Progress in using the electronic health record to improve primary care

BACKGROUND

The seminal work in the 1970s by Geoffrey Rose on population-based strategies for prevention[1] and Julian Tudor Hart on evidence-based anticipatory care[2,3] had a profound influence on primary care and were actively supported by the Royal College of General Practitioners.

In 1985 in the East London borough of Tower Hamlets, five GP practices collaborated as the Healthy Eastenders Project to support a basic electronic health record (EHR) system, employing nurses for preventive activities and providing comparative audits of their care. By 1992, with the first wave of general practice computerisation, a single EHR system, Egton Medical Information Systems (EMIS), was deployed across all practices in Tower Hamlets with the neighbouring boroughs of City and Hackney and Newham following closely. The Clinical Effectiveness Group (CEG) began to form a supportive network for implementing and evaluating work on preventive care across the locality.[4] The early system required 'floppy disks' to extract data using Morbidity Information Query and Export Syntax (MIQUEST) with manual transport, usually by bicycle, to the CEG office to collate information from each practice. Although cumbersome, the results were transformative, and for the first time practices could see their own performance and share comparable information with their peers.[4–6]

In the early days, the theoretical framework used by the CEG team to translate evidence-based innovation into routine clinical practice was necessarily pragmatic. With increasing experience, two complementary strategies framed the process of change.

The first included elements of change management described by Kotter.[7] These included: building the case for change, forming a coalition that includes both clinicians and managers, empowering others to act on the programme by the provision of education, comparative performance data, and quality improvement tools, creating early wins for the programme, and consolidating the new approach into work-as-usual to ensure sustainability. An early example of this approach was engaging all practices to code self-reported ethnicity in the early 1990s. Working in an area where 50% of registered patients are from ethnic minority groups, the importance of understanding inequalities in access to health services and clinical management by ethnicity was clear to all, but practices needed tools and support to do the work. Embedding ethnicity recording into new patient checks and chronic disease management data entry templates provided a simple tool, and population ethnicity recording rose rapidly to >80%.[8,9] This was consolidated by local commissioners providing financial support for health advocacy and translation services where they were most needed.

The second theoretical approach drew on Michie's behaviour change wheel.[10] Interventions are characterised by and linked to a core behaviour framework that includes:

- opportunity — environmental factors that prompt the desired behaviour, such as clinical guidelines and professional ownership;
- capability — including the knowledge, clinical and data management skills, and psychological capacity to engage with the activity; and
- motivation — which combines comparative peer performance review, emotional response to energise and direct behaviour, and financial incentives.

In this model CEG provided the analytic support for practice IT capability, and for practice-based facilitators to train and engage staff in using data entry templates, dashboards, patient recall searches, and on-screen prompts. These facilitators connect individual practices to the delivery of new programmes. The main components of the CEG approach to data-enabled improvement are summarised in Box 1.

TRUST AND LEADERSHIP

The CEG programmes won the trust of GPs by supporting them to work more efficiently, with greater patient benefit at reduced cost, while also increasing practice income. The CEG functioned as a non-aligned 'honest broker'. The neutral university location of the CEG reduced GP anxieties about the policing of performance by commissioners, and commissioner anxieties about GPs 'gaming' their performance for financial benefit.

Trust was further strengthened by CEG clinical leads, who worked locally as GP principals, had part-time academic appointments in the university, and held prominent positions in local commissioning organisations. Clinical leadership influenced the 'sign up' to data-sharing agreements with all GPs, the service agreements with hospital clinicians for novel care pathways, and the support from commissioners for new quality improvement programmes requiring additional funding. Effective clinical leadership has also been a major feature in US healthcare improvement and was

Box 1. Core components of the CEG approach to data-enabled improvement[a]

Prioritisation: agreement with local clinicians and managers on areas to target. Based on evidence, ability to make change, alignment of financial incentives, measurability, and overall value.	**Guidelines:** the CEG publishes local guidelines for target conditions, to achieve consensus on standards. These are evidence based and locally trusted.
Education: at CCG and local networks events, the CEG contributes to teaching on the content of agreed local guidelines.	**Clinical data entry templates:** these standardise clinical coding for common chronic disorders, and support performance measurement. Designed by the CEG team and embedded within the EHR system.
Computerised clinical prompts: a range of 'in consultation' and 'back office' searches and prompts. These increase guideline adherence by reminding clinicians of best practice and providing lists of patients for review.	**Analytics and dashboards:** data are pulled centrally from practice systems to the CEG. Interactive dashboards show comparative performance, which is benchmarked locally, regionally, and nationally.
Practice facilitation: serves to align CEG functions across practices. Facilitators get to know a group of practices and support data management and use of quality improvement tools. This role also provides feedback to the CEG for continuous improvement.	

[a]*Based on* Sharing to Improve, *Health Foundation briefing, May 2018.*[11] *CCG = clinical commissioning group. CEG = Clinical Effectiveness Group. EHR = electronic health record.*

highlighted in the Wachter report.[12–15]

The Wachter report also pointed out that digitisation is only one part of a whole system of change, and that:

'... implementing health IT is one of the most complex adaptive changes in the history of healthcare, and perhaps of any industry. Adaptive change involves substantial and long-lasting engagement between the leaders implementing the changes and the individuals on the front lines who are tasked with making them work.'[12]

IMPACT ON CLINICAL PERFORMANCE

Delivering the Quality and Outcomes Framework

The East London boroughs of Tower Hamlets, City and Hackney, and Newham include a population of 1 million people, registered at 140 general practices, who are among the most disadvantaged and ethnically diverse in the UK. Almost half the population in each of these clinical commissioning groups (CCGs) is of non-white ethnic origin. Some 35% of children live in poverty, with one in three children obese at the age of 11. Rates of ill health are high, and Newham has a higher prevalence of tuberculosis than anywhere else in Western Europe.[16]

In 2000 the UK government established the National Service Frameworks, which for the first time set out a road map for evidence-based chronic disease management.[17] This paved the way for the introduction of the Quality and Outcomes Framework (QOF) for general practice in 2004, a pay-for-performance scheme covering a broad range of chronic diseases, with financially incentivised targets for clinical indicators, designed to improve evidence-based care across the country. At the start of this programme general practices in East London were often in the lowest quintile of national performance. Over the next decade these three CCGs became among the most improved in England, with rankings in the top three positions among the 209 CCGs nationally for 25% of the 60 clinical QOF indicators in 2016/2017.[18]

The focus of the CEG is on clinical improvement, particularly for chronic disease management and preventive programmes including cardiovascular disease, diabetes, chronic kidney, lung disease, and immunisation. It promotes programmes with a robust evidence base, high impact, and value for money.

Using regular, comparative practice audits to harness professional activity, blood pressure control across the domains of hypertension, coronary heart disease (CHD), and diabetes improved faster than the London average.[19] These improvements were even more impressive when compared with the achievement of CCGs across England. Although in the top decile of deprivation, two of the three CCGs achieved the highest performance in England for blood pressure control in those with diabetes (Figure 1). The three CCGs perform above the English average by 5%, and above similarly deprived CCGs by 10%: each 1% represents about 1 year of improvement in these metrics, indicating a gap of 10 years in achievement between East London and some similarly disadvantaged areas.[19]

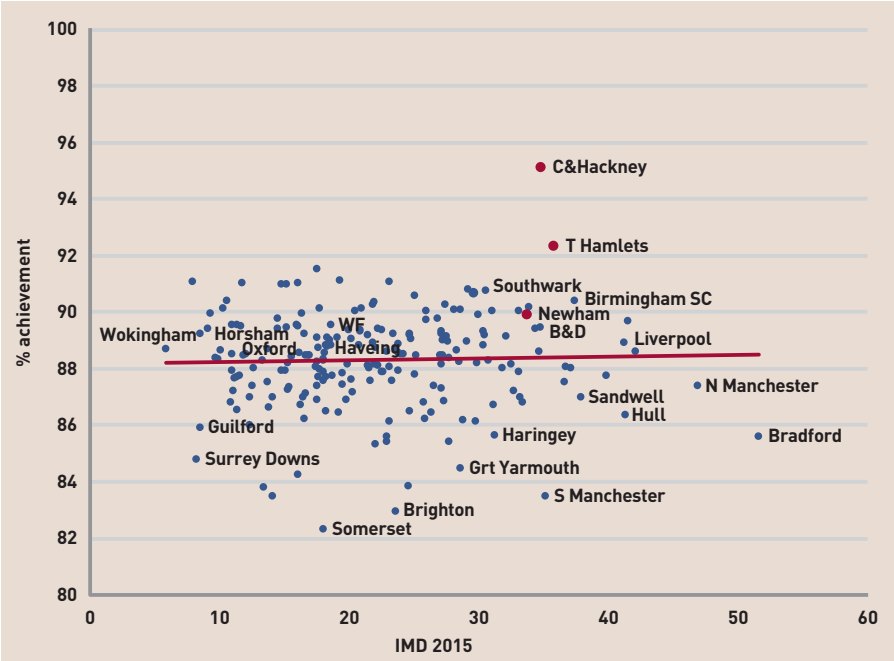
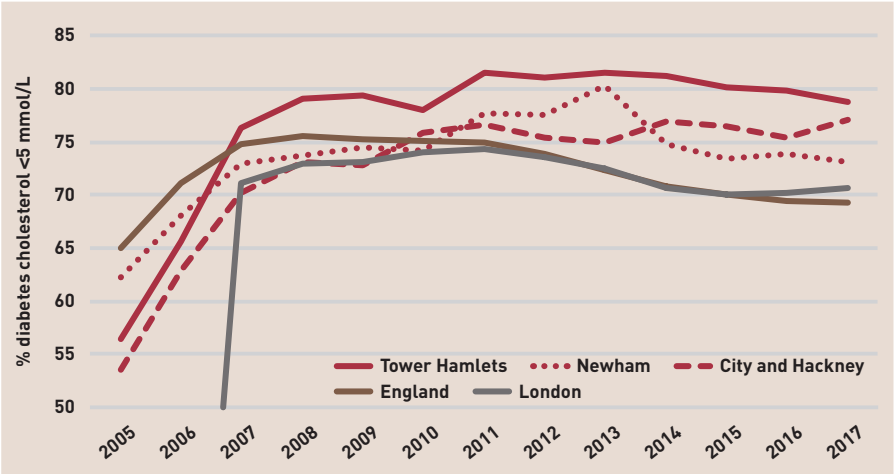


Figure 1. Blood pressure control for people with diabetes by CCG ranked by IMD: QOF 2015.[a]
[a]Average trend in red. CCG = clinical commissioning group. IMD = Index of Multiple Deprivation. QOF = Quality and Outcomes Framework. Source: adapted from QOF and NHS Digital data.

Cardiovascular diseases are the commonest major ameliorable diseases, and, along with smoking and blood pressure reduction, lipid-lowering treatment has a substantial impact on reducing hospital admissions or death. East London CCGs showed rapid improvement in the proportion of people with diabetes achieving cholesterol levels <5 mmol/L (Figure 2). Over 90% of patients in these CCGs with established cardiovascular disease — CHD, stroke, or peripheral arterial disease — are on a statin. Figure 3 shows that Tower Hamlets has the

Figure 2. Percentage of patients with diabetes achieving target serum cholesterol <5 mmol/L in East London CCGs compared with London and England 2005–2017. CCG = clinical commissioning group. QOF = Quality and Outcomes Framework. Source: adapted from QOF and NHS Digital data.



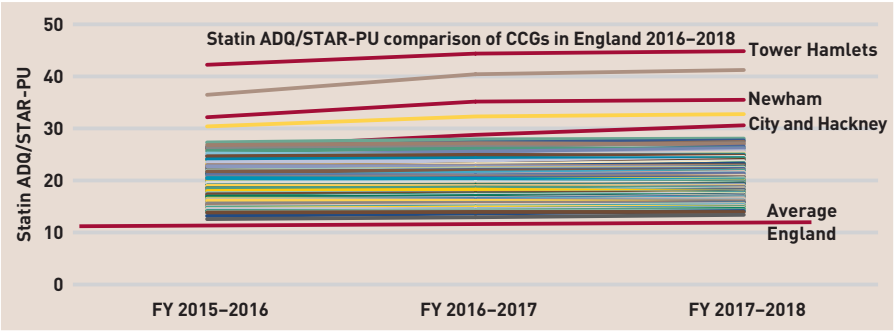


Figure 3. Statin prescribing across all CCGs in England 2016-2018: ADQ per standard prescribing unit. ADQ = average daily quantity. CCG = clinical commissioning group. FY = financial year. STAR-PU = Specific Therapeutic group Age-sex Related Prescribing Unit.

highest per capita spend on statins in the UK with City and Hackney and Newham not far behind, with a widening gap compared with most CCGs in England from 2014–2016.

Supporting local enhanced services and programmes for managed practice networks

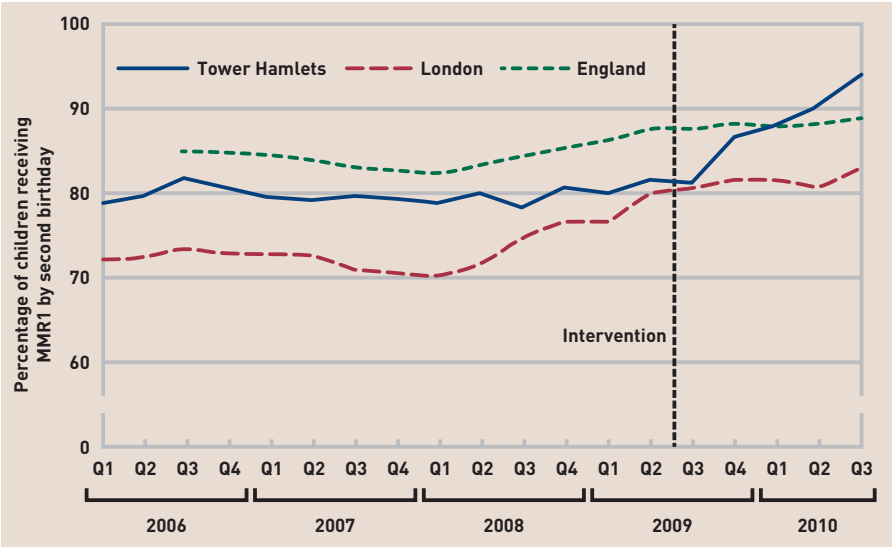
In 2008 Tower Hamlets invested growth money into eight managed practice networks, each with four to five practices covering 20 000–30 000 patients. Networks were created to improve the systematic delivery of chronic disease management, and to engage practices in collaborative working to find solutions for care delivery in a multi-ethnic, socially deprived area with rapid patient turnover. Practices were rewarded financially at network level, but retained autonomy over how improvements were delivered.[20] The CEG provided IT support, including near real-time network dashboards, which enabled data sharing and inter-practice scrutiny that fostered improvement. There were rapid early successes for these programmes, and examples include the early improvement in childhood immunisation rates (Figure 4), uptake of pulmonary rehabilitation for chronic lung disease, and attendance at retinal screening for patients with diabetes.[21–23] Enhanced services programmes with similar clinical content and successful implementation, without using practice networks, were developed in the other two CCGs. Recently all have developed CCG provider networks that contribute to the choice of programmes and to practice support.

CEG-LED QUALITY IMPROVEMENT PROGRAMMES

Extending the population reach of effective interventions

Additional CEG-led quality improvement programmes, supported by local practices, were introduced in participating CCGs. The following examples include programmes that extend the reach of evidence-based interventions into the population, and those that reduce ineffective activity.

Figure 4. Quarterly uptake of the MMR1 vaccine for Tower Hamlets 2006–2010 compared with London and England. Reproduced from Cockman P, Dawson L, Mathur R, Hull S. Improving MMR vaccination rates: herd immunity is a realistic goal.* BMJ *2011; 343: d5703 with permission from BMJ Publishing Group Ltd.[21]



Pulse checks and use of anticoagulation for atrial fibrillation

A programme of opportunistic recording of pulse regularity in people ≥65 years was started in 2014. Within 3 years the recording culture had changed and pulse checks had become the new normal, with 90% uptake across all participating CCGs (Figure 5). The size of the atrial fibrillation (AF) registers increased by 9% over 3 years, comprising an additional 790 patients identified with AF across the three CCGs.[24]

Over this period aspirin monotherapy (no longer recommended) for AF was reduced by more than half in 3 years, and anticoagulation increased by 15% as patients were switched from aspirin to anticoagulants. East London CCGs now have among the best performance in London for managing AF.

Improving CKD coding and primary care management

There is good evidence that the high rates of cardiovascular risk associated with chronic kidney disease (CKD) can be reduced by blood pressure control and the use of statins,[25] and that progression of CKD can be delayed by lowering blood pressure.[26]

Data from the recent national CKD audit demonstrate an association between coding status and better primary care management.[27] Lack of coding is associated with higher rates of unplanned hospital admission.[28]

The East London programme to improve coding rates included CKD dashboards, local guidance, and data-driven in-practice facilitation, focusing clinical visits for practices in the lowest decile of CKD coding.[29] Figure 6 shows the improvement in the three CCGs implementing this programme, with little change in neighbouring Waltham Forest, which acted as a natural control.

STOPPING INEFFECTIVE INTERVENTIONS AND SAVING MONEY

Reducing blood sugar testing

Self-monitoring for type 2 diabetes is, after insulin, the most expensive aspect of diabetes care. Free machines supplied by drug companies are handed out in pharmacies and diabetes clinics, 'locking in' patients to a lifetime supply of expensive testing strips.

Consensus on self-testing for diabetes was developed among local GP leads, consultants, specialist nurses, and

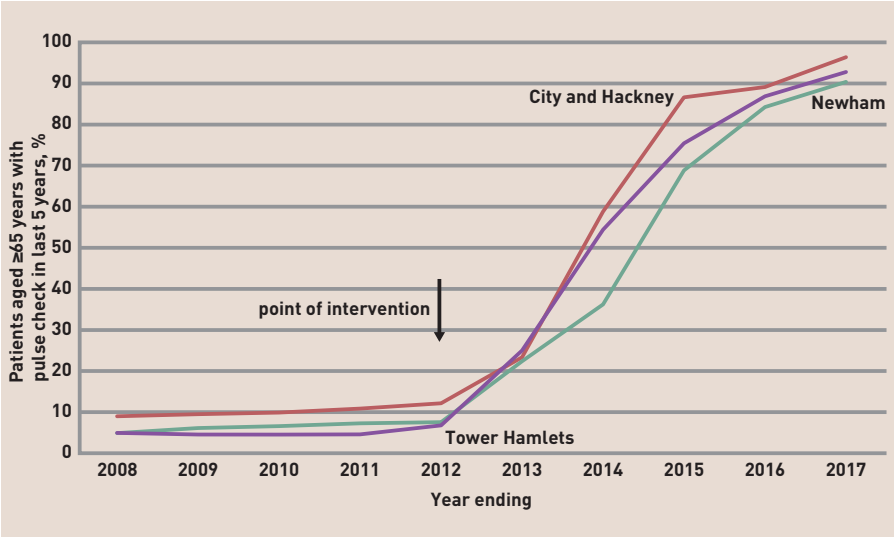


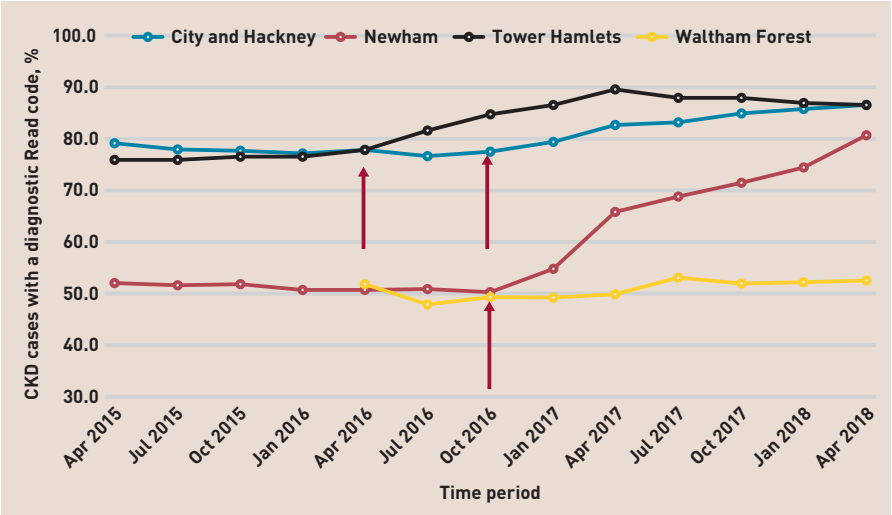
***Figure 5. Proportion of people >65 years with a pulse check in the previous 5 years in participating CCGs. CCG = clinical commissioning group. Source: Cole J, Torabi P, Dostal I,* et al. *Opportunistic pulse checks in primary care to improve recognition of atrial fibrillation: a retrospective analysis of electronic patient records.* Br J Gen Pract *2018; DOI: https://doi.org/10.3399/bjgp18X696605.*[24]**

prescribing advisers to reduce unnecessary self-testing. A programme supported by guidelines, dashboards, and local education reduced test strip prescribing from 40% to <10% among people not on insulin in the two intervention CCGs, with Newham acting as a natural control as it did not initially take part (Figure 7). If replicated nationally this programme would avoid unnecessary testing in 340 000 people and reduce prescribing costs by £21.8 million per annum.[30]

Reducing liver function tests for monitoring statins

Routine liver function tests (LFTs) for statin monitoring account for about 40% of all liver function testing and annual testing costs more than the cost of the statin. For most CCGs a full array of six to seven analytes are bundled together as the only ordering option for LFTs. For routine statin monitoring National Institute for Health and Care Excellence guidance recommends measurement of a single analyte, the ALT. Our intervention consisted of unbundling LFTs to enable ordering ALT alone, providing guidance to GPs and reporting on continuing progress. This achieved a 20% reduction in total LFTs, and reduced cost in Tower Hamlets CCG by £130 000 within a year.[31]

***Figure 6. CKD coding improvement across East London 2015–2018. CKD = chronic kidney disease. Source: Hull SA, Rajabzadeh V, Thomas N,* et al. *Improving coding and primary care management for patients with chronic kidney disease: an observational controlled study in East London.* Br J Gen Pract *2019; DOI: https://doi.org/10.3399/bjgp19X704105.*[29]**



DEVELOPING SERVICES ACROSS PRIMARY AND SECONDARY CARE

UK primary care has been an international leader in the use of electronic health records since the 1980s. In contrast, NHS hospitals were slow to follow international examples of integrated clinical record systems such as Geisinger in Pennsylvania, Intermountain in Utah, and Partners HealthCare in Massachusetts, relying instead on administrative data such as Hospital Episode Statistics to attempt to drive clinical improvement.[32]

In general practice clinical work is now almost entirely paperless, and telephone and email have become commonplace.[33] However, interoperable records between hospital and primary care continue to elude most of these initiatives. Typically, electronic GP referral letters to hospitals are still printed on arrival and then scanned as attachments to the hospital record.

There are important recent initiatives for change. Viewing of selected data between the GP EHR and the hospital EHR has become standard practice in East London. When a patient arrives in the hospital ward, a summary view of the GP EHR is available, indicating current medication and comorbidities. In the hospital record, the imaging reports and blood tests results are viewable by GPs.

East London community renal service

This novel community renal service, developed by CEG and Barts Health NHS Trust, is one example of integrating primary care population data with a hospital service. Population components include practice searches to code and manage patients where blood tests indicate they have unrecognised CKD, and a practice 'trigger tool' to identify patients with a falling eGFR who may be at risk of progressive CKD.[34] All patients requiring routine specialist advice are consented for record sharing and referred into the locality 'virtual renal clinic'. The entire patient record is reviewed by the consultant nephrologist using their hospital version of EMIS, and a management plan is written for GPs to view.

Many of these 'virtual' patients are older and have multiple comorbidities. They no longer need to travel further than their GP surgery for specialist advice. Wait time for a consultant nephrology opinion has fallen from 3 months to <10 days.

The integration of secondary and primary care services along the entire patient pathway has major applications for the commonest causes of hospital admission. However, changing the social organisation

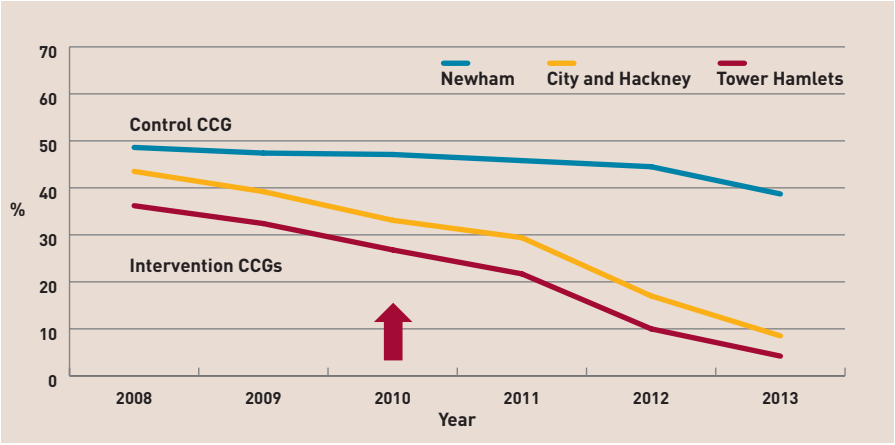


Figure 7. Proportion of patients with type 2 diabetes on no treatment or metformin only, who are prescribed self-monitoring blood glucose.[a] [a]The red arrow marks the start of the intervention. CCG = clinical commissioning group. Source: Robson J, Smithers H, Chowdhury T,* et al. *Reduction in self-monitoring of blood glucose in type 2 diabetes: an observational controlled study in east London.* Br J Gen Pract *2015; DOI: https://doi.org/10.3399/bjgp15X684421.[30]

of care is a complex task in which usable data is only one element

INTERNATIONAL PERFORMANCE

In this report we describe progression to national excellence in local CCG performance. East London performance is also internationally good. Table 1 compares performance in the 2017 English QOF with the US performance metrics from Healthcare Effectiveness Data and Information Set (HEDIS) for Kaiser Permanente Southern California, a high-performing US healthcare provider. Comparative results for diabetes care were better in East London, where care is provided for the entire population without exclusion. We estimate that about 20–30% would be excluded in the US. The East London data, from QOF 2016/2017, are without exception reporting. The 2017 HEDIS figures for commercial and Medicare clients have been averaged.[35] The UK blood pressure target is more stringent than the Kaiser target.

DISCUSSION

The success of quality improvement in East London primary care is contingent on several factors. These include local GP champions, farsighted commissioners, and a 'wise choice' of target conditions to ensure that programme choice was clinically important, measurable, and achievable within primary care. A further common factor in all three CCGs has been facilitated support for practice digital enablement by the CEG. Located in the university, and with independence from the CCGs, it enables practice data to be used for learning and improvement, rather than simply managing performance or attributing blame. Together these factors have formed the components of a local learning health system able to learn collectively and respond actively to the needs of both patients and providers.

Scaling up: next steps

Collaborative working is now well established in East London. How transferable are these programmes and patterns of working? Currently CEG is working by invitation in other East London CCGs, being careful to 'choose wisely' to ensure early successes using established programmes such as diabetes and AF. We expect it to take 3 years to build engagement and trust with new CCGs and GP practices. The importance of understanding the local context, and building trust with early successes, cannot be overstated. Providing practice tools and facilitation to support a core programme leads to increased capability, and in turn this leads to willingness to try more complex initiatives. Similar programmes are established in Southwark, and the North West London Integrated Care Services have independently developed similar projects across a comparable population.[36,37]

East London is now engaged in a new chapter of digital maturity with the development of Discovery. This is a data service that will integrate primary and secondary care data and contribute to the extension of such services across London.[38,39] Discovery is a system that will provide real-time access to the EHR for the extended clinical team, wherever they are based. It will also provide commissioning intelligence and an expanded information service for quality improvement, service redesign, and research into the next decade.

Table 1. Comparison of performance measures for patients with diabetes from HEDIS and QOF: Kaiser and East London CCGs 2017

	City and Hackney	Tower Hamlets	Kaiser Permanente
HbA1c <9%	80.4%	80.1%	78.8%
East London: blood pressure <140/80 mmHg, Kaiser <140/90 mmHg	84.2%	81.2%	77.0%

CCG = clinical commissioning group. HEDIS = Healthcare Effectiveness Data and Information Set. QOF = Quality and Outcomes Framework.

ADDRESS FOR CORRESPONDENCE

Sally A Hull
Centre for Primary Care and Public Health, Queen Mary University of London, 58 Turner Street, London E1 2AB, UK.
Email: s.a.hull@qmul.ac.uk

John Robson,
Reader in Primary Care, Centre for Primary Care and Public Health, Queen Mary University of London, London.

Kambiz Boomla,
Senior Clinical Lecturer, Centre for Primary Care and Public Health, Queen Mary University of London, London.

Sally A Hull,
Reader in Primary Care, Centre for Primary Care and Public Health, Queen Mary University of London, London.

Acknowledgements
The Clinical Effectiveness group is led by John Robson, Sally Hull, and Kambiz Boomla, and the staff are managed by Keith Prescott. The achievement in East London builds on the vision and trust of the GPs and their staff, the local CCGs, and the hospital consultants and administration.

Ethical approval
All data from reported publications were de-identified and managed according to the UK NHS information governance requirements. Ethical approval was not required for these reports as they rely on the use of routinely recorded de-identified data published in aggregate form.

Funding
Core CEG activity is funded by all participating clinical commissioning groups.

Competing interests
The authors have declared no competing interests.

DOI: https://doi.org/10.3399/bjgp20X708281

REFERENCES

1. Rose G. Strategy of prevention: lessons from cardiovascular disease. *Br Med J (Clin Res Ed)* 1981; **282(6279):** 1847–1851.
2. Hart JT. The marriage of primary care and epidemiology: the Milroy lecture, 1974. *J R Coll Physicians Lond* 1974; **8(4):** 299–314.
3. Hart JT. The inverse care law. *Lancet* 1971; **1(7696):** 405–412.
4. Robson J, Boomla K, Fitzpatrick S, *et al.* Using nurses for preventive activities with computer assisted follow up: a randomised controlled trial. *BMJ* 1989; **298(6671):** 433–436.
5. Atri J, Falshaw M, Livingstone A, Robson J. Fair shares in health care? Ethnic and socioeconomic influences on recording of preventive care in selected inner London general practices. Healthy Eastenders Project. *BMJ* 1996; **312(7031):** 614–617.
6. Falshaw ME, Fenton C, Parsons L, Robson J. Improving the uptake of breast screening: one initiative in east London. *Public Health* 1996; **110(5):** 305–306.
7. Kotter JP. Leading change: why transformation efforts fail. *Harvard Business Review* 1995; **March–April:** 59–67.
8. Hull S, Mathur R, Boomla K, *et al.* Research into practice: understanding ethnic differences in healthcare usage and outcomes in general practice. *Br J Gen Pract* 2014; DOI: https://doi.org/10.3399/bjgp14X683053.
9. Hull SA, Mathur R, Badrick E, *et al.* Recording ethnicity in primary care: assessing the methods and impact. *Br J Gen Pract* 2011; DOI: https://doi.org/10.3399/bjgp11X572544.
10. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011; **6:** 42.
11. Fisher R, Thorlby R, Warburton W. *Sharing to improve: four case studies of data sharing in general practice.* London: Health Foundation, 2018. https://www.health.org.uk/publication/sharing-improve-four-case-studies-data-sharing-general-practice (accessed 22 Jan 2020).
12. Wachter RM. *Making IT work: harnessing the power of health information technology to improve care in England. Report of the National Advisory Group on Health Information Technology in England.* 2016. https://www.gov.uk/government/publications/using-information-technology-to-improve-the-nhs (accessed 22 Jan 2020).
13. James BC, Savitz LA. How Intermountain trimmed health care costs through robust quality improvement efforts. *Health Aff (Millwood)* 2011; **30(6):** 1185–1191.
14. Institute of Medicine, Committee on Quality of Health Care in America. *Crossing the quality chasm: a new health system for the 21st century.* Washington, DC: National Academy Press, 2001.
15. Califf RM, Robb MA, Bindman AB, *et al.* Transforming evidence generation to support health and health care decisions. *N Engl J Med* 2016; **375(24):** 2395–2400.
16. Watts J. 'Dickensian levels' of tuberculosis in Newham are higher than in Tajikistan. *Evening Standard* 2015; **25 Mar:** https://www.standard.co.uk/news/health/dickensian-levels-of-tb-in-newham-are-higher-than-in-tajikistan-10134217.html (accessed 22 Jan 2020).
17. Department of Health. *National service framework for diabetes: standards.* 2001. http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4002951 (accessed 22 Jan 2020).
18. Quality and Outcomes Framework. Quality and Outcomes Framework data 2016/17 results. 2017. https://digital.nhs.uk/data-and-information/publications/statistical/quality-and-outcomes-framework-achievement-prevalence-and-exceptions-data/quality-and-outcomes-framework-qof-2016-17 (accessed 5 Feb 2020).
19. Robson J, Hull S, Mathur R, Boomla K. Improving cardiovascular disease using managed networks in general practice: an observational study in inner London. *Br J Gen Pract* 2014; DOI: https://doi.org/10.3399/bjgp14X679697.
20. Pawa J, Robson J, Hull S. Building managed primary care practice networks to deliver better clinical care: a qualitative semi-structured interview study. *Br J Gen Pract* 2017; DOI: https://doi.org/10.3399/bjgp17X692597.
21. Cockman P, Dawson L, Mathur R, Hull S. Improving MMR vaccination rates: herd immunity is a realistic goal. *BMJ* 2011; **343:** d5703.
22. Hull S, Mathur R, Lloyd-Owen S, *et al.* Improving outcomes for people with COPD by developing networks of general practices: evaluation of a quality improvement project in east London. *NPJ Prim Care Respir Med* 2014; **24:** 14082.
23. Hull SA Chowdhury T, Mathur R, Robson J. Improving outcomes for type 2 patients with diabetes using general practice networks: a quality improvement project in east London. *BMJ Qual Saf* 2014; **23(2):** 171–176.
24. Cole J, Torabi P, Dostal I, *et al.* Opportunistic pulse checks in primary care to improve recognition of atrial fibrillation: a retrospective analysis of electronic patient records. *Br J Gen Pract* 2018; DOI: https://doi.org/10.3399/bjgp18X696605.
25. Baigent C, Landray MJ, Reith C, *et al.* The effects of lowering LDL cholesterol with simvastatin plus ezetimibe in patients with chronic kidney disease: a randomised placebo-controlled trial. *Lancet* 2011; **377(9784):** 2181–2192.
26. Lv J, Ehteshami P, Sarnak MJ, *et al.* Effects of intensive blood pressure lowering on the progression of chronic kidney disease: a systematic review and meta-analysis. *CMAJ* 2013; **185(11):** 949–957.
27. Kim LG, Cleary F, Wheeler DC, *et al.* How do primary care doctors in England and Wales code and manage people with chronic kidney disease? Results from the National Chronic Kidney Disease Audit. *Nephrol Dial Transplant* 2018; **33(8):** 1373–1379.
28. Cleary F, Kim L, Caplin B, *et al. National Chronic Kidney Disease Audit. National report: Part 2.* Healthcare Quality Improvement Partnership, 2017. https://www.hqip.org.uk/resource/national-chronic-kidney-disease-audit-national-report-part-2/#.Xihc4ef7SDc (accessed 22 Jan 2019).
29. Hull SA, Rajabzadeh V, Thomas N, *et al.* Improving coding and primary care management for patients with chronic kidney disease: an observational controlled study in East London. *Br J Gen Pract* 2019; DOI: https://doi.org/10.3399/bjgp19X704105.
30. Robson J, Smithers H, Chowdhury T, *et al.* Reduction in self-monitoring of blood glucose in type 2 diabetes: an observational controlled study in east London. *Br J Gen Pract* 2015; DOI: https://doi.org/10.3399/bjgp15X684421.
31. Homer K, Robson J, Solaiman S, *et al.* Reducing liver function tests for statin monitoring: an observational comparison of two clinical commissioning groups. *Br J Gen Pract* 2017; DOI: https://doi.org/10.3399/bjgp17X689365.
32. Knapton S. How the NHS got it so wrong with care.data. *Daily Telegraph* 2016; **7 Jul:** https://www.telegraph.co.uk/science/2016/07/07/how-the-nhs-got-it-so-wrong-with-caredata/ (accessed 22 Jan 2019).
33. Chambers R, Schmid M. Making technology-enabled health care work in general practice. *Br J Gen Pract* 2018; DOI: https://doi.org/10.3399/bjgp18X694877.
34. Thomas N, Rajabzadeh V, Hull SA. Using chronic kidney disease trigger tools for safety and learning: a qualitative evaluation in East London primary care. *Br J Gen Pract* 2019; DOI: https://doi.org/10.3399/bjgp19X705497.
35. Kaiser Permanente. *2017 HEDIS® and CAHPS® report for members.* Washington, DC: Kaiser Permanente, 2018.
36. Clinical Effectiveness Southwark. South Southwark Federation and CCG. 2018. https://www.quayhealthsolutions.co.uk/clinical-effectiveness-southwark/ (accessed 22 Jan 2020).
37. North West London Whole Systems Integrated Care. 2018. https://www.healthiernorthwestlondon.nhs.uk/documents/wsic-dashboard (accessed 22 Jan 2020).
38. Readman L. *One London local health and care record exemplar — creating the data sharing ecosystem.* 2018. https://digitalhealth.london/one-london-local-health-and-care-record-exemplar-creating-the-data-sharing-ecosystem/ (accessed 22 Jan 2020).
39. Discovery: an NHS data access service 2018. https://www.discoverydataservice.org/Content/Home.htm (accessed 5 Feb 2020).