

BMJ Open The potential clinical benefits of medicines optimisation through comprehensive geriatric assessment, carried out by secondary care geriatricians, in a general practice care setting in North Staffordshire, UK: a feasibility study

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ABSTRACT

Objectives To evaluate the feasibility and potential clinical benefits of medicines optimisation through comprehensive geriatric assessment (CGA) of frail patients with multiple conditions, by secondary care geriatricians in a general practice care setting.

Methods Seven general practitioner (GP) practices in one region of Stoke-on-Trent volunteered to take part. GPs selected patients (n=186) who were local permanent residents, at least 65 years old and on eight or more medications per day. Patients were sent a written invitation outlining the assessment purpose/format. Prior to patient assessments, primary care staff prepared packs detailing patient medical history, recent consultations, current medications, recent laboratory tests and social circumstances. One hour was allocated for the CGA per patient, with one of three geriatricians, to enable sufficient time to explore all relevant aspects. Assessment comprised a full history, thorough clinical examination, assessment of balance and mobility, mental function and information on home environment and support arrangements. After consultation, geriatricians made recommendations regarding further assessments, investigations or medication changes. Geriatricians entered their main findings and recommendations onto a standard template.

Results In total, 687 recommendations for changes in patients' medication regimens were made for 169 (91%) patients. In 17 (9%) patients there was no recommendation to alter medications. This resulted in an average of four alterations in medication per patient. The predominant changes to medications were to stop medications (34%) or to reduce the dosage (24%). Starting a new medication represented 18% of all the medication changes. Adherence rates to geriatrician medication recommendations were 72% at 6 months and 65% at 12 months.

Conclusions CGA of older patients with complex needs, by geriatricians in a general practice care setting, is feasible. Our study demonstrated constructive collaboration between GPs and geriatricians from

Strengths and limitations of this study

- We did not have an independent control group of patients with which to compare the effect of the comprehensive geriatric assessment (CGA). Instead, we relied on patients who received a CGA to be their own controls (comparing healthcare usage 12 months pre-CGA and post-CGA intervention for each patient).
- By using patient medication information from geriatricians' records, it enabled us to record data relating to patient medications, medication changes and adherence to medication changes after CGA.
- The study was limited to one area of Stoke-on-Trent. Hence, the results cannot be readily extrapolated to other areas in North Staffordshire or elsewhere.
- As this was a study to assess the feasibility of undertaking a service redesign, the number of subjects was modest.
- Further investigation is necessary to understand why some practices did not want to be involved in the study and what could be done to increase participation. This may impact on wide scale generalisability.

secondary care, suggesting further studies and clinical trials are feasible and have scope to yield beneficial outcomes.

INTRODUCTION

We live in an increasingly ageing population, with the fastest population increases being in those aged 85 years and over. It is projected that by 2035, people aged 65 years and over will account for 23% of the population as compared with 17% in 2010.¹ The health and

social care of older people can often be complex due to frailty, multimorbidity, cognitive impairment, functional limitations and diverse care needs.²

Recent estimates suggest that 16% of adult patients in England have more than one of the long-term conditions outlined in the Quality and Outcomes Framework and these patients account for 32% of all consultations in general practice.³ Wallace *et al*⁴ summarised a number of key issues in managing older patients with multimorbidity in primary care. They included fragmentation and poor coordination of care, troublesome polypharmacy, reduced quality of life and increased healthcare usage. The complexity of these patients provides real challenges as clinical care teams are aiming to manage several coexisting and interacting chronic conditions with the prevailing model of single-disease clinical guidelines. Guidelines rarely deal with multimorbidity, and research studies have often included few or no frail older patients.⁵

A recent study of adults in primary care reported that 21% of patients with two long-term conditions were prescribed four to nine drugs and 1% were prescribed 10 or more medications. For patients with at least six conditions, these rates increased to 47% and 41%, respectively.⁶ It is recognised that unnecessary and inappropriate prescribing are associated with more adverse drug events and reduced well-being as well as increased healthcare usage and hospitalisations.⁷

There is a desire to deliver high-quality healthcare closer to home, thus relieving the demand on hard-pressed secondary care services, and to manage patients where it is more convenient and preferable for patients and their carers. This includes a greater amount of preventative and proactive care of long-term conditions and requires the deployment of multidisciplinary and multiprofessional care teams and innovative working practices.^{8,9}

Comprehensive geriatric assessment (CGA) has been defined as 'a multidimensional interdisciplinary diagnostic process focused on determining a frail elderly person's medical, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and long-term follow-up'.² Ellis and Langhorne further defined frailty as a reduced ability to withstand illness without loss of function because of the effects of the ageing process, presence of chronic conditions, functional impairments and dependence on others.² Randomised controlled trials (RCTs) have shown that CGA and individualised multidisciplinary interventions reduce the rate of functional decline, decrease admissions to hospital and to institutional care, and prolong survival.^{10,11}

This project focused on frail patients with long-term conditions living in the community and aimed to evaluate the role of geriatricians in supporting their clinical management within primary care. Since we were unaware of any literature reporting the use of secondary care geriatricians in the general practice care setting, we wished to undertake a pilot to assess the willingness of general practitioners (GPs) and patients to engage with the

project and any barriers that would prevent their recruitment. Furthermore, we needed to determine whether it would be possible to collect data relating to each patient's current medications and the medication changes recommended by the geriatricians. We also wished to assess whether it would be possible to evaluate adherence to medication recommendations.

METHODS

Objectives

The main objective of this study was to evaluate the feasibility of undertaking a service redesign where secondary care geriatricians worked in the general practice care setting. A secondary objective was to gain insight into the potential clinical benefits of medicines optimisation through CGA of frail patients with multiple conditions. Furthermore, we aimed to determine whether data collection and analysis were feasible. It was also expected that data generated during this study would be useful in planning a comparative RCT.

Study venue

All 17 general practices in 1 region of Stoke-on-Trent, North Staffordshire, UK were invited to participate. Of these, seven practices (41%) with patient populations of >5000 volunteered to take part. They included some of the most deprived wards in the city. Each practice had an overall average attainment in Quality and Outcomes Framework cardiovascular/diabetes indicators as compared with the average attainment by all 54 practices in Stoke-on-Trent clinical commissioning group (CCG). A CGA was carried out by geriatricians in clinics within the general practice surgeries, at home visits or in patients' residential care or nursing home settings.

Ethical approval was not required as this project was not research, but an evaluation of the feasibility of service redesign, endorsed by the Stoke-on-Trent CCG, including the Caldicott Guardian who oversees any research and development with which the CCG is associated or has commissioned.

Patient selection

Patients were selected for the study by the GPs. A search of each participating general practice clinical computer system was performed to identify local permanent residents who were at least 65 years old and were on eight or more medications per day. There were two advantages to choosing the simple criterion of ≥ 8 medications: (1) patients on multiple medications may be receiving inappropriate polypharmacy and could have scope for optimisation and (2) there is a strong association between the number of medications and degree of multimorbidity.¹²

Some patients ≥ 65 years with less than eight medications were also considered for inclusion at the discretion of their GPs if they felt that it would enhance their well-being and quality of life, for example, patients with unstable long-term conditions or at high risk of

complications, deterioration or hospital admission. Patients were excluded if they had been under the care of a geriatrician or psychogeriatrician in the previous 6 months as they would have already undergone holistic assessment and interventions. Temporary residents were also excluded as it would be difficult to follow them up and access their medical records.

From the initial list of patients that was generated in each practice, GPs selected the maximum number that could be accommodated in the planned geriatrician sessions that were allocated to each general practice surgery. In their selection of patients, GPs subjectively gave priority to those who they felt had the greatest needs and were likely to benefit the most. Patients were sent a written invitation outlining the purpose and format of the assessment and patients who accepted the offer were then allocated an appointment.

Geriatricians

Three geriatricians took part, including a local community consultant geriatrician and two specialist registrars. The latter were in the final year of their geriatric medicine training and were about to take up consultant geriatrician posts. The input of all three geriatricians to this study was on a part-time/sessional basis.

Assessment process

Prior to the patient assessments taking place, the primary care staff prepared a succinct pack incorporating each patient's medical history, recent consultations, current medications, recent laboratory tests and social circumstances. One hour was allocated per patient for the CGA to enable the geriatrician sufficient time to explore all relevant aspects. On a typical day of consultations, a geriatrician carried out a CGA on six patients.

The assessment comprised a full history, thorough clinical examination, assessment of balance and mobility, mental function and information on home environment and support arrangements. At the end of each consultation the geriatricians made recommendations regarding further assessments (eg, physiotherapy, occupational therapy, other specialist input), investigations or medication changes. Geriatricians entered the main findings, conclusions and their recommendations onto a standard template. Additionally, a comprehensive typed report was later sent to each patient's GP. Both of these documents were used subsequently for data analysis and evaluation of the service. At the end of each consultation, patients were asked to comment on the usefulness of the consultation. At the end of each day of assessments, the geriatrician met with the relevant GPs for 1–1.5 hours to outline every patient seen that day, discuss the rationale of the recommendations made, and give GPs an opportunity to comment on the usefulness of the assessments.

The geriatricians did not arrange to see the patients again and it was the remit of GPs to implement the recommendations and monitor progress. However, the

geriatricians remained available for advice at any time afterwards by phone or email at the discretion of the GPs.

The research team subsequently reviewed the patients' documentation to determine whether the general practice teams acted on the geriatrician recommendations and interventions.

Follow-up

Patients were reanalysed 6 and 12 months after assessment by collecting data on whether patients were receiving the geriatrician-recommended medications, the numbers of health-related episodes and usage of health services, and residency status. The health episodes and use of services included were: GP consultations, visits by community matrons, diabetes or specialist nurses from other departments, physiotherapy or other remedial therapy sessions, health checks, hospital outpatient clinics, appointments for hospital-based procedures, telephone calls to GP surgeries for advice, GP home visits, A&E department attendances, visits to the local walk-in primary care assessment centre and hospital admissions.

Data collection and statistical methods

In order to enable comparisons over time, the same types of data for the 12 months prior to the CGA were also collected ('baseline' data), grouped over two 6-month periods. The completeness of the data collected was dependent on the level of detail that the GP practice IT systems provided. The IT systems used at the GP practices included EMIS LV, EMIS Web and SystemOne. Statistical analysis was carried out using the SAS statistical package, V.9.3. For this pilot study, primarily descriptive statistics are presented, based on data type (means and SD for normally distributed variables, medians and IQRs for skewed variables and number and proportions for binary variables). Comparisons of counts before and after the intervention, for both planned and unplanned hospital admissions, were analysed using conditional negative binomial regression. Estimates of incident rate ratios (IRRs) and associated 95% CIs were presented. *p* Values were not presented as this was not a hypothesis-testing exercise.

RESULTS

The holistic assessments by the three geriatricians were performed in early 2014. A total of 186 patients were assessed, 110 (59%) were women and 76 (41%) men. Their median age was 81 years (range: 65–99) and women were significantly older than men ($p < 0.05$) as shown in

Table 1 Age and gender of patients who underwent assessment

Gender	Number (%)	Median age (years)	Age range (years)
Male	76 (41)	78	66–93
Female	110 (59)	82	65–99

Table 2 Geriatricians' medication recommendations following assessment

Changes	Occurrence	Changes per participant (mean)	% of participants	% of total medication changes
Start medication	122	0.7	44	18
Stop medication	232	1.4	71	34
Increase medication	55	0.3	25	8
Decrease medication	188	1.1	66	27
Change to alternative	90	0.5	35	13
Total	687	4		100

table 1. One hundred and forty patients (75%) lived at home and 46 (25%) lived in a residential care or nursing home. Of the patients who lived at home, 84 (45%) were cohabiting and 56 (30%) lived alone. One hundred and twenty-three (66%) of the patients were assessed by the community consultant geriatrician, and 33 (18%) and 30 (16%) by the two specialist registrars, respectively.

Geriatricians' recommendations for medicines optimisation

In total, 687 recommendations for changes in patients' medication regimens were made for 169 (91%) patients. In 17 (9%) patients there was no recommendation to alter medications. Changes in patients' medication are itemised in **table 2**. This resulted in an average of four changes in medication per patient. By far the predominant changes to medications were to stop medications (34%) or to reduce the dosage (24%), which together accounted for 58% of all medication changes. Starting a new medication represented 122 (18%) of all the medication changes. In seven patients, the geriatricians recommended consideration for a Do Not Attempt Resuscitation agreement to be implemented.

Feedback

All of the GPs involved in the project, who met the geriatricians to discuss their patients' assessments, were positive about this pilot project and felt that their patients benefited clinically and that the presence of geriatricians in primary care was constructive and worthwhile. They further reported that their patients were pleased about the specialist community-based assessment by the geriatricians and felt that they benefited or that they were at least reassured. We received no unfavourable comments.

Follow-up analysis

By 6 months postassessment, 12 patients had died and by 12 months this had increased to a total of 27 (14.5%) patients. Five patients had insufficient data available at 6 and 12 months (missing documentation). This resulted in complete data at 12 months for 154 (83%) patients. Given the high proportion of survivors at 12 months, we confine the analysis mostly to the 12 months' data-set.

The median age of the 154 patients was 79 years (range: 66–100), 90 (58%) were women (median age 80 years) and 64 (42%) were men (median age 78 years). These demographics were not statistically significantly different

from those at the time of the assessments shown in **table 1**. At the 12 months' postassessment, 120 (78%) patients were living at home and 34 (22%) in a residential care or nursing home. Of those living at home, 51 (33%) were living alone and 69 (45%) were cohabiting. All these findings were not statistically significantly different from the corresponding proportions at the time of the geriatrician assessments. Following the assessments, the geriatricians did not receive any direct communication from the GP surgeries regarding complications from the recommendations they had made or any requests for other advice.

Medication adherence

Table 3 shows the extent to which the recommendations made by the geriatricians were still in place. The rates of adherence were 72% at 6 months and 65% at 12 months.

Interactions with healthcare usage

Figure 1 shows the data for the 154 patients who completed the 12 months follow-up period. In the two 6-month periods prior to CGA, the total rates of healthcare episodes requiring services usage were stable. In the 6 months following the assessment, healthcare services usage increased by 132 (37%) and fell slightly thereafter that is, by 19 (4%).

A separate descriptive analysis was also performed for just emergency episodes during each of the four 6-month periods. The emergency group of episodes comprised: GP home visits, telephone requests for advice out of normal working hours, walk-in primary care centre attendance, A&E attendance and hospital admission. In the 12 months prior to the CGA, there was an increase of 18 (34%) in emergency episodes requiring healthcare services usage. In the 6-month period following the CGA, there was a further increase by 45 (63%). In the subsequent 6-month period a much smaller increase was observed that is, only 6 (5%) more episodes.

There were increases in total and emergency healthcare episodes and service usage from the baseline period to those in the postassessment period. For planned admissions, the IRR was 1.23 (1.07, 1.41), entailing a 23% increase after the intervention. For unplanned admissions, the IRR was 1.83 (1.43, 2.34), entailing an 83% increase. However, these were before–after analyses with no independent control group, so it is not known what the

Table 3 Medication adherence* at 6 and 12 months postassessment

	Adherence	Non-adherence	Unknown (%)
6 months	122 (72%)	45 (27%)	2 (1)
12 months	100 (65%)	51 (33%)	3 (2)

Adherence defined as drug recommendation still implemented post-CGA, including drug type and dosage recommended by geriatrician at assessment.

magnitude of change would have been for a comparison group which had not received the intervention. An RCT would be needed to determine the effects of an intervention. It has been demonstrated, however, that data collection and analysis are feasible, and preintervention values and attrition rates are available to help plan for a full trial.

DISCUSSION

This pilot project demonstrated that CGAs of older patients with complex needs, by geriatricians in a general practice care setting, were feasible. GPs involved in the study reported that they found the intervention by the geriatricians both constructive and popular with patients. GPs also appreciated the support they received in optimising their patients' medications. This high level of satisfaction by GPs and service users is consistent with the favourable feedback observed in other studies of community-based holistic assessment and interventions in older frail people.¹³ Furthermore, we demonstrated that the computerised clinical systems within general practice enabled easy identification of suitable patients for selection as well as the collection of important clinical data to evaluate and compare outcomes. The infrastructure is therefore in place for such models of service to be further evaluated and implemented in community settings. However, this may not necessarily be the case everywhere as half of the general practices who were invited to participate had declined, hence we cannot exclude the possibility that adequate infrastructure is not in place in those practices.

In this study, patients received a holistic assessment by specialist geriatricians, but only on one occasion and without further involvement. This differs from the standard hospital-based CGA that entails concurrent involvement of multiple professionals as well as ongoing monitoring and reassessments. In a similar, larger study of a geriatrician-led outreach service for residents of residential homes, patients were additionally offered further visits for management of intercurrent problems as required.¹⁴ In that study, a significant reduction in acute hospital admissions was observed after implementation of the service as compared with a 2-year baseline period prior to its commencement. Hence, there seems to be merit in community-based geriatric assessments with on-going involvement of geriatricians when patients become unstable. However, both this study and our

current study did not include an independent control group to enable a rigorous evaluation of the intervention. An ideal study design would involve RCT methodology and clearly there is justification for further clinical research in community settings. We have also demonstrated that data collection is feasible, and have been able to generate estimates relating to our outcomes, and estimates of attrition rates, which can be used in planning a further study.

Although this study has some limitations, mainly due to being a single-arm intervention study, it does appear to demonstrate a significant impact on medicines optimisation, the results of which indicate that a full RCT should now be undertaken. On average, four drug alterations per patient were recommended. Furthermore, almost 60% of the alterations comprised cessation of drugs or reductions in dosage. The intention of this was to improve patient well-being through medicines optimisation and rectifying excessive dosages in frail vulnerable patients. Additionally, there are obvious cost savings implications to these medication changes (not evaluated as part of this study) that are worthy of full health economic evaluation in a subsequent study. The detrimental effects of inappropriate polypharmacy are common and a report from The King's Fund has advised that policy, medical training and clinical practice must adopt an approach to identify and rectify 'problematic' polypharmacy.¹⁵ However, it is important to differentiate 'appropriate' polypharmacy, that is, when potential benefits outweigh potential harms.¹⁶ Also, it is important to detect potential drug omissions denying patients potential benefits. In our study, 18% of medication changes represented the commencement of a new drug.

The number of emergency/unplanned healthcare interactions increased following the CGA ([figure 1](#)). This continues the trend of increasing healthcare usage observed during the two 6-month periods prior to the CGA. Increasing healthcare usage (planned and unplanned) would be expected to show an increasing trend as these frail patients with multiple conditions become sicker. The continued increase in unplanned healthcare usage in the 6 months following the CGA may be due to the time needed for modifications to medication to be implemented and to take effect. It can be seen that in the second 6-month period post-CGA (months 6–12) the number of unplanned/emergency healthcare interactions levels out and does not continue to increase in line with the previous 18 months. An independent control group, as part of a RCT, would confirm whether this observed flattening out in unplanned healthcare interactions was due to the CGA.

The geriatricians carried out holistic assessment of the patients and not only a medications review. Hence, as well as recommending modifications to optimise patient medication, geriatricians made further recommendations for extra investigations, assessments and interventions. This may, in part, explain the increase in planned healthcare interactions observed ([figure 1](#)) in the first

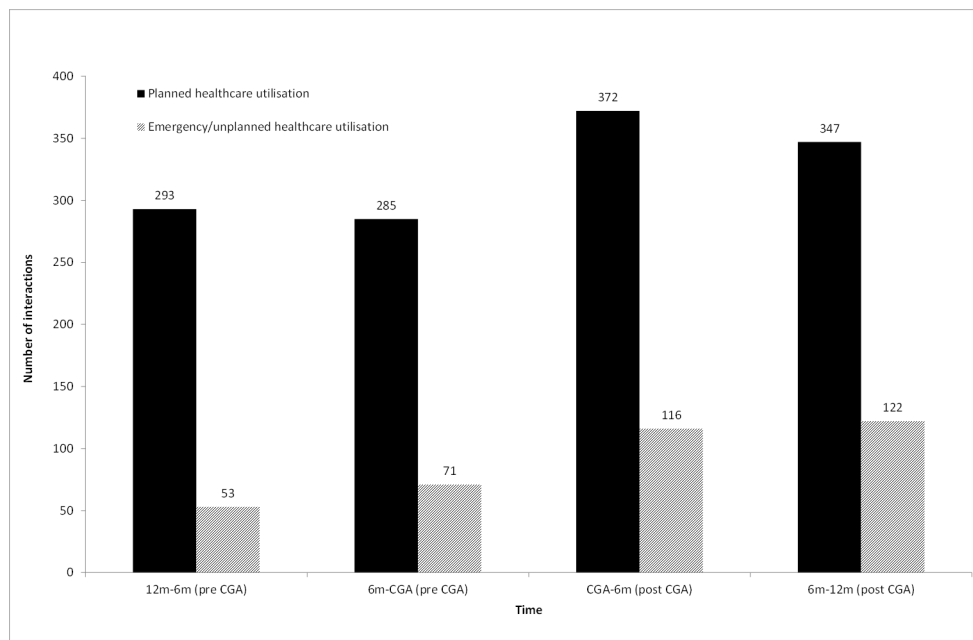


Figure 1 Planned and emergency/unplanned healthcare service usage during 1-year precomprehensive geriatric assessment (CGA) and 1-year post-CGA, grouped in 6 monthly periods.

6 months post-CGA and why these decrease in the second 6-month period.

Given that about 90% of healthcare contacts take place in primary care,¹⁷ there is much to gain through interventions to address potentially harmful polypharmacy in community settings. To this end, pharmacists can also make a valuable contribution as it has been shown that they can result in more appropriate prescribing, drug cost reductions and reduced healthcare services usage.¹⁸ Another prominent finding regarding medications is that rates of adherence to the geriatricians' recommendations in our study were high 6 months after assessment (72%) and even after 12 months (65%). This suggests that amendments were well received by both patients and their GPs.

The death rate in our study over a period of 1 year was low that is, about 15%. It is not possible to relate this to the single comprehensive assessment by a geriatrician. Also, the median age of the patients in our study was not very high (median men; 78 years, women; 82 years). In Hutchinson's *et al* study¹⁴ the median age was higher, the patients were more often acutely ill, and their death rate was much higher (73%) over a 4-year period postenrolment to the community-based service. Again, an RCT would be the best method to elucidate possible effects of innovative community-based services on mortality rates.

The essence of our study was in line with the current national drive to move a range of services, traditionally provided in hospital settings, into the community.^{19 20} Also, our approach was in tune with the recent National Institute for Health and Care Excellence Guidance on the management of multimorbidity whose recommendations include identifying relevant patients proactively by using electronic health records, performing CGA and reducing pharmacological treatment burden²¹.

Better communication and cooperation between GPs and secondary care specialists has been identified as one of the determining factors that lead to improved effectiveness of new community-based services.²² It is therefore encouraging that our study and another community project in North Staffordshire¹³ demonstrate a very constructive collaboration between GPs and geriatric team specialists from secondary care, suggesting that further studies and clinical trials are feasible and have scope to yield beneficial outcomes.

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Contributors SCL helped to manage the project, analysed the data and drafted and revised the paper. K LW co-managed the project and reviewed/ revised the paper. NAD collected all data and contributed to the data analysis. BP was the lead geriatrician who undertook comprehensive geriatric assessments of patients and reviewed and revised the paper. MJB was the independent statistician and reviewed/ revised the paper. AA reviewed the paper. RC devised, funded and comanaged the project as well as reviewed and revised the paper.

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Competing interests Sally-Ann Chambers, one of the geriatricians who undertook the comprehensive geriatric assessments, is the daughter-in-law of RC.

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REFERENCES

1. Office for National Statistics. Population ageing in the United Kingdom, its constituent countries and the European Union. 2012 http://www.ons.gov.uk/ons/dcp171776_258607.pdf.
2. Ellis G, Langhorne P. Comprehensive geriatric assessment for older hospital patients. *Br Med Bull* 2004;71:45–59.
3. Salisbury C, Johnson L, Purdy S, *et al.* Epidemiology and impact of multimorbidity in primary care: a retrospective cohort study. *Br J Gen Pract* 2011;61:12–21.
4. Wallace E, Salisbury C, Guthrie B, *et al.* Managing patients with multimorbidity in primary care. *BMJ* 2015;350:h176.
5. Fernando P, Arora A, Crome P. Inclusion of older people in interventional clinical trials. *Clin Investig* 2014;4:87–99.
6. Payne RA, Avery AJ, Duerden M, *et al.* Prevalence of polypharmacy in a Scottish primary care population. *Eur J Clin Pharmacol* 2014;70:575–81.
7. Duerden M, Avery T, Payne R. Polypharmacy and medicines optimisation. *King's Fund* 2013.
8. Newbold M. Shifting care from hospitals to 'community': a role for hospitals? *British Journal of General Practice* 2013;63:379–80.
9. House of Commons Health Committee—managing the care of people with long-term conditions second report volume 1 Jul. 2014.
10. Sternberg SA, Bentur N. The contribution of comprehensive geriatric assessment to primary care physicians. *Isr J Health Policy Res* 2014;3:44.
11. Aminzadeh F. Adherence to recommendations of community-based comprehensive geriatric assessment programmes. *Age Ageing* 2000;29:401–7.
12. Moody DA. A study to identify potential predictors of primary care consultation rates in people aged 65 years and over MSc Thesis. Keele University Staffordshire, UK 2006.
13. Oleshko C, Moody D. Over 75s project, newcastle-under-Lyme. *British Geriatrics Society Newsletter* 2015;56:30–2.
14. Hutchinson AF, Parikh S, Tacey M, *et al.* A longitudinal cohort study evaluating the impact of a geriatrician-led residential care outreach service on acute healthcare utilisation. *Age Ageing* 2015;44:365–70.
15. Duerden M, Avery T, Payne R. *Polypharmacy and medicines optimisation. Making it safe and sound*. London: The King's Fund, 2013.
16. Jansen J. De-prescribing in older people. *BMJ* 2016;353:431–3.
17. Health and Social Care Information Centre. Primary care. <http://www.hscic.gov.uk/primary-care> (accessed 14 Jun 2016).
18. Davey C, Miller R, Friel A, *et al.* Consultant pharmacist case management of elderly patients in intermediate care. *Age and Ageing* 2014;43:ii2.
19. *NHS England Five Year Forward View*. UK: NHS England, 2014.
20. Shepperd S, Illiffe S, Doll HA, *et al.* Hospital at home' services to avoid admission to hospital. http://cochrane.org/CD007491/EPOC_hospital-home-services-avoid-admission-hospital (accessed 28 May 2017).
21. NICE Guideline. Multimorbidity: clinical assessment and management. <http://www.nice.org.uk/guidance/ng56>
22. Mian C, Winpenny E. Can hospital services work in primary care settings? *BMJ* 2016;353:445.