, a substantial number of studies have been published examining pharmacists' impact on asthma clinical outcomes. Twenty-five studies were included in this review: 15 were conducted in community pharmacies, 5 in ambulatory clinics, 2 in an inpatient hospital setting, and 3 as various community initiatives. The studies varied in the type of intervention provided and outcomes measured. The most common outcome in community pharmacies was pulmonary function measures, in which all but one trial found improvements. Half of the community pharmacy trials found improvements in asthma severity, 75% found improvements in healthcare utilization, and although some trials found improvements in QOL, 2 trials found decreases in QOL. Ambulatory clinics reported improvements in asthma symptoms and pulmonary function and decreased healthcare utilization. Most trials in the ambulatory care setting reported decreases in QOL postintervention. Trials in the hospital setting most often reported decreases in healthcare utilization. Limitations of the studies, however, included varying definitions of asthma control, methodologies used in the studies, and the lack of long-term follow-up. CONCLUSIONS: Future study designs may require larger sample size and measure outcomes that better assess disease severity in asthma, such as impairment and risk domains. This review supports the National Heart, Lung, and Blood Institutes of the National Institutes of Health Expert Panel Report 3 guidelines in recognizing pharmacists as accessible healthcare practitioners who, via patient education and medication management, may help patients with asthma attain better control of their disease state.

**Cai H, Dai H, Hu Y, Yan X, Xu H. Pharmacist care and the management of coronary heart disease: a systematic review of randomized controlled trials. *BMC Health Serv Res* 2013;13:461.**

Abstract: BACKGROUND: Secondary prevention is important for reducing both mortality and morbidity of patients with coronary heart disease (CHD). Pharmacists can provide medication and also work on disease management for patients with CHD. This review has been carried out to evaluate the role of pharmacist care on mortality, morbidity, and the CHD management. METHODS: The PubMed, MEDLINE, EMBASE, Web of Science and Cochrane Central Register of Controlled Trials databases were searched for randomized controlled trials (RCTs) to evaluate the impact of pharmacist care interventions on patients with CHD (in both community and hospital settings). Primary outcomes of interest were mortality, cardiovascular events and hospitalizations. Secondary outcomes were medication adherence, blood pressure control, and lipid management. RESULTS: Five RCTs (2568 patients) were identified. The outcomes were mortality, cardiovascular events, and hospitalizations in one study (421 patients), medication adherence in five studies, blood pressure in two studies (1914 patients), and lipid management in three studies (932 patients). The interventions of pharmacists included patient education, medication management, feedback to health care professionals, and disease management. There

was no significant effect of pharmacist care on mortality, recurrent cardiac events or hospitalization of CHD patients. Significant positive effects of pharmacist care were shown on medication adherence in three studies, on blood pressure control in one study and on lipid management in one study. CONCLUSION: In this study, we concluded that pharmacists have a beneficial role in the care of CHD patients, although the evidence supporting positive impacts on mortality and morbidity remains uncertain due to the unavailability of data in these areas. Further research is needed to discern the contribution of pharmacist care on hard endpoints of CHD.

**Charrois TL, Zolezzi M, Koshman SL, Pearson G, Makowsky M, Durec T, et al. A systematic review of the evidence for pharmacist care of patients with dyslipidemia. *Pharmacotherapy: The Journal of Human Pharmacology & Drug Therapy* 2012;32(3):222-233.**

Abstract: STUDY OBJECTIVE: To evaluate the effect of pharmacist care on patients with dyslipidemia. DESIGN: Systematic review of 21 randomized controlled trials. PATIENTS: A total of 5416 patients who received enhanced pharmacist care or standard care as part of a research study. MEASUREMENTS AND MAIN RESULTS: Nineteen databases and four trial registries were systematically searched from inception through February 21, 2010, with an update in September 2011. In addition, Web sites of relevant professional associations, scientific meetings, and research groups were reviewed, and manual searches of select journals were performed. A total of 8771 articles were identified, and 21 studies included. Data from the studies were analyzed using a random-effects model. The primary outcome measure assessed was the difference between the groups (pharmacist intervention vs standard care) in low-density lipoprotein cholesterol (LDL) level at the end of follow-up. Secondary outcome measures included the difference between the groups at the end of follow-up in total cholesterol, high-density lipoprotein cholesterol, and triglyceride levels; and the proportion of patients who achieved target lipid parameters, underwent lipid panel measurements, adhered to therapy, and/or were instructed to change their lipid-lowering therapy. At the end of follow-up, the mean LDL level was 10.7 mg/dl lower in the enhanced pharmacy care groups compared with the standard care groups (95% confidence interval [CI] -16.9 to -4.6 mg/dl), with moderate heterogeneity. The mean total cholesterol level was significantly lower in the enhanced pharmacy care groups compared with the standard care groups; however, these results were highly heterogeneous. Patients who received enhanced pharmacist care were also more likely than those receiving standard care to achieve target lipid parameters (odds ratio [OR] 2.46, 95% CI 1.43-4.25) and to have a lipid panel ordered or recommended by a pharmacist during the study (OR 2.05, 95% CI 1.30-3.24). Patients in the pharmacist intervention groups were almost twice as likely as patients in the standard care groups to have a change in lipid-lowering therapy (OR 1.82, 95% CI 1.09-3.06). Adherence data could not be analyzed. CONCLUSION: This systematic review showed that enhanced pharmacist care improves lipid parameters, notably LDL levels, in patients with dyslipidemia. These results point to the benefit that pharmacist care can provide across the spectrum of dyslipidemia management, from screening patients to treating them to assisting them in the attainment of clinical targets.

**Collins C, Limone BL, Scholle JM, Coleman CI. Effect of pharmacist intervention on glycemic control in diabetes. *Diabetes Res Clin Pract* 2011;92(2):145-152.**

Abstract: AIM: To conduct a meta-analysis evaluating the effect of pharmacist intervention on glycemic control. METHODS: A systematic search of Medline and CENTRAL was conducted from the earliest possible date through June 2010. Trials were included if they were randomized controlled trials in a diabetic population, evaluated any form of pharmacist intervention and reported data on hemoglobin A1C (A1C). A random-effects model was used to calculate weighted mean differences (WMDs) and 95% confidence intervals. RESULTS: Fourteen trials (n = 2073) evaluating the effect of pharmacist intervention on glycemic control were identified. Pharmacist intervention significantly lowered A1C (n = 14 trials, WMD -0.76%, 95%CI -1.06 to -0.47) and fasting blood glucose (FBG) (n = 4 trials, WMD -29.32 mg/dL, 95%CI -39.54 to -19.10). A moderate to high degree of statistical heterogeneity was observed in these analyses (I(2) > 44.1% for both). CONCLUSIONS: Our findings demonstrate statistically and clinically significant associations between pharmacist intervention and improvement in glycemic control.

**Elias MN, Burden AM, Cadarette SM. The impact of pharmacist interventions on osteoporosis management: a systematic review. *Osteoporos Int* 2011;22(10):2587-2596.**

Abstract: UNLABELLED: We completed a systematic review of the literature to examine the impact of pharmacist interventions in improving osteoporosis management. Results from randomized controlled trials suggest that pharmacist interventions may improve bone mineral density testing and calcium intake among patients at high risk for osteoporosis. INTRODUCTION: Pharmacists play a key role in many

healthcare systems by helping patients manage chronic diseases. We completed a systematic review of the literature to identify randomized controlled trials (RCTs) that have examined the impact of pharmacy interventions in narrowing two gaps in osteoporosis management: identifying at-risk individuals and improving adherence to therapy. **METHODS:** We searched the electronic databases of EMBASE, HealthStar, International Pharmaceutical Abstracts, MEDLINE, and PubMed from database development to April 2010, examined grey literature, and completed manual searches of reference lists to identify English-language research that examined osteoporosis management interventions within pharmacy practice. Results from RCTs were abstracted and assessed for bias. **RESULTS:** We identified 25 studies that examined pharmacist interventions in osteoporosis management: 16 cohort, 5 cross-sectional, 1 historical/ecological control, and 3 RCTs. RCT interventions included osteoporosis educational and counseling programs, screening by pharmacists based on risk factor assessment or bone mineral density testing, and physician contact or recommendations for patients to follow-up with a general practitioner. Results from the three RCTs suggest that pharmacist interventions may improve bone mineral density testing (targeted screening) and calcium intake among patients at high risk for osteoporosis. However, two of the three RCTs had high risk of bias, and no study examined the impact of pharmacist intervention on osteoporosis treatment adherence. **CONCLUSIONS:** Data support the potential role for pharmacists to help reduce gaps in osteoporosis management through improved identification of high-risk patients. More research is needed to examine pharmacist interventions on osteoporosis treatment adherence.

**Evans CD, Watson E, Eurich DT, Taylor JG, Yakiwchuk EM, Shevchuk YM, et al. Diabetes and cardiovascular disease interventions by community pharmacists: a systematic review. *Ann Pharmacother* 2011;45(5):615-628.**

**Abstract:** **OBJECTIVE:** To systematically review and assess the quality of studies evaluating community pharmacist interventions for preventing or managing diabetes or cardiovascular disease (CVD) and/or their major risk factors. **DATA SOURCES:** A comprehensive literature search was performed using MEDLINE (1950-February 2011), EMBASE (1980-February 2011), International Pharmaceutical Abstracts (1970-February 2011), Cumulative Index to Nursing and Allied Health Literature (1982-June 2007), and Cochrane Central Register of Controlled Trials (1898-February 2011). Search terms included: community pharmacy(ies), community pharmacist(s), cardiovascular, diabetes, and intervention. The grey literature was searched using the ProQuest Dissertations and Theses, Theses Canada, and OAlster databases. **STUDY SELECTION AND DATA EXTRACTION:** Articles published in English or French with all study designs were considered for the review. Studies were included if they contained interventions designed to reduce the incidence, risk, or mortality of CVD or diabetes; affect clinical indicators of CVD or diabetes mellitus (including hypertension, dyslipidemia, or hemoglobin A(1c)); and/or improve adherence to treatment strategies. Only studies involving interventions carried out primarily by pharmacists in community pharmacy settings were included. Study quality was assessed using a checklist validated for both randomized and nonrandomized studies. **DATA SYNTHESIS:** A total of 4142 studies were initially identified, with 40 meeting our inclusion criteria. Eleven studies were randomized controlled trials, 4 were cluster randomized trials, and 2 studies had randomized before-after designs. The remaining studies were controlled before-after (n = 2), cohort (n = 4), and uncontrolled before-after (n = 17) designs. Interventions focused on diabetes (n = 12), hypertension (n = 9), medication adherence (n = 9), lipids (n = 5), evidence-based medication initiation or optimization (n = 3), risk factor prediction scores (n = 1), and body mass index (n = 1). All studies contained interventions focused at the patient level and the majority of studies (34/40) involved interventions directed at both the physician and patient. No specific intervention emerged as superior, and study quality was generally poor, making it difficult to determine the true effect of the interventions. **CONCLUSIONS:** Poor study quality, time-intensive interventions, and unproven clinical significance warrant the need for further high-quality studies of community pharmacist interventions for preventing or managing diabetes or CVD and/or their major risk factors.

**Farris KB, Ashwood D, McIntosh J, DiPietro NA, Maderas NM, Landau SC, et al. Preventing unintended pregnancy: pharmacists' roles in practice and policy via partnerships. *Journal of the American Pharmacists Association: JAPhA* 2010;50(5):604-612.**

**Abstract:** **OBJECTIVES:** To review the literature regarding pharmacists' roles in preventing unintended pregnancy, review the relevant laws and policies in the United States to describe pharmacists' and/or pharmacy's role in policy development related to unintended pregnancy, and identify partners who pharmacists can work with in this public health area. **DATA SOURCES:** A systematic review was con-

ducted focusing on the role of pharmacists in unintended pregnancy. For practice, articles were identified in Medline through July 1, 2009, using MeSH and keywords. For policy, two authors examined the current status of access issues related to over-the-counter (OTC) status and collaborative practice agreements. Partners were identified in the reviews and authors' experiences. DATA EXTRACTION: English-language, U.S.-based articles that contained either qualitative or quantitative data or were review articles addressing pharmacist interventions, pharmacists' knowledge and attitudes regarding contraception, and pharmacists' comfort and ability to counsel on preventing unintended pregnancy were included. DATA SYNTHESIS: Some improvements to emergency contraception (EC) access in pharmacies have occurred during the previous decade. Studies focused on counseling, pharmacist provision of depot reinjection, and pharmacist initiation of oral contraceptives were positive. No studies linked increased contraceptive access in pharmacies to lower pregnancy rates. In terms of policy, the literature described three access-related areas, including (1) EC and conscience clauses, (2) collaborative practice agreements, and (3) changes in prescription to OTC status. Pharmacists' partnerships may include physicians/clinicians, local health departments, family-planning organizations, nongovernmental organizations, and colleges of pharmacy. CONCLUSION: Currently, pharmacists may increase access to contraceptives primarily via EC and use of collaborative practice agreements to initiate and/or continue hormonal contraceptives. New practice models should be implemented in community or clinic practices as allowed by collaborative practice regulations in each state. We encourage researchers and practitioners to consider a community approach in their endeavors by working with numerous types of primary care providers and organizations to explore ways to increase contraceptive access.

**Fathima M, Naik-Panvelkar P, Saini B, Armour CL. The role of community pharmacists in screening and subsequent management of chronic respiratory diseases: a systematic review. Pharm Pract (Granada) 2013;11(4):228-245.**

Abstract: OBJECTIVE: The purpose of this review was to evaluate the role of community pharmacists in provision of screening with/without subsequent management of undiagnosed chronic obstructive pulmonary disease (COPD) and uncontrolled asthma. METHODS: An extensive literature search using four databases (ie. Medline, PubMed, International Pharmaceutical Abstracts (IPA) and Scopus) with search terms pharmacy, screening, asthma or COPD was conducted. Searches were limited to the years 2003-2013, those in English and those reporting research with humans. Data retrieval, analysis and result presentation employed a scoping review method. RESULTS: Seventeen articles met the inclusion/exclusion criteria, of which fifteen studies were based on people with asthma and two were based on people with COPD. Only seven asthma studies and one COPD study involved screening followed by subsequent management. More than half of the people screened were found to be poorly controlled and up to 62% of people were identified at high risk for COPD by community pharmacists. The studies varied in the method and type of asthma control assessment/screening, the type of intervention provided and the outcomes measured. The limitations of the reviewed studies included varying definitions of asthma control, different study methodologies, and the lack of long-term follow-up. While many different methods were used for risk assessment and management services by the pharmacists, all the studies demonstrated that community pharmacists were capable of identifying people with poorly controlled asthma and undiagnosed COPD and providing them with suitable interventions. CONCLUSIONS: The literature review identified that community pharmacists can play an effective role in screening of people with poorly controlled asthma and undiagnosed COPD along with delivering management interventions. However, there is very little literature available on screening for these chronic respiratory conditions. Future research should focus on development of patient care delivery model incorporating a screening protocol followed by targeted management interventions delivered by the community pharmacist.

**Gordon J, Watson M, Avenell A. Lightening the load? A systematic review of community pharmacy-based weight management interventions. Obes Rev 2011;12(11):897-911.**

Abstract: The extent to which community pharmacies can increase capacity for weight management is unknown. Thus, the objective of the present paper was to evaluate the effectiveness and cost-effectiveness of community pharmacy weight management interventions. This paper used a design of systematic review and narrative synthesis. Electronic databases (1999-2009) were searched, including Medline, EMBASE, CINAHL and Pharm-line. Weight management studies in community pharmacies were eligible for the inclusion criteria. All languages and study designs were considered. Outcome measures included body weight or anthropometry (at baseline and at least one follow-up time point). Data were extracted through independent, duplicate data extraction and quality assessment. As a result, 10 studies were included, totalling 2,583 service users and 582 pharmacies from the USA, the UK, Switzerland,

Spain and Denmark. One was a randomized controlled trial of a meal-replacement versus a reduced calorie diet. A non-randomized controlled before and after study compared community pharmacist treatment using Orlistat with usual care. Eight studies were uncontrolled. Five studies described behaviour change techniques. Long-term (12 months) mean weight loss measured in three studies ranged from 1.1 to 4.1 kg. Four uncontrolled studies reported statistically significant weight loss. No study reported economic evaluations. Currently, there is insufficient evidence for the effectiveness and cost-effectiveness of community pharmacy-based weight management initiatives to support investment in their provision.

**Li X, Mao M, Ping Q. Effect of pharmaceutical care programs on glycemc control in patients with diabetes mellitus: A meta-analysis of randomized controlled trials. J Pharm Technol 2010;26(5):255-263.**

Abstract: Background: Diabetes mellitus is a common disease that has an increasing influence on the health of human beings. While the role of pharmaceutical care (PC) programs in the treatment of patients with diabetes mellitus is well established, there is little research that quantitatively and comprehensively assesses the impact of PC programs on glycemc control in diabetics. Objective: To evaluate the effect of PC programs on glycemc control in patients with diabetes mellitus. Methods: Publications on PC programs and randomized controlled trials (RCTs) of glycemc control were retrieved by searching MEDLINE, Embase, Cochrane, Elsevier, Chinese Biomedicine Database, and Chinese Journal Full-Text Database databases from January 1996 through February 2010. Data were extracted by 2 reviewers independently, based on their correlation with this project, and then evaluated with meta-analysis. The meta-analysis was conducted using STATA version 10.1. Begg-Mazumdar's funnel plot was generated to determine the potential impact of publication bias. Results: Fourteen RCTs, with a total of 1770 patients with diabetes mellitus, were included in this meta-analysis. Pharmacists were involved in all of these PC interventions. The average +SD study period of included trials was 9.5 + 4.1 months. Drug counseling, drug therapy management, lifestyles education, self-monitoring, and recommendations of drug therapy changes were the most frequently used interventions. All of the trials reported the reduction of hemoglobin A<sub>1c</sub> (A1C) as the primary clinical outcome of PC intervention. Compared with the usual-care control groups, the PC intervention groups had significant reduction in A1C levels (weighted mean difference -0.68; 95% CI -1.03 to -0.34; p = 0.000). Conclusions: PC programs delivered separately or in combination by pharmacists and other health professionals can lead to an improvement in glycemc control. The incorporation of PC programs into disease management should be strongly considered.

**Morgado MP, Morgado SR, Mendes LC, Pereira LJ, Castelo-Branco M. Pharmacist interventions to enhance blood pressure control and adherence to antihypertensive therapy: Review and meta-analysis. Am J Health Syst Pharm 2011;68(3):241-253.**

Abstract: PURPOSE: Pharmacist interventions to enhance blood pressure (BP) control and adherence to antihypertensive therapy in adults with essential hypertension were reviewed. METHODS: A literature search was conducted to identify relevant articles describing pharmacist interventions intended to improve adherence to antihypertensive medications. Studies were included if they described a pharmacist intervention to improve medication adherence and analyzed adherence to therapy and BP control as outcomes. A fixed-effects model was used to combine data from randomized controlled trials. RESULTS: A total of 15 studies were identified, testing 16 different interventions and containing data on 3280 enrolled patients. Although 87.5% of the interventions resulted in significant improvements in treatment outcomes, only 43.8% of the interventions were associated with significant increases in medication adherence. All interventions that increased antihypertensive medication adherence also significantly reduced BP. Almost all the interventions that were effective in increasing adherence to medication were complex, including combinations of different strategies. Meta-analysis of 2619 patients in 8 studies found that pharmacist interventions significantly reduced systolic blood pressure (SBP) (p < 0.001) and diastolic blood pressure (DBP) (p = 0.002) and that the meta-analytic differences in SBP and DBP changes from baseline to endpoint in intervention and control groups were -4.9 + 0.9 mm Hg (p < 0.001) and -2.6 + 0.9 mm Hg (p < 0.001), respectively. CONCLUSION: A literature review and meta-analysis showed that pharmacist interventions can significantly improve medication adherence, SBP, DBP, and BP control in patients with essential hypertension. Interventions were complex and multifaceted and included medication management in all analyzed studies.



**Ni Y, Chen Y, Huang W. The effect of pharmaceutical care programs on blood pressure control in individuals with hypertension: A meta-analysis. J Pharm Technol 2009;25(5):292-296.**

Abstract: Objective: To evaluate the effect of pharmaceutical care (PC) programs on blood pressure control in individuals with hypertension. Methods: Studies were retrieved by searching MEDLINE, EMBASE, Cochrane, CNKI, and CBM databases from 1999 to February 2008. Randomized controlled trials (RCTs) on the association of pharmaceutical care programs with blood pressure control in individuals with hypertension were included in this study. Moreover, the studies were selected independently by 2 authors. The analysis was conducted by using Review Manager version 4.2 software. Results: Five RCTs with a total of 585 patients with hypertension were included in this meta-analysis. Compared with the control group, the PC program intervention group had significantly lower endpoint systolic blood pressure (SBP) and diastolic blood pressure (DBP). Moreover, SBP and DBP were significantly improved in the intervention group relative to the control group. Conclusions: PC programs appear to be an effective tool in helping to control blood pressure in hypertensive patients.

**Omran D, Guirguis LM, Simpson SH. Systematic review of pharmacist interventions to improve adherence to oral antidiabetic medications in people with type 2 diabetes. Canadian Journal of Diabetes 2012;36(5):292-299.**

Abstract: Objective: Poor adherence is an important challenge to healthcare professionals because it jeopardizes treatment success and increases the risk of serious complications, especially in patients with chronic diseases like diabetes. The purpose of this study was to summarize the effects of pharmacist interventions aimed at enhancing adherence to oral antidiabetic medications in patients with type 2 diabetes mellitus. Methods: Five electronic databases were searched through to March 12, 2011 to identify controlled trials reporting the effects of pharmacist interventions to improve medication adherence rates in adults with type 2 diabetes. Components of the intervention were categorized as educational, behavioural, affective or provider-targeted strategies. In addition to the impact on medication adherence rates, we recorded any reported effects on health outcomes. Results: Eight studies were included in this review. Education-related strategies were the most frequent (7 of 8 studies), and 6 of 8 studies used a combination of 2 or more strategies for the adherence intervention. Change in adherence rate was assessed using a variety of measurement methods, and 6 studies reported the effect of pharmacist intervention on clinical, economic or humanistic outcomes. Compared to a control group, 5 studies reported significant improvements in adherence rate with pharmacist intervention; however, glycemic control improved significantly in only 2 studies. Conclusions: Pharmacist interventions to improve medication adherence in diabetes generally use an educational component combined with behavioural, affective or provider-targeted strategies. Although these interventions appear to improve adherence, the effect on health outcomes has not been established. 2012 Canadian Diabetes Association.

**Rakestraw K, Lovett A. A systematic review of community pharmacy-based interventions for smoking cessation. J Am Pharm Assoc (2003) 2013;53 (2):e30-e31.**

Abstract: Objective: The aim of this study was to provide a critical and comprehensive overview of the published peer reviewed literature relating to community pharmacy-based smoking cessation efforts in the United States and Canada. Methods: Electronic databases, PubMed, and MEDLINE were searched for articles from January 1, 2002, to January 1, 2012. Key words used were smoking cessation, pharmacist, pharmacy, multidisciplinary, and reimbursement. Articles were excluded if they did not meet the criteria of relating to counseling or if the studies took place outside the United States and Canada. Twenty-four articles were included in this review: 8 on pharmacist and patient perception of pharmacy-based counseling, 4 on reimbursement and patient's willingness to pay, and 12 on methods of counseling and pharmacist's role. Results: Literature review suggests both patients and pharmacists have positive views on smoking cessation counseling by a pharmacist. Studies show that counseling related to medications is preferred. Specifically, patients prefer a non confrontational approach by pharmacists. Although the Public Health Service Clinical Practice Guidelines Treating Tobacco Use and Dependence: 2008 Update recommend an intensive intervention approach due to a strong dose response relationship between the session length and successful treatment outcomes, pharmacists are unlikely to use an intensive intervention. Pharmacists should perform brief counseling sessions by assessing a patient's willingness to quit and then motivating, educating, and referring the patient to an available resource. These brief sessions should be done in person and performed at each visit. Most insurance providers do not compensate for smoking cessation counseling. Pharmacists are encouraged to share with the patients' providers the cost benefits associated with counseling, and develop or adopt a system of track-ing codes for smoking cessation counseling. Conclusion: Evidence suggests that cost reduction

and improved health outcomes can occur when smoking cessation counseling is provided in the community pharmacy setting. Future research should examine reimbursement for pharmacist-provided counseling.

**Richardson TE, O'Reilly CL, Chen TF. A comprehensive review of the impact of clinical pharmacy services on patient outcomes in mental health. *Int J Clin Pharm* 2014;36(2):222-232.**

**Abstract:** Background The importance of pharmacists in mental healthcare is starting to be recognised around the world. However few studies have focused on the evidence supporting pharmacist involvement in the inpatient mental healthcare setting. Aim Evaluate types of outcomes achieved and level of evidence supporting clinical pharmacy services in inpatient mental health settings. Methods Medline, PyscINFO and International Pharmaceutical Abstracts databases were searched from January 1990 to March 31 2013. Studies were included if in an inpatient setting, published in English, and reported an intervention provided by a pharmacist or involving a pharmacist with a pivotal role in an intervention team. Data were extracted according to sample population and size, study design and outline, country, role of the pharmacist in the study, and the main results of the study. The level of evidence for each study was assessed using Australia's National Health and Medical Research Council's hierarchy of clinical evidence and results were categorised as having economic, clinical and/or humanistic outcomes. Results Eighteen articles met the inclusion criteria. A range of pharmaceutical services provided by pharmacists in inpatient mental healthcare were identified. These services highlight the role of pharmacists as reviewers of medication charts, laboratory results and medication prescribing and as educators of patients and other health care professionals. Six studies included a control or comparison group and had pre and post intervention measures. These comprised of three randomised control trials, one historical control study and two case series post and pre-post tests, corresponding to evidence levels of II, III-3 and IV respectively. Seven studies reported clinical outcomes, two economical and one humanistic outcomes. One study reported both clinical and economical outcomes. Seven studies focused on impact evaluation measures. Conclusions Pharmacists provide a variety of services and play a significant role in inpatient mental healthcare. However, the level of evidence supporting these services is limited and the type of outcomes achieved is narrow.

**Rubio-Valera M, Serrano-Blanco A, Magdalena-Belio J, Fernandez A, Garcia-Campayo J, Pujol MM, et al. Effectiveness of pharmacist care in the improvement of adherence to antidepressants: a systematic review and meta-analysis. *Ann Pharmacother* 2011;45(1):39-48.**

**Abstract:** BACKGROUND: Pharmacists can play a decisive role in the management of ambulatory patients with depression who have poor adherence to antidepressant drugs. OBJECTIVE: To systematically evaluate the effectiveness of pharmacist care in improving adherence of depressed outpatients to antidepressants. METHODS: A systematic review and meta-analysis of randomized controlled trials (RCTs) was conducted. RCTs were identified through electronic databases (MEDLINE, Cochrane Central Register of Controlled Trials, Institute for Scientific Information Web of Knowledge, and Spanish National Research Council) from inception to April 2010, reference lists were checked, and experts were consulted. RCTs that evaluated the impact of pharmacist interventions on improving adherence to antidepressants in depressed patients in an outpatient setting (community pharmacy or pharmacy service) were included. Methodologic quality was assessed and methodologic details and outcomes were extracted in duplicate. RESULTS: Six RCTs were identified. A total of 887 patients with an established diagnosis of depression who were initiating or maintaining pharmacologic treatment with antidepressant drugs and who received pharmacist care (459 patients) or usual care (428 patients) were included in the review. The most commonly reported interventions were patient education and monitoring, monitoring and management of toxicity and adverse effects, adherence promotion, provision of written or visual information, and recommendation or implementation of changes or adjustments in medication. Overall, no statistical heterogeneity or publication bias was detected. The pooled odds ratio, using a random effects model, was 1.64 (95% CI 1.24 to 2.17). Subgroup analysis showed no statistically significant differences in results by type of pharmacist involved, adherence measure, diagnostic tool, or analysis strategy. CONCLUSIONS: These results suggest that pharmacist intervention is effective in the improvement of patient adherence to antidepressants. However, data are still limited and we would recommend more research in this area, specifically outside of the US.

**Saba M, Diep J, Saini B, Dhippayom T. Meta-analysis of the effectiveness of smoking cessation interventions in community pharmacy. *J Clin Pharm Ther* 2014;39(3):240-247.**

**Abstract:** WHAT IS KNOWN AND OBJECTIVE: With the emerging and promising role of healthcare professionals in implementing smoking cessation services, community pharmacists, in particular, can play a

pivotal role. The aim of this meta-analysis is to evaluate the effectiveness of smoking cessation interventions delivered by community pharmacists in assisting smokers to quit. METHODS: PubMed, EMBASE, Scopus, International Pharmaceutical Abstracts and ISI Web of Knowledge were searched from inception to May 2013. Original research articles were selected for review, if they addressed the effectiveness of pharmacy-based interventions in smokers vs. a control group and reported smoking abstinence rates as an outcome. Obtained studies were assessed for methodological quality using the Cochrane Effective Practice and Organization of Care Group risk of bias tool. The primary outcome of measure was smoking abstinence based on the 'most rigorous criterion'. Pooled relative risks (RR) with 95% confidence interval (CI) were estimated using the Dersimonian and Laird random-effects models. Corresponding subgroup met-analysis was performed. RESULTS: Of the 1168 articles extracted, five studies (three randomized controlled trials and two controlled before-after studies) met the inclusion criteria, involving a total of 1426 smokers. Pharmacist interventions showed better abstinence rates as compared with controls (RR 2.21, 95% CI 1.49-3.29). Compared with the control group, the RR (95% CI) in the intervention group was 3.21 (1.81-5.72) for clinically validated abstinence and 1.66 (1.08-2.54) for self-reported abstinence. In the intervention group, the RR for short-term and long-term abstinence was 2.48 (1.15-5.31) and 2.40 (1.37-4.23), respectively. WHAT IS NEW AND CONCLUSIONS: Pharmacist-led interventions can significantly impact abstinence rates in smokers. Health policymakers should direct incentives for community pharmacists to provide such services.

**Sabater-Hernandez D, Azpilicueta I, Sanchez-Villegas P, Amariles P, Baena MI, Faus MJ. Clinical value of blood pressure measurement in the community pharmacy. Pharm World Sci 2010;32(5):552-558.**

Abstract: AIM OF THE STUDY: To investigate whether the measurement of blood pressure in the community pharmacy is a valuable method to diagnose hypertension, to assess the need and the effectiveness of anti-hypertensive treatments, or, in general, to make clinical decisions. METHOD: Information has been extracted from articles published in English and in Spanish, from January 1989 to December 2009, in indexed magazines in MEDLINE and EMBASE. To perform the search, multiple and specified terms related to the community pharmacy setting, to blood pressure measurement and to the comparison and agreement between blood pressure measurement methods were used. Selected articles were those that: (1) compared and/or measured the agreement (concordance) between community pharmacy blood pressure measurements obtained in repeated occasions, or (2) compared and/or measured the agreement between the community pharmacy blood pressure measurement method and other measurement methods used in clinical practice for decision-making purposes: blood pressure measurement by a physician, by a nurse and home or ambulatory blood pressure monitoring. Articles were included and analyzed by two investigators independently, who essentially extracted the main results of the manuscripts, emphasizing the assessment of the blood pressure measurement methods used and the completed statistical analysis. RESULTS: Only three studies comparing the community pharmacy blood pressure measurement method with other methods and one comparing repeated measurements of community pharmacy blood pressure were found. Moreover, these works present significant biases and limitations, both in terms of method and statistical analysis, which make difficult to draw consistent conclusions. CONCLUSION: Further research of high quality is needed, which results can guide the clinical decision-making based on the community pharmacy blood pressure measurement method.

**Saberi P, Dong BJ, Johnson MO, Greenblatt RM, Cocohoba JM. The impact of HIV clinical pharmacists on HIV treatment outcomes: a systematic review. Patient Prefer Adherence 2012;6:297-322.**

Abstract: OBJECTIVE: Due to the rapid proliferation of human immunodeficiency virus (HIV) treatment options, there is a need for health care providers with knowledge of antiretroviral therapy intricacies. In a HIV multidisciplinary care team, the HIV pharmacist is well-equipped to provide this expertise. We conducted a systematic review to assess the impact of HIV pharmacists on HIV clinical outcomes. METHODS: We searched six electronic databases from January 1, 1980 to June 1, 2011 and included all quantitative studies that examined pharmacist's roles in the clinical care of HIV-positive adults. Primary outcomes were antiretroviral adherence, viral load, and CD(4) (+) cell count and secondary outcomes included health care utilization parameters, antiretroviral modifications, and other descriptive variables. RESULTS: Thirty-two publications were included. Despite methodological limitation, the involvement of HIV pharmacists was associated with statistically significant adherence improvements and positive impact on viral suppression in the majority of studies. CONCLUSION: This systematic review provides evidence of the beneficial impact of HIV pharmacists on HIV treatment outcomes and offers suggestions for future research.

**Salgado TM, Moles R, Benrimoj SI, Fernandez-Llimos F. Pharmacists' interventions in the management of patients with chronic kidney disease: a systematic review. *Nephrology Dialysis Transplantation* 2012;27(1):276-292.**

Abstract: BACKGROUND: Patients with chronic kidney disease have multiple comorbidities and require complicated therapeutic regimens. The role of pharmacists caring for these patients has been documented, but no review of the impact of these interventions has occurred to date. The aim of this work is to assess the impact of pharmacists' interventions in patients with chronic kidney disease.

METHODS: Medline, International Pharmaceutical Abstracts, Pharmacy Abstracts and the Cochrane Library were searched for quantitative studies addressing the contribution of pharmacists' interventions in patients with chronic kidney disease. Quality of controlled studies was assessed using the Downs and Black scale. RESULTS: The search identified 37 studies (38 articles), involving 4743 participants, eligible for inclusion in the review. An uncontrolled design corresponded with 80% of the studies. Twenty-one articles (55.3%) reported outcome measures and process indicators, 4 (10.5%) reported only outcome measures and 13 (34.2%) reported only process indicators. Pharmacists identified 2683 drug-related problems in 1209 patients. The results from eight controlled studies (average quality score 0.57, SD = 0.10) demonstrated that pharmacists' interventions reduced all-cause hospitalisations [mean (SD) 1.8 (2.4) versus 3.1 (3.0),  $P = 0.02$ ] and cumulative time hospitalised [mean (SD) 9.7 (14.7) versus 15.5 (16.3) days,  $P = 0.06$ ], reduced the incidence of end-stage renal disease or death in patients with diabetic nephropathy (14.8 versus 28.2 per 100 patient-years, adjusted relative risk 60%,  $P < 0.001$ ), improved management of anemia (mean 69.8 versus 43.9%,  $P = 0.0001$  and 64.8 versus 40.4%,  $P = 0.043$  patients on goal hemoglobin and transferrin saturation, respectively), blood pressure [systolic mean (SD) 145.3 (16.8) versus 175.8 (33.9) mmHg,  $P = 0.029$ ; diastolic mean (SD) 77.0 (10.2) versus 91.8 (12.0) mmHg,  $P = 0.020$ ], calcium and phosphate parameters [serum phosphate levels mean (SD) 1.81 (0.54) versus 2.07 (0.25) mmol/L,  $P = 0.03$ ; calcium-phosphate product mean (SD) 4.43 (1.20) versus 4.80 (0.51) mmol(2)/L(2),  $P = 0.04$ ] and lipid management [total cholesterol mean (SD) 4.4 (1.1) versus 5.0 (1.4) mmol/L,  $P = 0.06$ ; low density lipoprotein cholesterol mean (SD) 2.3 (0.9) versus 2.8 (1.0) mmol/L,  $P = 0.013$ ]. Results from uncontrolled studies revealed positive impact of pharmacists' interventions on reduced number of transplant rejections [mean (SD) 0.22 (0.42) versus 0.50 (0.51) episodes,  $P = 0.008$ ] and adverse events (49 in 16.0% patients versus 73 in 21.3% patients,  $P < 0.05$ ). CONCLUSIONS: The evidence of pharmacists' interventions in patients with chronic kidney disease is sparse, of variable quality and with heterogeneous outcomes. On the basis of best available evidence, pharmacists' interventions may have a positive impact on outcomes of patients with chronic kidney disease.

**Santschi V, Chiolerio A, Burnand B, Colosimo AL, Paradis G. Impact of pharmacist care in the management of cardiovascular disease risk factors: a systematic review and meta-analysis of randomized trials. *Arch Intern Med* 2011;171(16):1441-1453.**

Abstract: BACKGROUND: Pharmacists may improve the clinical management of major risk factors for cardiovascular disease (CVD) prevention. A systematic review was conducted to determine the impact of pharmacist care on the management of CVD risk factors among outpatients. METHODS: The MEDLINE, EMBASE, CINAHL, and Cochrane Central Register of Controlled Trials databases were searched for randomized controlled trials that involved pharmacist care interventions among outpatients with CVD risk factors. Two reviewers independently abstracted data and classified pharmacists' interventions. Mean changes in blood pressure, total cholesterol, low-density lipoprotein cholesterol, and proportion of smokers were estimated using random effects models. RESULTS: Thirty randomized controlled trials (11,765 patients) were identified. Pharmacist interventions exclusively conducted by a pharmacist or implemented in collaboration with physicians or nurses included patient educational interventions, patient-reminder systems, measurement of CVD risk factors, medication management and feedback to physician, or educational intervention to health care professionals. Pharmacist care was associated with significant reductions in systolic/diastolic blood pressure (19 studies [10,479 patients]; -8.1 mm Hg [95% confidence interval {CI}, -10.2 to -5.9]/-3.8 mm Hg [95% CI, -5.3 to -2.3]); total cholesterol (9 studies [1121 patients]; -17.4 mg/L [95% CI, -25.5 to -9.2]), low-density lipoprotein cholesterol (7 studies [924 patients]; -13.4 mg/L [95% CI, -23.0 to -3.8]), and a reduction in the risk of smoking (2 studies [196 patients]; relative risk, 0.77 [95% CI, 0.67 to 0.89]). While most studies tended to favor pharmacist care compared with usual care, a substantial heterogeneity was observed. CONCLUSION: Pharmacist-directed care or in collaboration with physicians or nurses improve the management of major CVD risk factors in outpatients.

**Santschi V, Chiolero A, Colosimo AL, Platt RW, Taffe P, Burnier M, et al. Improving blood pressure control through pharmacist interventions: a meta-analysis of randomized controlled trials. *J Am Heart Assoc* 2014;3(2):e000718.**

Abstract: BACKGROUND: Control of blood pressure (BP) remains a major challenge in primary care. Innovative interventions to improve BP control are therefore needed. By updating and combining data from 2 previous systematic reviews, we assess the effect of pharmacist interventions on BP and identify potential determinants of heterogeneity. METHODS AND RESULTS: Randomized controlled trials (RCTs) assessing the effect of pharmacist interventions on BP among outpatients with or without diabetes were identified from MEDLINE, EMBASE, CINAHL, and CENTRAL databases. Weighted mean differences in BP were estimated using random effect models. Prediction intervals (PI) were computed to better express uncertainties in the effect estimates. Thirty-nine RCTs were included with 14 224 patients. Pharmacist interventions mainly included patient education, feedback to physician, and medication management. Compared with usual care, pharmacist interventions showed greater reduction in systolic BP (-7.6 mm Hg, 95% CI: -9.0 to -6.3; I(2)=67%) and diastolic BP (-3.9 mm Hg, 95% CI: -5.1 to -2.8; I(2)=83%). The 95% PI ranged from -13.9 to -1.4 mm Hg for systolic BP and from -9.9 to +2.0 mm Hg for diastolic BP. The effect tended to be larger if the intervention was led by the pharmacist and was done at least monthly. CONCLUSIONS: Pharmacist interventions - alone or in collaboration with other healthcare professionals - improved BP management. Nevertheless, pharmacist interventions had differential effects on BP, from very large to modest or no effect; and determinants of heterogeneity could not be identified. Determining the most efficient, cost-effective, and least time-consuming intervention should be addressed with further research.

**Santschi V, Chiolero A, Paradis G, Colosimo AL, Burnand B. Pharmacist interventions to improve cardiovascular disease risk factors in diabetes: a systematic review and meta-analysis of randomized controlled trials. *Diabetes Care* 2012;35(12):2706-2717.**

Abstract: OBJECTIVE: This systematic review and meta-analysis of randomized controlled trials (RCTs) assesses the effect of pharmacist care on cardiovascular disease (CVD) risk factors among outpatients with diabetes. RESEARCH DESIGN AND METHODS: MEDLINE, EMBASE, CINAHL, and the Cochrane Central Register of Controlled Trials were searched. Pharmacist interventions were classified, and a meta-analysis of mean changes of blood pressure (BP), total cholesterol (TC), LDL cholesterol, HDL cholesterol, and BMI was performed using random-effects models. RESULTS: The meta-analysis included 15 RCTs (9,111 outpatients) in which interventions were conducted exclusively by pharmacists in 8 studies and in collaboration with physicians, nurses, dietitians, or physical therapists in 7 studies. Pharmacist interventions included medication management, educational interventions, feedback to physicians, measurement of CVD risk factors, or patient-reminder systems. Compared with usual care, pharmacist care was associated with significant reductions for systolic BP (12 studies with 1,894 patients; -6.2 mmHg [95% CI -7.8 to -4.6]); diastolic BP (9 studies with 1,496 patients; -4.5 mmHg [-6.2 to -2.8]); TC (8 studies with 1,280 patients; -15.2 mg/dL [-24.7 to -5.7]); LDL cholesterol (9 studies with 8,084 patients; -11.7 mg/dL [-15.8 to -7.6]); and BMI (5 studies with 751 patients; -0.9 kg/m<sup>2</sup> [-1.7 to -0.1]). Pharmacist care was not associated with a significant change in HDL cholesterol (6 studies with 826 patients; 0.2 mg/dL [-1.9 to 2.4]). CONCLUSIONS: This meta-analysis supports pharmacist interventions-alone or in collaboration with other health care professionals-to improve major CVD risk factors among outpatients with diabetes.

**Stemer G, Lemmens-Gruber R. Clinical pharmacy services and solid organ transplantation: a literature review. *Pharm World Sci* 2010;32(1):7-18.**

Abstract: AIM OF THE REVIEW: Organ transplantation represents the therapy of choice for most types of end-stage organ failure, and post-transplant patient care warrants great attention. The aim of this study was to summarise the available evidence regarding the role and impact of clinical pharmacy services in the care of solid organ transplant patients. METHODS: A search of the literature was conducted using the MEDLINE, EMBASE and IPA databases to identify studies relevant to our investigation of the impact of clinical pharmacists' interventions. RESULTS: Only five out of nineteen of the included studies were randomised controlled trials; eleven studies were descriptive, and three were before-after studies. Interventions performed in these studies consisted of routine clinical pharmacy services with a focus on identifying, resolving and preventing drug-related problems; clinical pharmacy services with a focus on therapeutic drug monitoring; and those with a focus on compliance enhancement and educational interventions. The number and type of interventions and the physicians' acceptance rates were assessed in the majority of the included studies. Acceptance rates were generally above 95%, and most studies

reported that clinical pharmacy services had a positive impact on the care of solid organ transplant patients. Positive perceptions of patients and health care professionals are also reported. In two of the studies, patients' compliance rates and drug knowledge were assessed following counselling by a pharmacist. Dosing-related interventions were the most common interventions proposed. Immunosuppressants, cardiovascular drugs and antimicrobials were the drug classes most affected by the clinical pharmacists' interventions. CONCLUSIONS: High quality evidence that supports the benefit of clinical pharmacy services in the care of solid organ transplant patients is rare. Nevertheless, all of the included studies showed that clinical pharmacy services had a positive impact. Furthermore, all included studies showed that patients and physicians appreciated clinical pharmacists. The various outcome measures used in these studies were improved by interactions with clinical pharmacists. More randomised controlled trials are needed to contribute to the paucity of the existing evidence. [References: 38]

**Stemer G, Lemmens-Gruber R. Clinical pharmacy activities in chronic kidney disease and end-stage renal disease patients: a systematic literature review. BMC Nephrol 2011;12:35.**

Abstract: BACKGROUND: Chronic kidney disease (CKD) and end-stage renal disease (ESRD) represent worldwide health problems with an epidemic extent. Therefore, attention must be given to the optimisation of patient care, as gaps in the care of CKD and ESRD patients are well documented. As part of a multidisciplinary patient care strategy, clinical pharmacy services have led to improvements in patient care. The purpose of this study was to summarise the available evidence regarding the role and impact of clinical pharmacy services for these patient populations.

METHODS: A literature search was conducted using the Medline, Embase and International Pharmaceutical Abstracts databases to identify relevant studies on the impact of clinical pharmacists on CKD and ESRD patients, regarding disease-oriented and patient-oriented outcomes, and clinical pharmacist interventions on drug-related problems. RESULTS: Among a total of 21 studies, only four (19%) were controlled trials. The majority of studies were descriptive (67%) and before-after studies (14%). Interventions comprised general clinical pharmacy services with a focus on detecting, resolving and preventing drug-related problems, clinical pharmacy services with a focus on disease management, or clinical pharmacy services with a focus on patient education in order to increase medication knowledge. Anaemia was the most common comorbidity managed by clinical pharmacists, and their involvement led to significant improvement in investigated disease-oriented outcomes, for example, haemoglobin levels. Only four of the studies (including three controlled trials) presented data on patient-oriented outcomes, for example, quality of life and length of hospitalisation. Studies investigating the number and type of clinical pharmacist interventions and physician acceptance rates reported a mean acceptance rate of 79%. The most common reported drug-related problems were incorrect dosing, the need for additional pharmacotherapy, and medical record discrepancies.

CONCLUSIONS: Few high-quality trials addressing the benefit and impact of clinical pharmacy services in CKD and ESRD patients have been published. However, all available studies reported some positive impact resulting from clinical pharmacist involvement, including various investigated outcome measures that could be improved. Additional randomised controlled trials investigating patient-oriented outcomes are needed to further determine the role of clinical pharmacists and the benefits of clinical pharmacy services to CKD and ESRD patients.

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## **Tiltak som kan utføres av farmasøyter**

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**Bayoumi I, Howard M, Holbrook AM, Schabert I. Interventions to improve medication reconciliation in primary care. Ann Pharmacother 2009;43(10):1667-1675.**

Abstract: OBJECTIVE: To systematically review all primary care intervention studies designed to implement medication reconciliation for effects on medication discrepancies, clinical outcomes, and patient knowledge of their medications. DATA SOURCES: We searched MEDLINE (1988-March 2008); Healthstar (1966-March 2008); CINAHL (1982-March 2008); EMBASE (1980-March 2008); Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Database of Abstracts of Reviews of Effects, Cochrane Methodology Register, and Health Technology Assessments; and unpublished material. No language restrictions were applied. Search terms included medication reconciliation, medication errors, prescribing error, medication systems, adverse drug events, drug utilization review, medication list, medication record, and medications management. STUDY SELECTION AND DATA ABSTRACTION: Randomized controlled trials or before-and-after studies that examined the effect of various interven-

tions on medication discrepancies either in ambulatory settings or at hospital discharge among community-dwelling adults were included. Two reviewers independently assessed studies to determine inclusion. Level of agreement between the reviewers was good, with unweighted Cohen's kappa of 0.71. Two of 3 independent reviewers abstracted data and evaluated validity from included studies. Disagreements between reviewers were resolved by consensus. DATA SYNTHESIS: Four trials met the inclusion criteria. Two before-and-after studies (n = 275) in ambulatory care examining systematic medication reconciliation at each visit produced conflicting results. One study showed a reduction in the proportion of medication discrepancies from 88.5% to 49.1% (OR 0.13; 95% CI 0.07 to 0.21); the other showed no benefit. One randomized controlled trial and one before-and-after study (n = 202) evaluated pharmacist medication review at hospital discharge. Neither showed a benefit. Heterogeneity precluded pooling of studies. All included studies had significant design flaws. CONCLUSIONS: There is no good quality evidence demonstrating the effectiveness of medication reconciliation in the primary care setting. Further research is needed.

**Carter BL, Rogers M, Daly J, Zheng S, James PA. The potency of team-based care interventions for hypertension: a meta-analysis. Arch Intern Med 2009;169(19):1748-1755.**

Abstract: BACKGROUND: Team-based care is the strategy that has had the greatest effect on improving blood pressure (BP). The purpose of this systematic review was to determine the potency of interventions for BP involving nurses or pharmacists. METHODS: A MEDLINE search for controlled clinical trials that involved a nurse or pharmacist intervention was conducted. Mean reductions in systolic (S) and diastolic (D) BP were determined by 2 reviewers who independently abstracted data and classified the different intervention components. RESULTS: Thirty-seven articles met the inclusion criteria. Education about BP medications was significantly associated with a reduction in mean BP (-8.75/-3.60 mm Hg). Other strategies that had large effect sizes on SBP include pharmacist treatment recommendations (-9.30 mm Hg), intervention by nurses (-4.80 mm Hg), and use of a treatment algorithm (-4.00 mm Hg). The odds ratios (95% confidence intervals) for controlled BP were: nurses, 1.69 (1.48-1.93); pharmacists within primary care clinics, 2.17 (1.75-2.68); and community pharmacists, 2.89 (1.83-4.55). Mean (SD) reductions in SBP were: nursing studies, 5.84 (8.05) mm Hg; pharmacists in clinics, 7.76 (7.81) mm Hg; and community pharmacists, 9.31 (5.00) mm Hg. There were no significant differences between the nursing and pharmacy studies ( $P > \text{or} = .19$ ). CONCLUSIONS: Team-based care was associated with improved BP control, and individual components of the intervention appeared to predict potency. Implementation of new hypertension guidelines should consider changes in health care organizational structure to include important components of team-based care.

**Cutrona SL, Choudhry NK, Fischer MA, Servi A, Liberman JN, Brennan TA, et al. Modes of delivery for interventions to improve cardiovascular medication adherence. Am J Manag Care 2010;16(12):929-942.**

Abstract: OBJECTIVE: To determine the optimal modes of delivery for interventions to improve adherence to cardiovascular medications. STUDY DESIGN: Systematic review. METHODS: We conducted systematic searches of English-language, peer-reviewed publications in MEDLINE and EMBASE, 1966 through December 31, 2008. We selected randomized controlled trials of interventions to improve adherence to medications for preventing or treating cardiovascular disease or diabetes. Articles were classified based on mode of delivery of the main intervention as (1) person-independent interventions (mailed, faxed, or hand distributed; or delivered via electronic interface) or (2) person-dependent interventions (nonautomated phone calls, in-person interventions). RESULTS: We identified 6550 articles. Of these, 168 were reviewed in full and 51 met inclusion criteria. Among person-independent interventions (56% successful), electronic interventions were most successful (67%). Among person-dependent interventions (52% successful), phone calls showed low success rates (38%). In-person interventions at hospital discharge were more effective (67%) than clinic interventions (47%). In-person pharmacist interventions were effective when held in a pharmacy (83% successful), but were less effective in clinics (38%). CONCLUSIONS: Future medication adherence studies should explore new electronic approaches and in-person interventions at the site of medication distribution. Identifying times of increased patient receptivity to the adherence message such as hospital discharge also will be important.

**Dolovich L, Levine M, Holbrook A, Thabane L, Nair K, Riemersma K. A systematic review of interventions that optimize medication prescribing and use in Canada. *J Popul Ther Clin Pharmacol* 2010;17 (1):e100-e101.**

Abstract: Background: Information about sustainability of effective interventions to optimize medications has been largely lacking. This study examined the effectiveness, perceived usefulness, and sustainability of Canadian interventions to optimize medication prescribing and use in primary care. Methods: This systematic overview was supplemented with email surveys and key informant interviews. Five bibliographic databases (Medline, EMBASE, CINAHL, IPA, HEED) were searched from 1998- 2008. An exhaustive search of grey literature sources and other systematic reviews was completed. A standardized data abstraction form based on the Cochrane EPOC form was used. All steps were done in duplicate. Kappa scores were calculated. Data were analyzed qualitatively. Key stakeholders completed email or phone surveys regarding the benefits, practicality and sustainability of interventions identified from the overview. Results: Of 7906 citations reviewed, 31 interventions were included in the overview. An additional 23 interventions were included based on grey literature, systematic reviews, and reference lists of included articles (n=54 total). Most (89%) of studies were randomized controlled trials (RCTs) or cluster RCTs. Interventions typically related to cardiovascular disease, diabetes, or musculoskeletal conditions. Fiftyfour percent of interventions were multi-component interventions. Almost half of the interventions were delivered by pharmacists. Nine outcome categories measuring effectiveness were identified with prescribing and drug utilization and clinical outcomes measured for most interventions. Effectiveness varied across interventions. Results on practicality and sustainability are pending. Conclusions: Few Canadian-based medication focused interventions have been tested in randomized controlled trials in the past ten years. Those that were tested varied in intervention type and effect on processes and outcomes of care.

**Glynn LG, Murphy AW, Smith SM, Schroeder K, Fahey T. Self-monitoring and other non-pharmacological interventions to improve the management of hypertension in primary care: a systematic review. *Br J Gen Pract* 2010;60(581):e476-488.**

Abstract: BACKGROUND: Patients with high blood pressure (hypertension) in the community frequently fail to meet treatment goals: a condition labelled as 'uncontrolled' hypertension. The optimal way to organise and deliver care to hypertensive patients has not been clearly identified.

AIM: To determine the effectiveness of interventions to improve control of blood pressure in patients with hypertension. DESIGN OF STUDY: Systematic review of randomised controlled trials. SETTING: Primary and ambulatory care. METHOD: Interventions were categorised as following: self-monitoring; educational interventions directed to the patient; educational interventions directed to the health professional; health professional- (nurse or pharmacist) led care; organisational interventions that aimed to improve the delivery of care; and appointment reminder systems. Outcomes assessed were mean systolic and diastolic blood pressure, control of blood pressure and proportion of patients followed up at clinic. RESULTS: Seventy-two RCTs met the inclusion criteria. The trials showed a wide variety of methodological quality. Self-monitoring was associated with net reductions in systolic blood pressure (weighted mean difference [WMD] -2.5 mmHg, 95%CI = -3.7 to -1.3 mmHg) and diastolic blood pressure (WMD -1.8 mmHg, 95%CI = -2.4 to -1.2 mmHg). An organised system of regular review allied to vigorous antihypertensive drug therapy was shown to reduce blood pressure and all-cause mortality in a single large randomised controlled trial. CONCLUSION: Antihypertensive drug therapy should be implemented by means of a vigorous stepped care approach when patients do not reach target blood pressure levels. Self-monitoring is a useful adjunct to care while reminder systems and nurse/pharmacist-led care require further evaluation.

**Glynn LG, Murphy AW, Smith SM, Schroeder K, Fahey T. Interventions used to improve control of blood pressure in patients with hypertension. *Cochrane Database Syst Rev* 2010 (3):CD005182.**

Abstract: BACKGROUND: Patients with high blood pressure (hypertension) in the community frequently fail to meet treatment goals - a condition labelled as "uncontrolled" hypertension. The optimal way to organize and deliver care to hypertensive patients has not been clearly identified.

OBJECTIVES: To determine the effectiveness of interventions to improve control of blood pressure in patients with hypertension. To evaluate the effectiveness of reminders on improving the follow-up of patients with hypertension. SEARCH STRATEGY: All-language search of all articles (any year) in the Cochrane Controlled Trials Register (CTR) and Medline; and Embase from January 1980. SELECTION CRITERIA: Randomized controlled trials (RCTs) of patients with hypertension that evaluated the following interventions: (1) self-monitoring (2) educational interventions directed to the patient (3) educational interventions directed to the health professional (4) health professional (nurse or pharmacist) led



care (5) organisational interventions that aimed to improve the delivery of care (6) appointment reminder systems. Outcomes assessed were: (1) mean systolic and diastolic blood pressure (2) control of blood pressure (3) proportion of patients followed up at clinic. DATA COLLECTION AND ANALYSIS: Two authors extracted data independently and in duplicate and assessed each study according to the criteria outlined by the Cochrane Handbook. MAIN RESULTS: 72 RCTs met our inclusion criteria. The methodological quality of included studies varied. An organized system of regular review allied to vigorous antihypertensive drug therapy was shown to reduce systolic blood pressure (weighted mean difference (WMD) -8.0 mmHg, 95% CI: -8.8 to -7.2 mmHg) and diastolic blood pressure (WMD -4.3 mmHg, 95% CI: -4.7 to -3.9 mmHg) for three strata of entry blood pressure, and all-cause mortality at five years follow-up (6.4% versus 7.8%, difference 1.4%) in a single large RCT- the Hypertension Detection and Follow-Up study. Other interventions had variable effects. Self-monitoring was associated with moderate net reduction in systolic blood pressure (WMD -2.5 mmHg, 95% CI: -3.7 to -1.3 mmHg) and diastolic blood pressure (WMD -1.8 mmHg, 95% CI: -2.4 to -1.2 mmHg). RCTs of educational interventions directed at patients or health professionals were heterogeneous but appeared unlikely to be associated with large net reductions in blood pressure by themselves. Nurse or pharmacist led care may be a promising way forward, with the majority of RCTs being associated with improved blood pressure control and mean SBP and DBP but these interventions require further evaluation. Appointment reminder systems also require further evaluation due to heterogeneity and small trial numbers, but the majority of trials increased the proportion of individuals who attended for follow-up (odds ratio 0.41, 95% CI 0.32 to 0.51) and in two small trials also led to improved blood pressure control, odds ratio favouring intervention 0.54 (95% CI 0.41 to 0.73). AUTHORS' CONCLUSIONS: Family practices and community-based clinics need to have an organized system of regular follow-up and review of their hypertensive patients. Antihypertensive drug therapy should be implemented by means of a vigorous stepped care approach when patients do not reach target blood pressure levels. Self-monitoring and appointment reminders may be useful adjuncts to the above strategies to improve blood pressure control but require further evaluation.

**Golubev S, Fedoseyeva I, Johri M. Compliance measurement-guided medication management programs in hypertension: A systematic review. Basic and Clinical Pharmacology and Toxicology 2011;109:109-110.**

Abstract: Introduction: Whether interventions designed to correct patients' attitude to antihypertensive medication can improve hypertension management outcomes is unclear. Direct patient compliance management (which can include measurement, feedback and counselling), may be considered and used as an active component of hypertension treatment programs. This novel approach is known as compliance measurement-guided (medication) management (CMGM). We conducted a systematic review to determine the effectiveness of CMGM programs in essential hypertension. Methods: Data sources included MEDLINE, EMBASE, CENTRAL, hypertension meetings abstracts, and bibliographies of identified articles. Randomized controlled trials (RCT) and observational studies (OS) were included in the review and assessed by two reviewers independently. Quality assessment was performed with the Cochrane risk of bias tool and evaluated in a four-point continuum. A narrative data synthesis was performed due to significant heterogeneity among studies. Results: Thirteen studies (eight RCT, five OS) involving 2150 hypertensives were included. Five trials of CMGM with electronic devices as a sole intervention suggested a decrease in blood pressure (BP), but the result may have been due to bias. Short-term BP improvement under CMGM in complex interventions was revealed in four studies of low-to-moderate quality. In four integrated care studies of higher quality the impact of CMGM component was not possible to distil due to potential confounding by medication regimens. Regular feedback to the treating physician seems to be an essential component of CMGM and may be effectively mediated by a nurse or a pharmacist and via telecommunication. Conclusions: No definitive evidence for the effectiveness of CMGM as a health technology was found due to non-optimal study designs and methodological quality. Future research should follow accepted quality standards and current guidelines for the treatment of hypertension, include specific groups of patients with compliance problems, and consider clinical, economic, patient-reported and organizational outcomes.

**Gorman KM, Foster AD, Kaspin LC, Kindermann SL, Miller RM. Systematic review of diabetes disease management interventions. Value Health 2012;15 (4):A187.**

Abstract: OBJECTIVES: To improve the health outcomes and reduce costs of employees with diabetes, many employers are initiating diabetes disease management interventions. Given the variety of programs and lack of definitive guidelines reported in the literature, identifying the most appropriate strategy can be challenging. To contribute to employers' understanding of diabetes disease management

programs and determine which are most likely to be successful, this review sought to assess the interventions reported in the literature. **METHODS:** A systematic review of PubMed, Embase and Cochrane was performed. Publications reporting the outcomes of diabetes disease management interventions were identified. Accepted publications were abstracted into an evidence table and included in the data interpretation. **RESULTS:** In total, 37 publications met the inclusion criteria and were included in the analysis. Nine distinct categories of diabetes management interventions were identified and assessed: 1) counseling by healthcare provider; 2) group treatment management sessions; 3) education/educational materials; 4) telephone/telemedicine support; 5) web-based support; 6) self-management support; 7) pharmacist intervention; 8) physician education/support and 9) provision of medication or testing supplies. **CONCLUSIONS:** All of the diabetes disease management interventions identified by this systematic review were associated with significantly improved health outcomes, suggesting that patients will benefit from any strategy undertaken. Combinations of multiple interventions demonstrated the best clinical outcomes. It was not possible, however, to determine which interventions would be most effective, given a lack of direct comparisons and potential reporting biases.

**Hall J, Peat M, Birks Y, Golder S, Group P, Entwistle V, et al. Effectiveness of interventions designed to promote patient involvement to enhance safety: a systematic review. *Qual Saf Health Care* 2010;19(5):e10.**

**Abstract:** **BACKGROUND:** There is growing international interest in involving patients in interventions to promote and support them in securing their own safety. This paper reports a systematic review of evaluations of the effectiveness of interventions that have been used with the explicit intention of promoting patient involvement in patient safety in healthcare. **METHODS:** The authors searched Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, CENTRAL, CINAHL, EMBASE, HMIC, MEDLINE, MEDLINE in-process, PsycINFO and ASSIA to August 2008. We also searched databases of reports, conference proceedings, grey literature, ongoing research and relevant patient safety organisations, and hand-searched two journals. Meta-analysis of the data was not appropriate; therefore, studies were categorised according to how the interventions encouraged patients' actions to improve safety--informing the management plan, monitoring and ensuring safe delivery of treatment (by health professional and by self), making systems safer--and were critiqued in a narrative manner. **FINDINGS:** The authors identified 14 individual experimental and quasiexperimental studies plus one systematic review. The majority of studies fell into the monitoring and ensuring safe delivery of treatment by self category and were all related to enhancing medication safety. Authors reported improved patient safety incident outcomes for the intervention groups compared with controls where the interventions aimed to encourage patient involvement in: (1) monitoring and ensuring safe delivery of treatment by self (self-management of anticoagulation, 'easy' read information leaflet, nurse-led education to promote self-medication in hospital, patient package insert using lay terminology); (2) informing the management plan/monitoring and ensuring safe delivery of treatment by self (individualised teaching plan by nurse, pharmacist counselling). It was not possible to draw any clear conclusions as to the effectiveness of the interventions (with the exception of one specific aspect of self-medication, that is, self-management of anticoagulation) due to concerns about the methodological quality of the studies. **CONCLUSIONS:** There is limited evidence for the effectiveness of interventions designed to promote patient involvement on patient safety incidents and in general is poor quality. Existing evidence is confined to the promotion of safe self-management of medication, most notably relating to the self-management of oral anticoagulants.

**Hilgsmann M, Salas M, Hughes DA, Manias E, Gwady-Sridhar FH, Linck P, et al. Interventions to improve osteoporosis medication adherence and persistence: a systematic review and literature appraisal by the ISPOR Medication Adherence & Persistence Special Interest Group. *Osteoporos Int* 2013;24(12):2907-2918.**

**Abstract:** This study aims to systematically review, critically appraise and identify from the published literature, the most effective interventions to improve medication adherence in osteoporosis. A literature search using Medline, EMBASE, Cochrane library, and Cumulative Index to Nursing and Allied Health Literature was undertaken to identify prospective studies published between January 1, 1999 and June 30, 2012. We included studies on adult users of osteoporosis medications that tested a patient adherence intervention (e.g., patient education, intensified patient care, different dosing regimens) and reported quantitative results of adherence. The Delphi list was modified to assess the quality of studies. Of 113 articles identified, 20 studies fulfilled the inclusion criteria. The most frequent intervention was education (n = 11) followed by monitoring/supervision (n = 4), drug regimens (n = 2), drug regimens

and patient support (n = 1), pharmacist intervention (n = 1), and electronic prescription (n = 1). Although patient education improved medication adherence in four studies, two large-scale randomized studies reported no benefits. Simplification of dosing regimens (with and without patient support program) was found to have a significant clinical impact on medication adherence and persistence. Monitoring/supervision showed no impact on medication persistence while electronic prescription and pharmacist intervention increased medication adherence or persistence. In conclusion, this review found that simplification of dosing regimens, decision aids, electronic prescription, or patient education may help to improve adherence or persistence to osteoporosis medications. We identified wide variation of quality of studies in the osteoporosis area. The efficacy of patient education was variable across studies, while monitoring/supervision does not seem an effective way to enhance medication adherence or persistence.

**Hu D, Juarez DT, Yeboah M, Castillo TP. Interventions to increase medication adherence in African-American and Latino populations: a literature review. *Hawaii J Med Public Health* 2014;73(1):11-18.**

Abstract: The objective of this systematic review was to investigate the effectiveness of interventions to improve medication adherence in ethnic minority populations. A literature search from January 2000 to August 2012 was conducted through PubMed/Medline, Web of Science, The Cochrane Library, and Google Scholar. Search terms used included: medication (MeSH), adherence, medication adherence (MeSH), compliance (MeSH), persistence, race, ethnicity, ethnic groups (MeSH), minority, African-American, Hispanic, Latino, Asian, Pacific Islander, and intervention. Studies which did not have >75% of the sample population comprised of individuals of any one ethnic background were excluded, unless the authors performed sub-group analyses by race/ethnicity. Of the 36 studies identified, 20 studies showed significant post-intervention differences. Sample population sizes ranged from 10 to 520, with a median of 126.5. The studies in this review were conducted with patients of mainly African-American and Latino descent. No studies were identified which focused on Asians, Pacific Islanders, or Native Americans. Interventions demonstrating mixed results included motivational interviewing, reminder devices, community health worker (CHW) delivered interventions, and pharmacist-delivered interventions. Directly observed therapy (DOT) was a successful intervention in two studies. Interventions which did not involve human contact with patients were ineffective. In this literature review, studies varied significantly in their methods and design as well as the populations studied. There was a lack of congruence among studies in the way adherence was measured and reported. No single intervention has been seen to be universally successful, particularly for patients from ethnic minority backgrounds.

**Kaur S, Mitchell G, Vitetta L, Roberts MS. Interventions that can reduce inappropriate prescribing in the elderly: a systematic review. *Drugs Aging* 2009;26(12):1013-1028.**

Abstract: Inappropriate prescribing of medicines may lead to a significant risk of an adverse drug-related event. In particular, prescribing may be regarded as inappropriate when alternative therapy that is either more effective or associated with a lower risk exists to treat the same condition. This review aims to identify interventions and strategies that can significantly reduce inappropriate prescribing in the elderly. The review is based on a search of electronic databases using synonyms of keywords such as 'elderly', 'interventions', 'optimized prescribing' and 'inappropriate prescribing' to identify reported interventions intended to improve inappropriate prescribing in the elderly. A total of 711 articles published in English were retrieved and considered. Of these, 24 original studies, involving 56 to 124,802 participants, met the inclusion criteria and were included in the systematic review. In 16 studies, the statistical power used to assess the impact of the intervention was >90% at a significance level of  $\alpha=0.05$ . Various interventions were included in this study, such as educational interventions, medication reviews, geriatricians' services, multidisciplinary teams, computerized support systems, regulatory policies and multi-faceted approaches. Because of variability in assessment methodologies, mixed responses were found for education interventions aimed at improving inappropriate prescribing. For example, some studies did not assess what data were required to define whether a given level of intervention would be adequate, and others did not consider how many participants would be needed to demonstrate that a significant difference existed. Each of the three computerized support system interventions reported produced a significant enhancement in both prescribing and dispensing practices. Pharmacist interventions in community and hospital settings were evaluated in seven studies. However, variable criteria were used, with two studies using the Medication Appropriateness Index, another two studies using self-designed criteria for inappropriate prescribing, and the remaining three studies using Beers' criteria. A difficulty in assessing studies involving nursing home residents is that both consultant pharmacists and onsite pharmacist services may be involved, and, in one of the studies, only the role of the

consultant pharmacist was considered. One of the most effective interventions appeared to be multidisciplinary case conferences involving a geriatrician, which resulted in a number of examples of reduced inappropriate prescribing in both community and hospital settings. As the effect of regulatory policies as an intervention is dependent on the target population involved, the effectiveness of this type of intervention was variable. Different strategies may be useful in reducing inappropriate prescribing in the elderly. It is not clear whether combined strategies undertaken simultaneously have a synergistic effect.

**Kucukarslan SN, Hagan AM, Shimp LA, Gaither CA, Lewis NJ. Integrating medication therapy management in the primary care medical home: A review of randomized controlled trials. *Am J Health Syst Pharm* 2011;68(4):335-345.**

Abstract: PURPOSE: Randomized controlled trials (RCTs) that evaluated the effect of medication therapy management (MTM) on patient outcomes in the primary care medical home were reviewed to determine how these services may be integrated into the primary care medical home. METHODS: A literature search was conducted to identify RCTS published between 1989 and 2009 that evaluated the impact of MTM services on patient outcomes. To qualify as MTM services, the interventions had to include both a review of medication therapy and patient interactions, including educating patients about drug therapy, identifying potential barriers to medication adherence, and helping patients manage their diseases. The internal validity of the studies was evaluated using previously published criteria. The description, specification, and appropriateness of study objectives, study population, intervention, randomization, blinding, outcome measures, statistical analysis, and conclusions were evaluated. RESULTS: A total of 1795 publications were identified, but only 8 met the inclusion criteria. These studies targeted patients with specific medical conditions or patients with multiple medications without specifying a medical condition. The interventions varied in intensity (i.e., frequency and length of patient contact), ranging from a single patient contact in a community pharmacy setting to multiple visits with an ambulatory care pharmacist practicing in a collaborative care model. Two of the 8 studies obtained expected results. These studies targeted patients with unrealized therapeutic goals, and the interventions involved collaboration between pharmacists and physicians and extensive patient follow-up. CONCLUSION: Of 1795 publications identified, 8 were RCTS meeting selection criteria for evaluation of the effect of MTM services on patient outcomes. Two service elements that benefit patient care were identified: (1) selecting patients with specific therapeutic problems and (2) implementing MTM services that involve timely communication with primary care providers to discuss therapeutic problems, along with routine patient follow-up to support medication adherence to changes in therapy.

**Kwan JL, Lo L, Sampson M, Shojania KG. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review. *Ann Intern Med* 2013;158(5 Pt 2):397-403.**

Abstract: Medication reconciliation identifies and resolves unintentional discrepancies between patients' medication lists across transitions in care. The purpose of this review is to summarize evidence about the effectiveness of hospital-based medication reconciliation interventions. Searches encompassed MEDLINE through November 2012 and EMBASE and the Cochrane Central Register of Controlled Trials through July 2012. Eligible studies evaluated the effects of hospital-based medication reconciliation on unintentional discrepancies with nontrivial risks for harm to patients or 30-day postdischarge emergency department visits and readmission. Two reviewers evaluated study eligibility, abstracted data, and assessed study quality. Eighteen studies evaluating 20 interventions met the selection criteria. Pharmacists performed medication reconciliation in 17 of the 20 interventions. Most unintentional discrepancies identified had no clinical significance. Medication reconciliation alone probably does not reduce postdischarge hospital utilization but may do so when bundled with interventions aimed at improving care transitions.

**Lainer M, Mann E, Sonnichsen A. Information technology interventions to improve medication safety in primary care: a systematic review. *Int J Qual Health Care* 2013;25(5):590-598.**

Abstract: PURPOSE: Improving medication safety has become a major topic in all clinical settings. Information technology (IT) can play an important role to prevent adverse drug events (ADEs), but data on the effectiveness of IT interventions are controversial. The objective of this paper is to provide a systematic review about the effects of IT interventions on medication safety in primary care.

DATA SOURCES: PubMed, International Pharmaceutical Abstracts, EMBASE, Cochrane Database of Systematic Reviews, handsearching reference lists from full-text articles. STUDY SELECTION: Randomized controlled trials (RCTs), if interventions based on IT, performed in primary care and outcomes reported on medication safety. Data extraction Study characteristics and outcome data independently extracted

by two reviewers. Disagreement resolved by discussion with a third reviewer. RESULTS OF DATA SYNTHESIS: Out of 3918 studies retrieved, 10 RCTs met the inclusion criteria. Of the six studies evaluating computerized provider order entry (CPOE) with clinical decision support (CDS) only 3 studies effectively reduced unsafe prescribing. Both pharmacist-led IT interventions decreased the prescription of potentially inappropriate medication or unsafe prescribing in pregnancy. No reduction of ADEs was achieved by a web program or a TeleWatch system intervention. CONCLUSION: Only 5 of 10 RCTs revealed a reduction of medication errors. CPOE with CDS was effective if targeted at a limited number of potentially inappropriate medications. The positive results of pharmacist-led IT interventions indicate that IT interventions with inter-professional communication appear to be effective. The unequivocal results of the included RCTs stress the necessity of rigorous evaluation prior to large-scale implementation.

**Loganathan M, Singh S, Franklin BD, Bottle A, Majeed A. Interventions to optimise prescribing in care homes: systematic review. Age Ageing 2011;40(2):150-162.**

Abstract: BACKGROUND: prescribing for older people is a complex process and can elevate the risk of inappropriate prescribing, with potentially severe consequences. With a growing ageing population, strategies to improve prescribing in care homes are essential. Our aim was to review systematically the effects of interventions to optimise prescribing in care homes. METHOD: databases searched were MEDLINE, EMBASE, International Pharmaceutical Abstracts and the Cochrane Library from 1990. Search terms included were 'nursing home', 'residential home', 'inappropriate prescribing', 'education' and 'intervention'. Two independent reviewers undertook screening and methodological quality assessment, using the Downs and Black rating scale. RESULTS: the search strategy retrieved 16 studies that met the inclusion criteria. Four intervention strategies were identified: staff education, multi-disciplinary team (MDT) meetings, pharmacist medication reviews and computerised clinical decision support systems (CDSSs). Complex educational programmes that focused on improving patients' behavioural management and drug prescribing were the most studied area, with six of eight studies highlighting an improvement in prescribing. Mixed results were found for pharmacist interventions. CDSSs were evaluated in two studies, with one showing a significant improvement in appropriate drug orders. Two of three studies examining MDT meetings found an overall improvement in appropriate prescribing. A meta-analysis could not be performed due to heterogeneity in the outcome measures. CONCLUSION: results are mixed and there is no one interventional strategy that has proved to be effective. Nevertheless, education including academic detailing seems to show most promise. A multi-faceted approach and clearer policy guidelines are likely to be required to improve prescribing for these vulnerable patients.

**Maeda K. Systematic review of the effects of improvement of prescription to reduce the number of medications in the elderly with polypharmacy. Yakugaku Zasshi - Journal of the Pharmaceutical Society of Japan 2009;129(5):631-645.**

Abstract: Polypharmacy, the use of multiple medications, is commonly prescribed in the elderly but leads to reduced compliance with drug treatment regimens and increased risk of adverse drug reactions. This study was performed to systematically review the results of previous studies to assess the effects of interventions to improve prescription quality on reduction of the number of medications in elderly patients with polypharmacy, and to determine the most effective types of intervention in such cases. Relevant articles in the English language literature were retrieved by keyword searches on MEDLINE, the Cochrane Library, and cited references. The criteria for inclusion in this review were as follows: 1) studies in elderly subjects taking multiple medications or frail elderly subjects assumed to be taking multiple medications; 2) study interventions were intended to improve quality of drug use; 3) changes in the number of medications prescribed during the intervention period were reported; 4) the study designs were controlled clinical studies. Twenty-seven articles, including 28 controlled studies, matched all the inclusion criteria. The interventions in the studies included in the review were categorized into two groups: a medication review by medical professionals (26 studies); and a request to prescribing physicians for re-evaluation of the drug use for their patients (2 studies). Medication reviews by medical professionals, mainly pharmacists, resulted in a significant reduction of prescribed drugs (median, 0.45 drugs; 95%CI, 0.11-0.76). The differences in effects among intervention methods could not be investigated because of a lack of diversity in the methods used.

**Manias E, Williams A, Liew D. Interventions to reduce medication errors in adult intensive care: a systematic review. Br J Clin Pharmacol 2012;74(3):411-423.**

Abstract: Critically ill patients need life saving treatments and are often exposed to medications requiring careful titration. The aim of this paper was to review systematically the research literature on the efficacy of interventions in reducing medication errors in intensive care. A search was conducted of

PubMed, CINAHL EMBASE, Journals@Ovid, International Pharmaceutical Abstract Series via Ovid, ScienceDirect, Scopus, Web of Science, PsycInfo and The Cochrane Collaboration from inception to October 2011. Research studies involving delivery of an intervention in intensive care for adult patients with the aim of reducing medication errors were examined. Eight types of interventions were identified: computerized physician order entry (CPOE), changes in work schedules (CWS), intravenous systems (IS), modes of education (ME), medication reconciliation (MR), pharmacist involvement (PI), protocols and guidelines (PG) and support systems for clinical decision making (SSCD). Sixteen out of the 24 studies showed reduced medication error rates. Four intervention types demonstrated reduced medication errors post-intervention: CWS, ME, MR and PG. It is not possible to promote any interventions as positive models for reducing medication errors. Insufficient research was undertaken with any particular type of intervention, and there were concerns regarding the level of evidence and quality of research. Most studies involved single arm, before and after designs without a comparative control group. Future researchers should address gaps identified in single faceted interventions and gather data on multi-faceted interventions using high quality research designs. The findings demonstrate implications for policy makers and clinicians in adopting resource intensive processes and technologies, which offer little evidence to support their efficacy.

**Patterson SM, Hughes C, Kerse N, Cardwell CR, Bradley MC. Interventions to improve the appropriate use of polypharmacy for older people. *Cochrane Database Syst Rev* 2012;5:CD008165.**

Abstract: BACKGROUND: Inappropriate polypharmacy is a particular concern in older people and is associated with negative health outcomes. Choosing the best interventions to improve appropriate polypharmacy is a priority, hence there is growing interest in appropriate polypharmacy, where many medicines may be used to achieve better clinical outcomes for patients. OBJECTIVES: This review sought to determine which interventions alone, or in combination, are effective in improving the appropriate use of polypharmacy and reducing medication-related problems in older people. SEARCH METHODS: A range of literature databases including MEDLINE and EMBASE were searched in addition to handsearching reference lists. Search terms included polypharmacy, Beers criteria, medication appropriateness and inappropriate prescribing. SELECTION CRITERIA: A range of study designs were eligible. Eligible studies described interventions affecting prescribing aimed at improving appropriate polypharmacy in people aged 65 years and older where a validated measure of appropriateness was used (e.g. Beers criteria or Medication Appropriateness Index - MAI). DATA COLLECTION AND ANALYSIS: Three authors independently reviewed abstracts of eligible studies, extracted data and assessed risk of bias of included studies. Study specific estimates were pooled, using a random-effects model to yield summary estimates of effect and 95% confidence intervals. MAIN RESULTS: Electronic searches identified 2200 potentially relevant citations, of which 139 were examined in detail. Following assessment, 10 studies were included. One intervention was computerised decision support and nine were complex, multifaceted pharmaceutical care provided in a variety of settings. Appropriateness of prescribing was measured using the MAI score postintervention (seven studies) and/or Beers criteria (four studies). The interventions included in this review demonstrated a reduction in inappropriate medication use. A mean difference of -6.78 (95% CI -12.34 to -1.22) in the change in MAI score in favour of the intervention group (four studies). Postintervention pooled data (five studies) showed a mean reduction of -3.88 (95% CI -5.40 to -2.35) in the summated MAI score and a mean reduction of -0.06 (95% CI -0.16 to 0.04) in the number of Beers drugs per patient (three studies). Evidence of the effect of the interventions on hospital admissions (four studies) was conflicting. Medication-related problems, reported as the number of adverse drug events (three studies), reduced significantly (35%) postintervention. AUTHORS' CONCLUSIONS: It is unclear if interventions to improve appropriate polypharmacy, such as pharmaceutical care, resulted in a clinically significant improvement; however, they appear beneficial in terms of reducing inappropriate prescribing and medication-related problems.

**Press VG, Pappalardo AA, Conwell WD, Pincavage AT, Prochaska MH, Arora VM. Interventions to improve outcomes for minority adults with asthma: a systematic review. *J Gen Intern Med* 2012;27(8):1001-1015.**

Abstract: To assess interventions aimed at improving outcomes for minority adult patients with asthma. MEDLINE, PsycINFO, CINAHL and The Cochrane Library were searched to late 2010 for articles in English. Search terms were reported. Reference lists of included studies and relevant meeting abstracts (2009 and 2010) were searched. Study quality was assessed using a modified Downs and Black checklist that covered external validity, bias, confounding and statistical power. The maximum score was 29. It appeared that two reviewers independently assessed study quality. Data on the outcomes of interest

were extracted and grouped by outcome subdivided into education-based or system-level interventions. Two reviewers independently extracted data. Twenty-four studies were included in the review (10,267 participants, range 17 to 3,887): 10 randomised controlled trials (RCTs), six pre-post design studies, two case-control studies and six cohort studies. Sixteen studies were categorised as very good quality (20 points or more), six as good quality (15 to 19 points) and two as fair quality (10 to 14 points). The length of follow-up ranged from hospital discharge to 32 months. Health care utilisation: Studies of education-based interventions reported reductions for: emergency department visits post intervention (six out of eight studies) with the most successful interventions led by a pharmacist or asthma nurse or emergency department group sessions; hospital admissions after in-patient and emergency department based interventions (five out of seven studies); outpatient visits (one out of three studies); and a decrease in hospital admissions (five out of seven studies). There were mixed results for length of stay after in-patient education interventions by asthma nurses (two studies). There were some reductions in health care utilisation for system-based interventions for emergency department visits (three studies), hospital admissions (four out of five studies), length of stay (two studies) and urgent outpatient clinic visits (one study). Symptom control and self-management: Only two out of five studies reported some improvements in symptom control for education-based interventions, including one language-appropriate intervention. Other studies reported some improvements for participants' self-management skills (four out of five). For system-based interventions there were some improvements in symptoms (two out of three studies) and self-management (three studies). Overall health status and asthma quality of life: Improvements were reported for education-based studies assessing quality of life (four out of five studies). Mixed effects were reported for system-based interventions (four studies). Asthma-related knowledge: One out of four studies reported some improvements in asthma related knowledge for education-based interventions. There were improvements in knowledge reported for system-based studies (two studies). Education delivered by health care professionals appeared effective in improving outcomes for minority adult patients with asthma. Few studies were culturally tailored and most lacked comparison groups, which limited the conclusions that can be drawn from cultural tailoring. System redesign showed great promise, particularly use of team-based specialty clinics and long-term follow-up for acute care visits. The review question was clear. Broadly defined inclusion criteria were specified for study design, interventions and participants. Several relevant sources were searched and attempts were made to reduce potential for publication bias. Only studies in English and conducted in USA were included so there was potential for language bias. Study quality was assessed and summary scores were reported for each study. Appropriate methods to reduce reviewer error and bias were used throughout the review process. A narrative synthesis was appropriate given the differences between studies in interventions and outcomes. A range of different study designs were included, many of which did not have control groups and (as the authors noted) these were liable to a high risk of bias. Few studies reported interventions tailored specifically to cultural groups. Only studies conducted in USA were included and the results may not be generalisable to other settings and populations. The authors' conclusions reflect the evidence presented but their reliability is uncertain due to the variations between studies. Practice: The authors stated that clinicians should recognise that reproducible educational programmes that targeted health disparities for minority populations in USA needed to be further developed and implemented. Research: The authors stated that future research should evaluate the role of tailoring educational strategies, focus on patient-centred education and incorporate outpatient follow-up and/or a team-based approach.