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Introduction

Comorbidity is one of the most important issues facing health systems in the developed world (DoH, 2014; NICE, 2016). Patients with multiple long term conditions (LTCs) are becoming the norm, rather than the exception, and the numbers of people with comorbidities is increasing with an aging population. The prevalence of mental health disorder in individuals increases with the number of physical disorders which they have, an association which is stronger in young people and is also linked to socioeconomic deprivation (Barnett et al., 2012). Comorbidity between a LTC such as diabetes, respiratory disorders or coronary heart disease, and depression is associated with greater functional impairment, morbidity and healthcare costs (Brilleman et al., 2013; Naylor et al., 2012).

Depression is associated with poorer self-management in a number of LTCs (Ahola & Groop, 2013; Fredericks, Lapum, & Lo, 2012), and because of the importance of self-management (Ory et al., 2013) to longer-term outcomes this may explain the additional functional impairment and morbidity. Plausible biological and social mechanisms have been suggested that point to depression having the potential to be both a cause and an effect of a range of chronic diseases (Naylor et al., 2012; NICE, 2009).

Healthcare costs increase with the number of comorbid conditions a person has. The combination of depression with a LTC has been shown to be the most consistently cost-increasing combination across a wide range of LTCs, in comparison to any other comorbidity (Brilleman et al., 2013). This replicates findings from specific combinations of LTCs with depression. For example, total healthcare expenditure was four and a half times higher in

diabetic individuals with depression when compared to those without (Molosankwe, Patel, José Gagliardino, Knapp, & McDaid, 2012).

Self-management has been emphasised as a central part of care for people living with a LTC (Anderson et al., 2001; Kadu & Stolee, 2015; NICE, 2016). Unscheduled care such as Emergency Department attendance or unscheduled admission to hospital can be understood as a proxy for a failure of planned care to support successful self-management by people living with a LTC (Langer, Chew-Graham, Hunter, Guthrie, & Salmon, 2013; Payne, Abel, Guthrie, & Mercer, 2013). Whilst most people will need unscheduled hospital care at some time, people with a poorly managed LTC are more likely to require it. Although all UK citizens have access to unscheduled hospital care free at the point of delivery, increased use of such care in the context of comorbid depression may be part of the reasons for the higher health care costs reported. The NHS in England incentivises General Practices to identify and manage LTCs in their patient population through the Quality and Outcomes Framework (QOF), which was first introduced in 2004 (BMA & NHS, 2016). The QOF includes a range of sometimes overlapping conditions (see Table 3) for which enhanced identification and management are overall associated with better long term outcomes through the use of standardised coded disease registers (Chisholm, 1990) and structured follow up, linked to evidence based interventions (S. J. Gillam, Siriwardena, & Steel, 2012; S. Gillam & Siriwardena, 2010). One of the QOF standard coded LTCs is 'depression'.

The current study analyses a combined routine clinical dataset covering the whole adult population (age 18 and over) of Sheffield, England's fourth largest city. For the purpose of the study a bespoke dataset was created by combining extracts derived from routine NHS

records from primary care and secondary care, and linked at the person level. The dataset included cross-sectional data on all GP-recorded LTCs including depression as defined by QOF coding rule sets. In addition, it included longitudinal data on the use of scheduled and unscheduled hospital care, based on ICD10 and OPCS standard coding. This enabled the study team to identify the extent of General Practitioner (GP) recorded comorbidity and multi-morbidity, and the extent to which comorbid depression was associated with unscheduled hospital healthcare utilisation over the twelve months prior to the point of cross-sectional LTC data acquisition. The LTCs identified in Table 2 include all the conditions considered 'common and important' in the Barnett et al. (2012) study, with the exception of anxiety disorders, which are not included in the QOF coding set. That study analysed the prevalence of 40 disorders in a Scottish cohort of 1,751,841 people, reporting multi-morbidity and comorbidity between physical health and mental health conditions (Barnett et al., 2012)

Research questions

- What is the extent of GP identified comorbidity between common long term conditions and depression in Sheffield?
- Do patients with co-morbid depression and a long term condition have more unscheduled care than patients with a long term condition only?

Methods

Design

Retrospective observational study using routinely recorded service data.

Setting

The work was undertaken using a full population dataset for Sheffield, having a primary care registered population of 587,300 of mixed ethnic population (19.2% of Sheffield's population is of black or minority ethnic origin) (ONS, 2013). The Index of Multiple Deprivation 2015 Rank Average score statistic places Sheffield as the 60th most deprived local authority in England out of 326 local authorities. This average reflects a city with widely varied levels of deprivation between local areas (Department for Communities and Local Goverment, 2015)

Data collection

The analysis was undertaken using routine NHS commissioner datasets; no additional information was required from individuals and they were not approached. All primary care registered adults were included (n=469,368), a subset of whom appeared in planned and/or unplanned secondary care service records (as inpatient, outpatient or emergency department attendance). Person demographics and LTC diagnosis status at 30/6/2016 – including depression – were ascertained from the primary care record. Diagnostic data therefore reflected the prevalence of LTCs, including depression, as recorded by GPs prior to that date, and not removed by them before that date. All data were de-identified using approved procedures prior to transfer from the NHS to the study team. The study dataset included a unique pseudonym to enable linking records at the person level. Deprivation status was determined by attributing an Index of Multiple Deprivation (IMD) score, IMD2015 (Department for Communities and Local Goverment, 2015) at the Lower Layer Super Output Area (LSOA) level. This was done by mapping individuals' postcodes of

residence into LSOA prior to de-identification. Study data were stored in accordance with standard University of Sheffield information governance policy on anonymised data.

Analysis

Descriptive statistics included demographics; types and numbers of LTCs; extent of GP recorded depression; extent of comorbidity between LTCs and depression; number of emergency department attendances and number of unscheduled and planned hospital inpatient spells.

The proportion of individuals who had ≥1 'unscheduled attendance' over a twelve month period from 01/7/2015 to 30/6/2016 were compared using chi squared for patients identified with LTCs other than depression only, and for patients with comorbid depression.

A logistic regression model was developed to determine the influence of depression on the likelihood that patients with a LTC would access unscheduled care over the specified 12-month period. Other potential confounding variables including age, gender, IMD and number of LTCs were added to the model before including the diagnosis of depression. The categorical age and IMD variables were dummy coded when entered into the model. Therefore, all age categories presented in Table 1 were compared to the reference category of 18-44 years and all IMD quintiles displayed in Table 1 were compared to the reference category of the 20% least deprived quintile as defined by LSOA of residence. Odds Ratios (ORs) with 95% CIs were reported for significant predictor variables.

Ethics Review

Ethical approval granted by Camberwell Research Ethics Committee (REC ref 15/LO/1209 on 23.07.2015) on behalf of the UK National Research Ethics Service.

Results

The prevalence of LTCs, depression and comorbidity

Data were available on 469,368 adults aged 18 and over. Table 1 provides demographic details for the population. Of these, 33.2% of the population are resident in LSOAs matching the most deprived quintile of the English population. Amongst the adult population 220,010 (46.9%) had at least one QOF compliant LTC (including depression). 75,107 (16.0%) of the adult population had a recorded diagnosis of depression. Of the total adult population 38,232 (8.1%) had a GP recorded diagnosis of depression plus at least one other QOF compliant LTC. Of all patients diagnosed with at least one LTC (excluding depression) 20.9% also had a diagnosis of depression. Of all patients diagnosed with depression, 50.9% had at least one other LTC. Table 2 provides a detailed breakdown of the prevalence of the QOF compliant LTCs in people with or without recorded depression. Table 2 also details how QOF LTCs were grouped for subsequent analyses to avoid double counting of overlapping conditions. Figure 1 provides a visual representation of the same data ordered to illustrate the likelihood of depression in each LTC.

Unscheduled Care

The proportion of patients who accessed unscheduled care over the twelve month period from 01/7/2015 to 30/6/2016 increased as the number of reported LTCs increased (see figure 2). Amongst patients with depression and no other LTC 22.8% accessed unscheduled care on at least one occasion over the same period. The proportion of individuals who had ≥1 'unscheduled attendance' over the previous 12 months were compared using chi

squared for patients identified with physical health LTC(s) only (24.0%), and for patients with comorbid depression (31.5%). There was a statistically significant association between co-morbid depression and use of unscheduled care, $X^2(1)=883.860$, p<.001.

A logistic regression model was also developed, to determine the effects of depression on the likelihood that patients with a LTC would access unscheduled care over the specified 12 month period. A Bonferroni correction was applied resulting in statistical significance being accepted at the level of p < .004. The final logistic regression model was statistically significant, X^2 (13)=5550.319, p < .001. The model explained 4.4% of the observed variation in access to unscheduled care on one or more occasion in the 12 months. Table 4 shows all significant predictors of access to unscheduled care. Results suggest that individuals with a diagnosis of depression and at least one LTC were 1.59 times more likely to use unscheduled care in the 12 months than individuals with at least one LTC and no diagnosis of depression. Patients in the 45-64 and 65-84 year age groups were less likely to use unscheduled care than those aged 18-44 years, whereas patients aged above 85 years were more likely to use unscheduled care than those under 45 years. Females and those in the most deprived areas were also more likely to use unscheduled care. A significant interaction between age and depression was identified and subsequently included in the model (Figure 3), with the influence of depression reducing in the highest age categories.

Discussion

LTCs were common within this population, with 46.9% of adults having one or more LTC recorded. This is in line with the results of a large cross-sectional study of a Scottish population that reported an overall rate of 42.2% (Barnett et al., 2012). That study included

children, whereas the current study only included adults aged 18 and over. Prevalence reported in this study were generally higher than for the overlapping conditions reported by Barnett et al. (2012), even taking account of the differences in population. The exceptions were lower reported prevalence in this study for chronic obstructive pulmonary disease (2.6% vs. 3.2%) and peripheral vascular disease (0.9% vs. 1.3%). The largest differences in reported prevalence were for depression (16.0% vs. 8.2%), asthma (12.0% vs. 6.0%), atrial fibrillation (7.1% vs. 1.4%), chronic kidney disease (4.3% vs. 1.9%), and epilepsy (1.4% vs. 0.8%). The differences between reported prevalence rates for asthma and epilepsy may have been affected by the Scottish study requiring a prescription of a relevant medication in the previous twelve months. The difference between reported prevalence for depression may have been affected by the Scottish study requiring that a Read code for depression was recorded in the previous twelve months, or that four anti-depressant prescriptions had been provided. The current study followed QOF coding rules in including all adults with a current diagnosis of depression on the primary care record, in line with a view of depression as commonly a chronic condition requiring long-term management (NICE, 2016).

Sixteen percent of the adult population had a GP recorded diagnosis of depression, and prevalence of depression was elevated compared to the general population, for patients with all QOF LTCs except learning disability. Comparing LTCs it was evident that depression was most likely to be recorded for those with a GP recorded serious mental illness, reflecting prior epidemiological findings for elevated rates of depression in people with schizophrenia (Buckley, Miller, Lehrer, & Castle, 2009).

Around 20% of the adult population made use of unscheduled hospital care over the twelve month period studied. Perhaps unsurprisingly the likelihood of making any use of unscheduled hospital care increased with the number of LTCs reported. In this study, having

a LTC and living in a more deprived area was predictive of use of unscheduled care, as was being in the youngest or oldest age categories. This finding replicates that of earlier studies indicating the importance of multi-morbidity and deprivation on use of unscheduled care (Payne et al., 2013). Even after controlling for these risk factors, the impact on unscheduled care use from having identified depression was large and statistically significant.

Multi-morbidity occurs more frequently and 10-15 years earlier in more socioeconomically deprived areas, with increasing overlap of physical and mental health problems as deprivation indices increase (McLean et al., 2014). Such factors reportedly contribute to the emergence of 'inverse care' in primary care, which in turn may increase the risk of unscheduled care (Mercer, Guthrie, Furler, Watt, & Hart, 2012; Payne et al., 2013).

The finding that those in the 18-44 age category having comorbid LTC and depression were significantly more likely to access unscheduled care compared to those in the 45-64 and 65-84 age categories would indicate particular challenges for management of this younger age group. There are indications in the literature that this may result from different patterns of multi-morbidity amongst different age bandings (McLean et al., 2014). McLean et al. (2014) identified that older multi-morbid populations were more likely to have 'concordant' physical conditions, that is those that have related aetiology and/or management, whilst multi-morbidity in younger age groups was characterised by 'discordant' physical health problems and mental health problems.

In this, the largest UK population study to date, our findings of a strong link between depression and unscheduled hospital care support findings from a smaller cross sectional population study in Scotland (Payne et al., 2013; 180,815 vs 469,368) and a prospective survey linked to GP held data of a socio-economically deprived population (1411) in Manchester, England (Guthrie et al., 2016). If we take unscheduled care use as a proxy for a

failure of planned care to support successful self-management by people living with a LTC (Langer et al., 2013; Payne et al., 2013) the findings of this study would indicate that approaches to enhance self-care for LTCs may be particularly useful for people also experiencing depression. In particular approaches that integrate care for LTCs and depression may be useful in overcoming the challenges resulting from this combination (NICE, 2016). Qualitative studies addressing why patients with LTCs use unscheduled care would indicate that they often do so because of a sense of pressing need that is not being met by other health services (Langer et al., 2013). Individualised management plans (NICE, 2016), collaborative care approaches (Gunn, Diggens, Hegarty, & Blashki, 2006) and chronic disease self-management programmes (Harrison et al., 2012) may all have particular benefits for this population.

Limitations

This study made use of combined general practice and hospital data that was, respectively, cross-sectional and retrospective in nature. As a result, the analysis was limited by the accuracy of recorded coded data. The cross-sectional nature of the prevalence data precluded identification of the direction of influence between LTCs and depression. Only those LTCs identified within the QOF were available within the dataset, so the prevalence of LTCs identified overall will under-estimate the totality of life-limiting conditions. For example, chronic pain is not a QOF condition, but was reported to be present in 7.2% of the Scottish sample reported by Barnett et al. (2012). The definition of unscheduled hospital care combined emergency department attendance and unplanned hospital admissions. The

available hospital data did not allow the disaggregation of these two types of unscheduled healthcare usage in a reliable manner. Other factors not available within the dataset could have been significant in predicting use of unscheduled hospital care in the population. Specifically, the extent of recording of ethnic origin within the GP data was poor and precluded its inclusion in the analysis. GP consultation activity was also not available within this dataset on account of data extraction challenges.

Whilst the database included a large number of people, it reflected the population of one English city that may have factors associated with it that limit the generalisability of results.

Conclusion

In people with a long term condition, depression increases use of unscheduled hospital care, even when controlling for other potential confounding variables including age, gender, deprivation and number of LTCs.

References

Ahola, A. J., & Groop, P.-H. (2013). Barriers to self-management of diabetes. *Diabetic Medicine*, *30*(4), 413–420. https://doi.org/10.1111/dme.12105

Anderson, G., Knickman, J. R., Anderson, G., Knickman, J., Nolte, E., McKee, M., … Aron, D. (2001). Changing The Chronic Care System To Meet People's Needs. *Health Affairs*, *20*(6), 146–160. https://doi.org/10.1377/hlthaff.20.6.146

Barnett, K., Mercer, S. W., Norbury, M., Watt, G., Wyke, S., & Guthrie, B. (2012). Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *The Lancet*, *380*(9836), 37–43. https://doi.org/10.1016/S0140-6736(12)60240-2

BMA, & NHS. (2016). 2016/17 General Medical Services (GMS) contract Quality and Outcomes Framework (QOF) Guidance for GMS contract 2016/17. London: NHS Employers.

Brilleman, S. L., Purdy, S., Salisbury, C., Windmeijer, F., Gravelle, H., & Hollinghurst, S. (2013). Implications of comorbidity for primary care costs in the UK: a retrospective observational study. *British Journal of General Practice*, *63*(609).

Buckley, P. F., Miller, B. J., Lehrer, D. S., & Castle, D. J. (2009). Psychiatric comorbidities and schizophrenia. *Schizophrenia Bulletin*, *35*(2), 383–402.

Chisholm, J. (1990). The Read clinical classification. *BMJ (Clinical Research Ed.)*, *300*(6732), 1092.

Department for Communities and Local Goverment. (2015). *English indices of deprivation 2015*. London: GOV.UK.

DoH. (2014). *Comorbidities: A framework of principles for system wide action*. London.

Fredericks, S., Lapum, J., & Lo, J. (2012). Anxiety, Depression, and Self-Management: A

Systematic Review. *Clinical Nursing Research*, *21*(4), 411–430.

https://doi.org/10.1177/1054773812436681

Gillam, S. J., Siriwardena, A. N., & Steel, N. (2012). Pay-for-performance in the United

Kingdom: impact of the quality and outcomes framework: a systematic review. *Annals

of Family Medicine*, *10*(5), 461–8. https://doi.org/10.1370/afm.1377

Gillam, S., & Siriwardena, A. (2010). *The quality and outcomes framework – QOF-

transforming general practice*. Oxfordshire: Radcliffe Publishing Ltd.

Gunn, J., Diggens, J., Hegarty, K., & Blashki, G. (2006). A systematic review of complex

system interventions designed to increase recovery from depression in primary care.

BMC Health SErvices Research, *6*, 88.

Harrison, M., Reeves, D., Harkness, E., Valderas, J., Kennedy, A., Rogers, A., … Bower, P.

(2012). A secondary analysis of the moderating effects of depression and

multimorbidity on the effectiveness of a chronic disease self-management programme.

Patient Education and Counseling, *87*, 67–73.

Kadu, M. K., & Stolee, P. (2015). Facilitators and barriers of implementing the chronic care

model in primary care: a systematic review. *BMC Family Practice*, *16*(1), 12.

https://doi.org/10.1186/s12875-014-0219-0

Langer, S., Chew-Graham, C., Hunter, C., Guthrie, E. A., & Salmon, P. (2013). Why do

patients with long-term conditions use unscheduled care? A qualitative literature

review. *Health and Social Care in the Community*, *21*(4), 339–351.

McLean, G., Gunn, J., Wyke, S., Guthrie, B., Watt, G. C. M., Blane, D. N., & Mercer, S. W.

(2014). The influence of socioeconomic deprivation on multimorbidity at different ages.

British Journal of General Practice, *64*(624), e440–e447.

Mercer, S. W., Guthrie, B., Furler, J., Watt, G., & Hart, J. (2012). Multimorbidity and the inverse care law in primary care. *BMJ*, *344*.

Molosankwe, I., Patel, A., José Gagliardino, J., Knapp, M., & McDaid, D. (2012). Economic aspects of the association between diabetes and depression: A systematic review. *Journal of Affective Disorders*, *142*, S42–S55. https://doi.org/10.1016/S0165-0327(12)70008-3

Naylor, C., Parsonage, M., McDaid, D., Knapp, M., Fossey, M., & Galea, A. (2012). *Long-term conditions and mental health : the cost of co-morbidities*. London: The King's Fund.

NICE. (2009). *Depression in adults with a chronic physical health problem. Treatment and Management. Guideline 91.* London.

NICE. (2016). *Multimorbidity: clinical assessment and management. NG56*. London: National Institute for Health and Care Excellence.

ONS. (2013). *2011 Census: Quick statistics for England and Wales.* London.

Ory, M. G., Ahn, S., Jiang, L., Smith, M. L., Ritter, P. L., Whitelaw, N., & Lorig, K. (2013). Successes of a National Study of the Chronic Disease Self-Management Program. *Medical Care*, *51*(11), 992–998. https://doi.org/10.1097/MLR.0b013e3182a95dd1

Payne, R., Abel, G., Guthrie, B., & Mercer, S. (2013). The effect of physical multimorbidity, mental health conditions and socioeconomic deprivation on unplanned admissions to hospital: a retrospective cohort study. *Canadian Medical Association Journal*, *185*(5), E221–E228. https://doi.org/10.1503/cmaj.121349