

NHSGGC Mindful Prescribing Strategy – Polypharmacy

Executive Summary

Introduction

The use of multiple medications is appropriate if ongoing assessment determines that all medicines remain appropriate but 'Polypharmacy' may be considered as the use of more medicines than are clinically indicated representing unnecessary or potentially harmful drug treatment. This latter definition promotes a more 'Mindful Prescribing' attitude in all medication review opportunities and highlights that even one or two medicines may reflect inappropriate prescribing for some patients.

The NHSGGC Area Drug and Therapeutics Committee has established a Polypharmacy Subcommittee to develop, implement and monitor a NHSGGC 'Mindful Prescribing' Strategy and associated single system workplan to continuously improve the safety and quality of polypharmacy prescribing.

Causes and consequences of polypharmacy

The prescribing of medicines is increasing rapidly in our ageing population where evidence-based guidelines are encouraging more prescribing of preventative treatments. However with increasing co-morbidity, clinical decision making is more difficult because clinicians and patients often struggle to balance the benefits and risks of multiple recommended treatments. There is also evidence that the more prescribers who are involved in the care of a patient the greater the prevalence of inappropriate prescribing

Negative consequences of polypharmacy include adverse drug reactions, drug-drug interactions, medication errors and non-adherence. Adverse reactions to medicines account for 5 -17% of all hospital admissions with risks more closely linked to increasing co-morbidities and number of drugs prescribed than increasing age.

Drivers for change

There are a number of key national drivers for change which would be supported by activities to promote a mindful prescribing approach by all prescribers. In particular NHSGGC is required to report to SGHD on progress for reviewing a specific cohort of patients on polypharmacy identified as high risk

Evidence for interventions to address polypharmacy

A recent Cochrane Review reported that it is unclear if interventions to improve appropriate polypharmacy resulted in a clinically significant improvement; however, they appear to be beneficial in terms of reducing inappropriate prescribing and medication related problems

Studies have identified that the most effective models require a multidisciplinary team approach, in particular, where there is a comprehensive geriatric assessment framework.

Current NHSGGC interventions to address polypharmacy

There are a range of initiatives in place across NHSGGC providing polypharmacy medication reviews which use different selection criteria to identify patients for review. The availability of SGHD information on patients considered high priority for polypharmacy review will assist in planning future service provision.

NHSGGC Mindful Prescribing Recommendations

To support a Mindful Approach to prescribing across NHSGGC the ADTC Polypharmacy Subcommittee will lead the activities to address the following recommendations.

1. Develop, implement and monitor a NHSGGC polypharmacy strategy with an associated single system work plan to improve the safety and quality of polypharmacy prescribing.
2. Work collaboratively with other NHS Scotland Health Boards to understand the most effective strategies for prescriber engagement; develop clinical tools and patient information to support the process; promote peer review of experience and outcomes.
3. Engage effectively with patients to empower them to participate in making choices around medication use.
4. Engage with prescribers across acute services, partnerships and primary care to foster improved understanding of the causes and risks of polypharmacy and facilitate sharing of good practice in medication review, clinical effectiveness and patient involvement.
5. Provide guidance to prescribers on which patients should be considered a priority for polypharmacy review.
6. Establish NHSGGC mechanisms with input from patients and clinicians to deliver regular multidisciplinary polypharmacy reviews with patient engagement and communication of outcomes across healthcare interfaces.
7. Provide prescribing guidance and tools to support the delivery of effective medication reviews with rationalisation of prescribing needs and effective communication of outcomes to patients and all prescribers involved in providing care.
8. Evaluate the impact of activities to address polypharmacy within acute services/ partnerships and primary care with regular reports provided to SGHD and NHSGGC medicines advisory and clinical governance groups. This will require qualitative and quantitative evaluation.

***NHSGGC ADTC Polypharmacy Subcommittee
December 2012***

NHS GGC Mindful Prescribing Strategy – Polypharmacy

1. Introduction

The use of multiple medications is appropriate if ongoing assessment determines that all medicines remain appropriate but ‘Polypharmacy’ may be considered as the use of more medicines than are clinically indicated¹ representing unnecessary or potentially harmful drug treatment. This latter definition promotes a more ‘Mindful Prescribing’ attitude in all medication review opportunities and highlights that even one or two medicines may reflect inappropriate prescribing for some patients.

The NHSGGC Area Drug and Therapeutics Committee has established a Polypharmacy Subcommittee to develop, implement and monitor a NHSGGC Mindful Prescribing Strategy and associated single system workplan to continuously improve the safety and quality of polypharmacy prescribing. In addition it is hoped that this strategy will encourage prescribers to adopt a ‘Mindful Prescribing’ approach for all patients. See Appendix 1 for details of membership (December 2012)

1.1 Causes of polypharmacy

The prescribing of medicines is increasing rapidly in our ageing population where evidence-based guidelines are encouraging more prescribing of preventative treatments. Four out of five people aged over 75 years take a prescription medicine and 36% are taking four or more medicines²

Clinical guidelines are almost always focused on making recommendations about the treatment of individual diseases. However with increasing co-morbidity, clinical decision making is more difficult because clinicians and patients often struggle to balance the benefits and risks of multiple recommended treatments³

There is evidence that the more prescribers who are involved in the care of a patient the greater the prevalence of inappropriate prescribing.^{4 5 6} Whether the observed increased risk of harm is due to the prescribers or a problem with communication, written or verbal, is unknown. These studies have observed that no single person takes responsibility for the whole system, with well intentioned people doing their best but in an uncoordinated way.

Bill’s story illustrates the impact of multiple prescribers

“I am 86 and I have asthma and arthritis and have just had a TIA, which luckily was not a stroke, though investigation revealed past strokes, but it has left me with a diet of eight medications. At least three medical specialties are involved in managing these. Some are actively managed now by stroke and cardiology departments, others are the responsibility in theory of my GP but all in practice are managed by me.

In my own fairly complex situation I maintain two daily issuing boxes, refilled once a week and keep a store of all drugs in a large box. Stock replenishment soon becomes random so the pharmacist could not pick up on incompatibility or upward drift without an impossibly complex system. What is important is that I worry about this issue and question every change. Arthritis makes opening blister packs difficult.

Pharmacists, GPs and clinical specialists lead largely independent lives and only occasionally will we get coordination for a patient on this issue.”

1.2 Consequences of polypharmacy

Negative consequences of polypharmacy include adverse drug reactions, drug-drug interactions, medication errors and non-adherence. It is suggested that up to 50% of medicines are not taken as prescribed⁷. Adverse drug reactions to medicines account for 5 -17% of all hospital admissions⁸.

Studies have shown that the risk of adverse drug reaction is more closely linked to increasing co-morbidities and number of drugs prescribed than increasing age⁹. The risk of prescribing medicines considered potentially inappropriate for older people increases with increased volume of prescribing.^{10 11 12}

2. Drivers for Change

2.1 NHS Scotland Healthcare Quality Strategy 2010

www.scotland.gov.uk/Resource/Doc/311667/0098354.pdf

The strategy sets out 3 Quality Ambitions;

- Mutually beneficial partnerships between patients, their families and those delivering healthcare services which respect individual needs and values and which demonstrate compassion, continuity, clear communication and shared decision-making.
- There will be no avoidable injury or harm to people from healthcare they receive, and an appropriate, clean and safe environment will be provided for the delivery of healthcare services at all times.
- The most appropriate treatments, interventions, support and services will be provided at the right time to everyone who will benefit, and wasteful or harmful variation will be eradicated.

2.2 Scottish Patient Safety Programme in Primary Care

www.scottishpatientsafetyprogramme.scot.nhs.uk

The National Patient Safety Programme for Primary Care contains several initiatives addressing some of the problems associated with polypharmacy. In addition to looking at specific high risk medicines e.g. lithium and methotrexate there is a focus on drug-drug interactions e.g. aspirin and NSAID, and inappropriate prescribing e.g. antipsychotics prescribed to people with dementia.

2.3 General Medical Services – Quality and Outcomes Framework (QOF)

A review of medicines with only the patient's notes (Level 2) is covered under Medicines Indicator 11 and 12 of QOF as follows;

- Medicines 11 – A medication review is recorded in the notes in the preceding 15 months for all patients prescribed four or more repeat medicines (Standard 80%)
- Medicines 12 - A medication review is recorded in the notes in the preceding 15 months for all patients prescribed repeat medicines (Standard 80%)

However, a Level 3 clinical review of the medicines and condition is required to ensure patient engagement in the polypharmacy medication review process.

2.4 Scottish Government Health Department (SGHD) Quality and Efficiency Programme

<http://www.scotland.gov.uk/Topics/Health/NHS-Scotland/Delivery-Improvement>

One of the workstreams within the prescribing arm of the SGHD Quality and Efficiency Programme is polypharmacy. The project objectives include;

- To review current actions and tools used across NHS Scotland to support medication review, polypharmacy and patient involvement.
- To outline good practice and report on potential methodologies that improve patient safety through high quality pharmaceutical care and meaningful therapeutic partnerships and so improve patient safety and reduce waste.
- To determine potential systems to tackle patient safety and waste in repeat prescribing.

2.5 SGHD National Polypharmacy Guidance

<http://www.central.knowledge.scot.nhs.uk/upload/Polypharmacy%20full%20guidance%20v2.pdf>

National Polypharmacy Guidance was launched on 1st November 2012 to provide guidance to clinicians undertaking Level 3 medication reviews with patient engagement. The guidance also provides direction to Health Boards planning services to address the polypharmacy agenda. NHSGGC has been provided with details of approximately 9000 patients aged over 75 years with a SPARRA risk score of 40-60% considered high priority for review. The priority patients are on medicines from a minimum of 10 BNF sections and patients will be flagged to highlight care home residency or use of high risk medicines. Boards will be asked to regularly report on supportive activities as part of the SGHD Quality and Efficiency Programme.

2.6 Summary of drivers for change

There are a number of key national drivers for change which would be supported by activities to promote a mindful prescribing approach by all prescribers.

In response, NHSGGC will develop, implement and monitor a Mindful Prescribing Strategy with an associated single system work plan to improve the safety and quality of polypharmacy prescribing. We need to work collaboratively with other health boards to understand and share strategies to support this process. We need to engage effectively with our patients to empower them to participate in making choices around medication use including medicines purchased. We need to engage prescribers across acute services, partnerships and primary care to foster improved understanding of the causes and risks of polypharmacy. This will be supported by the sharing of good practice in medication review, polypharmacy and patient involvement

3. Evidence for interventions to address polypharmacy

3.1 Cochrane Review – Interventions to improve the appropriate use of polypharmacy for older people (2012)

<http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008165.pub2/abstract>

The Cochrane Review reported that it is unclear if interventions to avoid inappropriate polypharmacy, such as pharmaceutical care, resulted in a clinically significant improvement; however, they appear to be beneficial in terms of reducing inappropriate prescribing and medication related problems.

3.2 Comprehensive geriatric assessment

The impact of a framework for assessing the need for drugs within the comprehensive geriatric assessment has been assessed.^{13 14} . It was found to result in an 81% discontinuation of medicines. No significant adverse events or deaths were attributable to discontinuation, and 88% of patients reported global improvement in health^{15 16} .

3.3 Pharmacist medication review

Research in polypharmacy has focused on the role of pharmacists in undertaking medication reviews and supporting patients^{17 18 19 20 21 22 23 24} and findings have included;

- A reduction in the number of medicines prescribed and prescribing costs with improved guideline adherence.
- Conflicting evidence of impact on hospital admissions and no significant difference in care home admissions, quality of life or mortality.
- Evidence of improved prescribing when pharmacists work closely with GPs and wider multidisciplinary team – higher number of medication changes, more drug therapy problems resolved, increased awareness drug related problems and reduction in prescribing costs.

3.4 GP medication review

There are fewer trials looking at the role of general practitioners in undertaking medication review^{25 26 27 28} There are ongoing trials in this area^{29 30} but current findings show that

- Education combined with support e.g. medication risk assessment and facilitation of medication review resulted in improved medication appropriateness and fewer prescribed medicines by GPs compared to education alone with a reduction in falls requiring medical attention at 12 months. Quality of life scores were unaffected by the intervention.
- Comprehensive supported discharge provided by the GP alongside the district nurse resulted in fewer readmissions.
- Medication review using the 'Inappropriate Prescribing in the Elderly Tool' by GPs resulted in a significant reduction in the number of drugs prescribed, identification and reduction in inappropriate prescribing and high patient satisfaction²⁸ .

4. NHSGGC existing initiatives to address polypharmacy

A scoping exercise undertaken across NHSGGC during 2011/12 has identified a range of ongoing activities to address the polypharmacy agenda;

4.1 Long Term Conditions

Pharmacists from the Long Term Conditions and Research team in PPSU have been undertaking polypharmacy medication reviews for people with heart failure in the primary care setting. The pharmacists looked to optimise heart failure medicines (initiation and up-titration); identify contra-indicated medication; review medicines prescribed for other conditions; review BP and pulse; review blood chemistry. Although improved guideline adherence was observed, no improved clinical outcomes were demonstrated in this population which was relatively well treated at baseline.

4.2 Prescribing Support Teams

Within CH(C)Ps, Prescribing Support Teams are involved in the delivery of polypharmacy reviews within GP practices. A sample of evaluation demonstrated that pharmacist review of 77 patients on 10 or more medicines identified 193 drug therapy

problems of which 67% were safety or clinical effectiveness issues. In addition to addressing the drug safety problems, prescribing efficiencies of £2.2K per year were realised.

The prescribing team also support medication review where either there is limited evidence of clinical outcome with use of the medicine at individual patient level audit has demonstrated low level of follow up review to assess effectiveness

4.3 Care Home Residents

Prescribing for the care home population is approximately 6-7 times higher than that of the general practice population. A number of key reports have identified that care home residents are particularly at risk of adverse effects from medication which accounts for 5-17% of all hospital admissions. Consequently the provision of medication review for care home residents has been identified as a pharmaceutical care priority within NHS GGC.

Clinical pharmacists within the CH(C)P prescribing support teams and Nursing Home Medical Practice undertake reviews for care home residents as part of the multidisciplinary health care team. Recent evaluation demonstrated that pharmacist led review of 258 patients in 5 care homes identified 599 drug therapy problems and in addition prescribing efficiencies of £99K per year were realised.

4.4 Medicines Management Local Enhanced Service (MM LES)

Approximately 90% of NHS GGC GP practices have signed up to a MM LES which was implemented in 2010 and will run until at least 2013. The LES for General Practice facilitates practice staff review of repeat prescribing with the removal of unnecessary drugs from repeat prescription e.g. duplicate drugs.

Analysis of prescribing trends across Scotland's health boards would suggest that the LES has in part helped to mitigate the increase in prescribing volume in NHS GGC. The MM LES does not facilitate Level 3 face to face medication reviews so in its current format it provides limited support for the polypharmacy agenda.

4.5 Medication reviews within the NHS GGC Rehabilitation Service

Pharmacists working within the Rehabilitation Service visit patients, mainly elderly who have either been recently discharged from hospital or are admission avoidance patients who have attended Accident and Emergency or have been referred by their GP.

Criteria for referral for pharmacist review includes multiple changes to medicines during in patient stay; potential side effects from medication (including falls); on 5 or more regular medicines; compliance problems. A face to face medication review may be carried out in the patient's home.

4.6 Chronic Medication Service (CMS)

The fourth component of the national community pharmacy contract is now being implemented across Scotland. Each registered patient must have a completed initial pharmacist assessment within three months of registration. One of the areas covered by this initial assessment is polypharmacy and identified issues around duplication of medication, appropriateness and use of medication are supported. Community pharmacists now have a framework to have directed dialogue with the patients and prescribers regarding any identified issues with a view to managing patients medication in a more appropriate and coordinated manner to maximise clinical outcomes.

4.7 Change Fund Initiatives

Pharmacy activities funded by the Change Fund provide medication reviews aiming to reduce emergency hospital admissions and re-admissions for avoidable medication related-issues

Inverclyde and East Renfrewshire CHCPs have appointed pharmacists to work within the CHCP Prescribing Teams to undertake medication review of older patients on polypharmacy/ high risk medicines. The reviews are undertaken within a variety of settings; in GP practices; at home; within care homes; in sheltered housing.

West Dumbartonshire, East Renfrewshire and Inverclyde CHCPs have appointed prescribing support technicians to support medicines reconciliation and compliance assessment for older patients post discharge. Referrals are received from a range of sources including Homecare, GP practices, hospital pharmacy and discharge teams.

4.8 Polypharmacy medication reviews in acute services

A clinical pharmacist working as part of a multidisciplinary team undertook medication reviews for 103 patients admitted to a Medicines for the Elderly receiving ward.

Patients on admission were prescribed multiple medicines: median 9 range 3-20. 83% (85/103) had changes to their medicine post-review. The average number of medicines increased was 0.47 and the number decreased was 1.74 per patient, with a net reduction of 1.27. 143 medicines were discontinued: 64% due to ADR or contra-indications, 23% unnecessary/ no indication/ ineffective, 5% poor adherence and 8% due to other reasons

4.9 Falls and osteoporosis pharmacy team

The Community Falls Prevention Programme is a multi-disciplinary team set up to provide support and care for older people who have fallen. People using this service may be referred for pharmacy review by one of the Falls & Osteoporosis pharmacy team, who are part of the Long Term Conditions and Research team.

The falls team pharmacists will carry out a medication review for patients on four or more regular medicines to identify any that may be responsible for, or contribute to, causing the fall.

4.10 Existing initiatives in other NHS Scotland health boards

The National Polypharmacy Guidance provides details of polypharmacy initiatives implemented and evaluated in other health boards in NHS Scotland

4.11 Summary of interventions to address polypharmacy

Currently there are a range of initiatives across NHSGGC providing face to face polypharmacy medication reviews which use different selection criteria to prioritise patients for review.

The availability of information on patients considered high priority for polypharmacy review will assist in planning future service provision. This will be supported by the development of local mechanisms to provide regular multidisciplinary reviews which have the strongest evidence base. Guidance and tools to support the delivery of effective medication review will be required by prescribers. Effective communication of outcomes across healthcare interfaces will be required. Standardised tools will support the evaluation of polypharmacy initiatives across NHSGGC allowing regular reports to SGHD and GGC medicines advisory and clinical governance groups.

5. NHSGGC Mindful Prescribing Recommendations

To support a Mindful Approach to prescribing across NHSGGC the ADTC Polypharmacy Subcommittee will lead the activities to address the following recommendations;

1. Develop, implement and monitor a NHSGGC polypharmacy strategy with an associated single system work plan to improve the safety and quality of polypharmacy prescribing.
2. Work collaboratively with other NHS Scotland Health Boards to understand the most effective strategies for prescriber engagement; develop clinical tools and patient information to support the process; promote peer review of experience and outcomes.
3. Engage effectively with patients to empower them to participate in making choices around medication use.
4. Engage with prescribers across acute services, partnerships and primary care to foster improved understanding of the causes and risks of polypharmacy and facilitate sharing of good practice in medication review, clinical effectiveness and patient involvement.
5. Provide guidance to prescribers on which patients should be considered a priority for polypharmacy review.
6. Establish NHSGGC mechanisms with input from patients and clinicians to deliver regular multidisciplinary polypharmacy reviews with patient engagement and communication of outcomes across healthcare interfaces.
7. Provide prescribing guidance and tools to support the delivery of effective medication reviews with rationalisation of prescribing needs and effective communication of outcomes to patients and all prescribers involved in providing care.
8. Evaluate the impact of activities to address polypharmacy within acute services/ partnerships and primary care with regular reports provided to SGHD and NHSGGC medicines advisory and clinical governance groups. This will require qualitative and quantitative evaluation.

***NHSGGC ADTC Polypharmacy Subcommittee
December 2012***

**Appendix 1 – Membership of ADTC Polypharmacy Subcommittee
(December 2012)**

NAME	TITLE
Graeme MacPhee (Chair)	Consultant - Medicine for the Elderly Southern General Hospital
Noreen Downes (Professional Secretariat)	Lead Clinical Pharmacist for Prescribing Development - Medicines for Elderly/ care Homes
TBC	Patient representative
Heather Harrison	Senior Prescribing Advisor Central Prescribing Team
Alison Mitchell	Consultant in Old Age Psychiatry Leverndale Hospital
Ishbel McCallum	Senior Clinical Pharmacist Leverndale Hospital
Bernadette Campbell	Non Medical Prescribing Advisor
Jean Hannah	Clinical Director Nursing Home Medical Practice
Karen Ross	Planning Manager - Acute Service Strategy Implementation & Planning
Anne Cochrane	Primary Care Support Nurse
Rachel Bruce	Lead Clinical Pharmacist for Prescribing Development – Interface/Patient Safety in Primary Care
Sarah Gray	Clinical Pharmacist - Medicine for the Elderly Southern General Hospital
Caroline Holms	LMC representative - GP, Midlock Medical Centre
Stephen McLaughlin	GP, Linwood Surgery
Roger Hardman	Medical Prescribing Advisor - GP
Paul Forsyth	Heart Failure Pharmacist Long Term Conditions and Research Team
Elaine Paton	Primary Care Development Pharmacist Community Pharmacy Development Team
Lynn King	Prescribing Support Pharmacist CHP Prescribing Support Team
Hilary Campbell	Prescribing Support Pharmacist CHP Prescribing Support Team

REFERENCES

- ¹ Montamat SC, Cusack B. Overcoming problems with polypharmacy and drug misuse in the elderly. *Clin Geriatr Med.* 1992;8:143-158.
- ² Quality and Outcome Framework 2012
http://www.nhsemployers.org/Aboutus/Publications/Documents/QOF_2012-13.pdf
- ³ Guthrie B et al *BMJ* 2012;345:e6341
- ⁴ Hilmer SN. The dilemma of polypharmacy. *Aust Prescr.* 2008;31:2-3
- ⁵ Tamblyn RM, McLeod PJ, Abrahamowicz M, Laprise R. Do too many cooks spoil the broth? Multiple physician involvement in medical management of elderly patients and potentially inappropriate drug combinations. *CMAJ* 1996 Apr 15;154(8):1177-1184.
- ⁶ Barber ND, Alldred DP, Raynor DK, Dickinson R, Garfield S, Jesson B, Lim R, Savage I, Standage C, Buckle J, Franklin B, Woloshynowych M, Zermansky AG. Care homes' use of medicines: prevalence, causes and potential harm of medication errors in care homes for older people. *Qual. Saf. Health Care.* 2009;18:341-346
- ⁷ *DTB* 2012;50:1 doi:10.1136/dtb.2011.02.0076
- ⁸ M Zhang et al Co-morbidity and repeat admission to hospital for adverse drug reactions in older adults: retrospective cohort study *BMJ* 2009; 338:a275
- ⁹ Field TS, Gurwitz JH, Avorn J, McCormick D, Jain S, Eckler M, et al. Risk factors for adverse drug events among nursing home residents. *Arch.Intern.Med.* 2001 ;161(13):1629-1634.
- ¹⁰ Fialova D, Topinkova E, Gambassi G, Finne-Soveri H, Jonsson PV, Carpenter I, et al. Potentially inappropriate medication use among elderly home care patients in Europe. *JAMA* 2005. 16;293(11):1348-1358.
- ¹¹ Johnell K, Klarin I. The relationship between number of drugs and potential drug-drug interactions in the elderly: a study of over 600,000 elderly patients from the Swedish Prescribed Drug Register. *Drug Saf.* 2007;30(10):911-918.
- ¹² Duerden M, Millson D, Avery A, Smart S. The quality of GP prescribing. 2011. (available from www.kingsfund.org.uk/document.rm?id=9215)
- ¹³ Garfinkel D, Mangin D. Feasibility study of a systematic approach for discontinuation of multiple medications in older adults. *Arch Intern Med* 2010;170(18):1648-54
- ¹⁴ Garfinkel D, Zur-Gil S, Ben-Israel J. The war against polypharmacy: a new costeffective geriatric-palliative approach for improving drug therapy in disabled elderly people. *Isr Med Assoc J.* 2007;9(6):430-434.
- ¹⁵ Sergi, M. De Rui, S. Sarti, et al. Polypharmacy in the elderly: can comprehensive geriatric assessment reduce inappropriate medication use?. *Drugs & Aging.* 2011. 28(7); 509-519.
- ¹⁶ Lampela, S. Hartikainen, P. Lavikainen, et al. Effects of medication assessment as part of a comprehensive geriatric assessment on drug use over a 1-year period: a population-based intervention study. *Drugs & Aging.* 2010. 27(6); 507-521
- ¹⁷ Lenaghan, R. Holland & A. Brooks. Home-based medication review in a high risk elderly population in primary care - The POLYMED randomised controlled trial, *Age and Ageing.* 2007. 36(3); 292-297
- ¹⁸ Holland, R., Lenaghan, E., Harvey, I., Smith, R., Shepstone, L., Lipp, A., Christou, M., Evans, D. & Hand, C. Does home based medication review keep older people out of hospital? The HOMER randomised controlled trial. *BMJ.* 2005; 330(7486): 293.
- ¹⁹ Richmond, V. Morton, B. Cross, et al. Effectiveness of shared pharmaceutical care for older patients: RESPECT trial findings. *British Journal of General Practice.* 2010. 60(570);14-20.
- ²⁰ Hugtenburg, S. D. Borgsteede & J. J. Beckeringh. Medication review and patient counselling at discharge from the hospital by community pharmacists. *Pharmacy World & Science.* 2009. 31(6); 630-637
- ²¹ Denneboom, M. G. H. Dautzenberg, R. Grol, et al. Treatment reviews of older people on polypharmacy in primary care: Cluster controlled trial comparing two approaches. *British Journal of General Practice.* 2007. 57(542); 723-731
- ²² Vinks TH, TH, Egberts TC, de Lange TM, et al. Pharmacist-based medication review reduces potential drug-related problems in the elderly: the SMOG controlled trial.: *Drugs & Aging.* 2009. 26(2); 123-133.
- ²³ Gastelurrutia, S. I. Benrimoj, J. Espejo, et al. Negative clinical outcomes associated with drug-related problems in heart failure (HF) outpatients: Impact of a pharmacist in a multidisciplinary HF clinic. *Journal of Cardiac Failure.* 2011. 17(3); 217-223.
- ²⁴ Trygstad, D. B. Christensen, S. E. Wegner, et al. Analysis of the North Carolina long-term care polypharmacy initiative: a multiple-cohort approach using propensity-score matching for both evaluation and targeting. *Clinical therapeutics.* 2009. 31(9); 2018-2037
- ²⁵ Bregnhøj L, Thirstrup S, Kristensen MB, Bjerrun L, Sonne J. Combined intervention programme reduces inappropriate prescribing in elderly patients exposed to polypharmacy in primary care. *European Journal of Clinical Pharmacology* 2009; 65:199-207
- ²⁶ Rytter L, Jakobsen HN, Noholt FRO, et al. Comprehensive discharge follow-up in patients' homes by GPs and district nurses of elderly patients. *Scandinavian Journal of Primary Health Care,* 2010; 28: 146-153
- ²⁷ Pit EW, Byles JE, Henry DA, et al. A quality use of medicines program for general practitioners and older people: a cluster randomised controlled trial. *Medical Journal of Australia* 2007; 187(1): 23-30

²⁸ Walsh EK and Cussen K. "Take ten minutes": a dedicated ten minute medication review reduces polypharmacy in the elderly.: Irish Medical Journal. 2010. 103(8); 236-238.

²⁹ Desborough, Houghton J, Wood J, et al. Multi-professional clinical medication review in care homes for the elderly: study protocol for a randomised controlled trial with cost effectiveness analysis. *Trials* 2011;12:218 doi:10.1186/1745-6215-12-218

³⁰ Leenderste AJ, Konig FHP, Goodwaard AN, et al Preventing hospital admissions by reviewing medication (PHARM) in primary care: design of the cluster randomised, controlled, multi-centre PHARM-study. *BMC Health Service Research* 2011; 11:4 <http://www.biomedcentral.com/1472-6963/11/4>