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Do managed clinical networks improve quality of diabetes care? Evidence from a retrospective mixed methods evaluation

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Abstract:

Problem: System-wide improvement of chronic disease care is challenging because it requires collaboration and communication across organisational and professional boundaries. Managed clinical networks are one potential solution, but there is little evidence of their effectiveness.

Design and setting: Retrospective, mixed-methods evaluation of the form and impact of quality improvement in the Tayside Diabetes Managed Clinical Network (MCN) 1998-2005.

Strategies for change: Progressive implementation of multiple quality improvement strategies predominately directed at individuals and clinical teams (guideline development and dissemination; education; clinical audit; encouragement of multidisciplinary team working; task redesign). Information technology played an important role in supporting QI activity, but participants identified it as facilitative rather than delivering QI by itself. More important was achieving widespread clinical engagement through persuasion and appeal to shared professional values by clinical leaders.

Effects of change: Simple process measures such as glycated haemoglobin measurement rapidly improved. More complex process measures such as eye screening improved more slowly, and were more dependent on redesign of the care pathway. Improvement was greater for type-2 than type-1 diabetes. Significant shifts of care for type-2 diabetes into primary care were achieved, but were harder to achieve without additional resources.

Lessons learnt: Delivering better care to whole populations across organisational and professional boundaries required sustained work over long periods, and at all levels of the system of care. Past network focus on clinical collaboration has been effective at improving

clinical process and outcome, and the network is now prioritising work with managers and patients to support future redesign.

Key learning points

Quality improvement (QI) activity within the Tayside Diabetes Managed Clinical Network (TDMCN) initially focused on changing individual and small team professional practice, and task redesign within the existing care pathway. This delivered large improvements in processes of care, and to a lesser extent, intermediate outcomes.

Information technology played an important role in QI activity by supporting clinical care and communication (via a web-based shared record), by automating audit and feedback (via the regional registry) and by facilitating knowledge dissemination and management (via the network website).

Key to network success was engagement of primary care and specialist clinicians in quality improvement. This was achieved through negotiation to achieve consensus across the multidisciplinary team on network vision and short to medium term goals, facilitated by leadership being enthusiastic and committed, and shared between specialists and general practitioners.

Participants in the evaluation identified lack of patient and managerial involvement during the network's formative years as problematic. In the last 2-3 years, the network has actively sought to increase patients' involvement in network planning and self-care, and to make general NHS management more engaged partners in network quality improvement.

BACKGROUND

Outline of problem

The rising incidence and prevalence of diabetes presents a growing challenge to health services internationally.[1] Systematically implementing national diabetes guidelines[2] is difficult though, because it requires clinical care and quality improvement to be co-ordinated across existing health service and disciplinary boundaries. In the UK, National Service Frameworks provide additional guidance on how clinical guidelines can be delivered, and recommend the creation of clinical networks with responsibility for all diabetes care in an area.[3-7] However, there is little reported evidence as to how networks should be organised or their effectiveness.[8 9] This paper describes the form and impact of quality improvement work in the Tayside Diabetes Managed Clinical Network (TDMCN), which has previously been identified as a model for UK diabetes services.[10]

Outline of the context

The Tayside Region of Scotland has a population of ~385,000, and includes deprived urban areas, small towns, and remote, rural areas. Primary healthcare is provided by 72 general practices, with specialist diabetes services delivered from three sites (a teaching hospital diabetes centre, and two district general hospitals), plus outreach clinics in small towns distant from these. The number of people with diabetes in the region increased by ~50% between January 1998 and January 2005, from 8,846 (2.3% prevalence) to 13,527 (3.5%).

This report is based on an independent evaluation of TDMCN conducted in 2004/5. The evaluation examined the quality improvement (QI) strategies used by the network between 1998 and 2005 through analysis of network documents (annual reports, planning documents,

minutes of network meetings), observation of meetings, and qualitative interview with multidisciplinary team members and patients. The impact of these activities was quantitatively examined by analysis of data extracted from the regional diabetes register. The evaluation was approved by Tayside Local Research Ethics Committee.

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Professionals were purposively sampled from MCN committees, and from general practices that were high and low users of the MCN website. We were unable to identify high and low website users reliably in hospital settings and so used snowballing techniques to recruit hospital professionals with variable levels of commitment to the MCN. People with diabetes were sampled from high and low web-using general practices, but initial analysis indicated that they had little knowledge of the MCN as an organisation. We therefore instead recruited lay representatives on MCN committees to explore the perspectives of informed patients (Table 2). Semi-structured interview schedules were used and lasted 30-70 minutes, and were taped and transcribed.

Table 1: In-depth interviews		
Interviews with:	**Initial sampling frame**	**Completed**
MCN core management group and Tayside Diabetes Advisory Group (TDAG)	6	9
General practitioners	4	3
Practice nurses	4	4
Practice managers	4	A
Hospital professionals	6	8
Patients sampled via practices	8	4
Supplementary interviews (patient representatives and Trust managers)	As indicated by initial analysis	5
Total	32	36

ASSESSMENT OF PROBLEMS

Since the late 1990s, clinical data for all people with diabetes in Tayside has been entered into a regional register. Accuracy and completeness is maintained by the use of a unique identifier throughout NHS Tayside (the Community Health Index number), and routine data checking and correction by MCN data facilitators. In 1998, a complete audit of all people with diabetes in Tayside identified widespread deficiencies in care, with inappropriately low levels of clinical process and outcome (table 1). This prompted widespread recognition that change was essential in both primary and secondary care.[11 12]

Table 1: Quality of diabetes care in Tayside 1/1/98

Indicator*	Type-1 diabetes % achieving indicator (numerator/denominator)		Type-2 diabetes % achieving indicator (numerator/denominator)	
Glycated haemoglobin measured	58.2	(686/1178)	58.8	(4511/7668)
Blood pressure measured	50.8	(598/1178)	61.1	(4685/7668)
Total cholesterol measured	20.0	(236/1178)	26.5	(2031/7668)
Creatinine measured	31.4	(370/1178)	41.7	(3199/7668)
Foot vascular status assessed	35.5	(418/1178)	47.2	(3621/7668)
Foot neurological status assessed	28.5	(336/1178)	38.2	(2929/7668)
Retinal screening	57.3	(675/1178)	66.6	(5111/7668)
Smoking status recorded	77.6	(914/1178)	82.9	(6357/7668)
Glycated haemoglobin ≤10%	77.7	(533/686)	90.4	(4077/4511)
Glycated haemoglobin ≤7%	13.6	(93/686)	42.8	(1933/4511)
Systolic blood pressure ≤ 140mmHg	78.4	(469/598)	50.7	(2374/4685)
Diastolic blood pressure ≤ 80mmHg	75.4	(451/598)	57.8	(2710/4685)
Total cholesterol ≤ 5mmol/l	43.2	(103/236)	30.7	(624/2031)

*Process measures = percentage of patients with record of process in previous 12 months; intermediate outcome measures = percentage of patients with measurement in last 12 months achieving target

STRATEGIES FOR CHANGE

Quality improvement activities implemented

The working assumption from the outset was that there are no single interventions, or 'magic bullets', that are guaranteed to improve quality.[13] TDMCN therefore progressively implemented a range of complementary QI strategies, within a supportive national context that included national guidelines[14] and guidance,[4] and quality improvement orientated regulation[15] by NHS Quality Improvement Scotland[16]. Table 2 shows the scope of the QI activities undertaken by TCMCN, and when each was first implemented. Analysis drew on Ferlie and Shortell's multilevel framework for healthcare quality improvement[17] to which network activities to reinforce shared goals and systematic care broadly map, although TDMCN predates and did not explicitly follow this, or any other QI model.

Table 2: Quality improvement strategies used in Tayside Diabetes Managed Clinical Network, and in Scotland

Levels[17] **Strategies used by TDMCN** (Strategies not used by TDMCN in brackets)	**Examples (identified from documentary and interview data)**	**Used from when?**
Individual professional		
Education	Single and multi-professional, varying levels, locally organised and/or using wider resources eg Warwick Diabetes Course[18]	1998
Data feedback	Routine via stand-alone regional register initially, then via DARTS/SCI-DC[19]	1996
Benchmarking	Routine individual practice comparison with regional and locality averages via DARTS/SCI-DC[19]	1998
Guidelines, protocol, pathway implementation	Tayside Diabetes Handbook available via MCN website is a locally modified set of national guidelines (SIGN)[14 19]	2000
Leadership development	Strong central leadership with considerable delegation to task focused TDAG subgroups[19]	1999
(Academic detailing)	(Not explicitly used)	
Groups/teams of professionals		
Team development	Multi-disciplinary collaborative working central to MCN ethos[18]	1998
Task redesign	For example, of eye screening, education for people with newly diagnosed type-2 diabetes, care for patients starting insulin[18]	2000
Clinical audits	Stand-alone regional register was designed for audit; DARTS/SCI-DC includes practice audit tools[19]	1996
Guidelines, protocol, pathway implementation	Single shared guidelines and protocols for all professional groups disseminated via MCN website.[19]	2000
	Care pathway redesign in 2002, but implementation has been slow	2002
(Breakthrough collaborative)	(Some Tayside practices are part of the Scottish Care Collaborative which has a diabetes arm, but not an MCN initiative)	(2003)
Organisation		
Quality assurance	Routine data collection and audit via DARTS/SCI-DC, locally agreed but consistent with national standards[14]	1996
Organisation development	Regional service redesign with creation of new care pathway, although never fully implemented[20]	2002
Knowledge management /transfer	Regionally co-ordinated multidisciplinary education and training, knowledge dissemination via MCN website and newsletters[19]	2000
Public disclosure	Annual reports, regional quality data and key network documents published via MCN website[19]	2000
(Continuous quality improvement)	(Not explicitly used)	
Larger system / environment		
National bodies	Scottish Intercollegiate Guidelines Network guidelines for diabetes[14]; Scottish Diabetes Group and Framework[4 21]	1996 2002
Accrediting licensing agencies	Quality Improvement Scotland review of diabetes services against national standards, and MCN accreditation[16]	2002
Payment policies	2004 General Medical Services (General Practitioner) contract[22]	2004
(Evidence-based practice centres) (Legal system)		

Between 1998 and 2005, TDMCN primarily encouraged systematic, guideline-driven care by focusing on changing the clinical practice of individual professionals and small, multidisciplinary teams. Areas of activity identified by participants as key are briefly described below (more detailed information can be found on the network website[19]).

a) Guidelines, protocol, pathway implementation

National guidelines were locally modified to create the Tayside Diabetes Handbook, available in both paper and electronic form. Matching patient information leaflets were created and made available electronically, combining information about both diabetes and services available. Guideline implementation was achieved primarily through audit, feedback, and professional education, focusing on changing routine clinical practice, supplemented where necessary with task redesign. Between 1998 and 2002, the emphasis was on ensuring that key care processes and outcomes were delivered, with less attention paid to ensuring that only patients needing specialist care attended hospital. In 2002, a new care pathway was defined by a multi-disciplinary working group, which clearly identified when primary or specialist care was appropriate for people with type-2 diabetes.[20] Implementation was monitored through changes in the proportion of people with type-2 diabetes attending hospital.

b) Education

Professional education has been tailored to varying levels of clinician interest, from locality-based multi-disciplinary diabetes forums where educational form and content were determined by participants, through development of a local MSc level module, to sponsorship for professionals to undertake an intensive course in diabetes management.[23]

c) Audit, feedback and benchmarking

Routine feedback to practices of performance on clinical process and outcome measures has occurred since 1996 using the regional register to provide comparison with other practices in the locality. Since 2000, network performance has been publicly reported annually.

d) Task redesign within the existing care pathway

Examples include rapid delivery of national policy requirements for universal digital retinopathy screening in 2003/4 including extending the use of mobile screening units to ensure equity of access in rural areas; design and implementation of group education for people with newly diagnosed type-2 diabetes; and group rather than individual conversion to insulin therapy.

e) Care pathway redesign

From the outset, the majority of patients with type-2 diabetes received the bulk of their care in the community, either exclusively or as part of a 'shared-care' scheme. However, large numbers of uncomplicated patients attending hospital clinics with limited capacity led to significant waits for routine appointments. In 2002, the network therefore created a new care pathway[20] to focus specialist resources on those most likely to benefit from them, with full implementation dependent on significantly increasing the proportion of people with type-2 diabetes cared for exclusively in primary care. In the absence of new resources, guidelines and persuasion were the only strategies available to achieve this.

Network resources and organisation facilitating change

a) Resources

Since 1998, there has been no change in specialist medical, dietetics or podiatry resource, apart from the addition of one whole time equivalent diabetes specialist nurse, and investment in staff and equipment for retinal screening from 2003. Formalisation as an MCN led to stable funding for a whole-time network manager, secretary and data facilitator, and part-time clinical lead and IT support posts. However, considerable time was voluntarily given to MCN development by its clinical members, and diabetes-focused work in primary care was not formally reimbursed until the introduction of a new contract in 2004. Changes in care therefore primarily reflect a widespread clinical commitment to implement systematic care, rather than direct investment in service delivery.

b) Network organisation and leadership

From the outset, leadership in TDMCN has been shared, with key posts held jointly by a specialist and a primary care doctor. Overall responsibility for quality improvement and setting MCN strategy lies with the Tayside Diabetes Advisory Group, which has representation from patients, all professional groups involved in diabetes services, and NHS Tayside Health Board. Responsibility for specific developments has been delegated to clinically-led sub-groups focused on particular tasks (including guidelines development; eye, foot and pregnancy care; data governance; and professional and patient education).[19] Clinicians interviewed for the evaluation identified this combination of shared leadership and involvement of all professional groups in network planning as key to ensuring widespread clinical commitment to change, with trust engendered by shared professional values and explicit negotiation of priorities and activities.

c) Information technology

IT has been at the heart of QI activity since network inception. The original standalone, manually updated regional register of the late 1990s evolved into a web-based diabetes record from 2000 that is automatically populated from primary care and hospital IT systems, and has since been implemented across Scotland. The record supports individual clinical care, audit and feedback to practices, and monitoring of process and outcome across the network. It additionally underpins network-organised care including recall for eye-screening and booking of group education for people with newly diagnosed type-2 diabetes. Access to the clinical record along with audit and data feedback tools is via the MCN website, which also provides access to the Tayside Diabetes Handbook, patient information leaflets, and information about the network including personnel, services provided, and network reports and strategy documents.[19]

Effects of change

a) Clinical process and outcome

Tables 3 and 4 compare clinical processes and outcomes in January 1998 and January 2005 for type-1 and type-2 diabetes. Figures 1-8 in the web-supplement show patterns of change over the whole period. Reflecting implementation of routine registration and recall, simple clinical processes performed by individual clinicians (taking blood, measuring blood pressure, recording smoking status) rapidly improved early in network development, reaching high levels by 2000 with slow improvement towards maximum since. More complex processes like foot examination have shown continued slow improvement over the whole period, and retinal screening has only shown significant improvement since the redesign of

the regional eye screening service (although the quality of both foot and eye screening has improved over the whole period with shifts to routine use of monofilaments for foot examination, and to all retinal screening now being by quality-assured digital photography). Process measures for people with type-2 diabetes have improved more than for those with type-1.

Interpretation of intermediate outcome data should be cautious, since significant numbers of patients were not regularly screened in the early years. Since unscreened patients are likely to have worse control, engaging more patients in care may initially lead to worse *measured* outcomes.[24] For people with type-2 diabetes, mean systolic and diastolic blood pressure and cholesterol are significantly lower. Glycaemic control worsened in the first three years but has shown improvement since. For people with type-1 diabetes, intermediate outcomes are only improved for cholesterol control (although again, glycaemic control worsened in the early years of the network, and has been improving since).

Table 3: Change in quality 1st January 1998 to 1st January 2005 for people with type-1 diabetes

Indicator*	% (n) achieving measure 1/1/98	% (n) achieving measure 1/1/05	Difference 1998-2005 (95% confidence interval)	p-value#	Pattern of change (see web-only figures 1-8)
Glycated haemoglobin measured	58.2 (1178)	91.2 (1471)	33.0 (29.8 to 36.2)	<0.001	Rapid rise before 2000
Blood pressure measured	50.8 (1178)	77.3 (1471)	26.5 23.0 to 30.1)	<0.001	Rapid rise before 2000
Cholesterol measured	20.0 (1178)	71.0 (1471)	51.0 (47.8 to 54.3)	<0.001	Rapid rise before 2000
Creatinine measured	31.4 (1178)	79.1 (1471)	47.7 (44.3 to 51.0)	<0.001	Rapid rise before 2000
Smoking recorded	77.6 (1178)	93.5 (1471)	15.9 (13.2 to 18.6)	<0.001	Rapid rise before 2000
Foot vascular status assessed	35.5 (1178)	61.7 (1471)	26.2 (22.5 to 29.9)	<0.001	Slow continuous improvement
Foot neurological status assessed	28.5 (1178)	60.8 (1471)	32.3 (28.7 to 35.9)	<0.001	Slow continuous improvement
Retinal screening	57.3 (1178)	74.2 (1471)	16.9 (13.1 to 20.5)	<0.001	Improvement after redesign in 2003
Glycated haemoglobin<=10%	77.7 (686)	78.4 (1345)	0.7 (-3.1 to 4.5)	0.72	Worse till 2001, improving since
Glycated haemoglobin<=7%	13.6 (686)	12.2 (1345)	-1.3 (-4.4 to 1.8)	0.39	Worse till 2001, improving since
Systolic blood pressure <=140mmHg	78.4 (598)	72.2 (1144)	-6.2 (-10.4 to -2.0)	0.005	Recent deterioration
Diastolic blood pressure <=80mmHg	75.4 (598)	74.0 (1144)	-1.5 (-5.7 to 2.8)	0.51	No significant change
Cholesterol <=5mmol/l	43.2 (236)	60.3 (1078)	17.1 (10.1 to 24.0)	<0.001	Slow continuous improvement
Mean glycated haemoglobin (%)	8.75	8.88	0.13 (0.02 to 0.24)	0.008	Worse till 2001, improving since
Mean systolic blood pressure (mmHg)	129.4	132.4	3.0 (1.7 to 4.3)	<0.001	Recent deterioration
Mean diastolic blood pressure (mmHg)	76.2	75.1	-1.1 (-1.8 to -0.4)	0.001	Slow continuous improvement
Mean cholesterol (mmol/l)	5.28	4.85	-0.43 (-0.51 to -0.35)	<0.001	Slow continuous improvement

*Process measures = percentage of patients with record of process in previous 12 months; intermediate outcome measures = percentage of patients with measurement in last 12 months achieving target value

Bonferroni corrected threshold for significance p=0.003

Table 4: Change in quality 1st January 1998 to 1st January 2005 for people with type-2 diabetes

Indicator*	% (n) achieving measure 1/1/98	% (n) achieving measure 1/1/05	Difference 1998-2005 (95% confidence interval)	p-value#	Pattern of change (see web-only figures 1-8)
Glycated haemoglobin measured	58.8 (7668)	94.2 (12060)	35.4 (34.2 to 36.6)	<0.001	Rapid rise before 2000
Blood pressure measured	61.1 (7668)	87.0 (12060)	25.9 (24.6 to 27.1)	<0.001	Rapid rise before 2000
Cholesterol measured	26.5 (7668)	91.2 (12060)	64.7 (63.6 to 65.8)	<0.001	Rapid rise before 2000
Creatinine measured	41.7 (7668)	94.6 (12060)	52.9 (51.7 to 54.1)	<0.001	Rapid rise before 2000
Smoking recorded	82.9 (7668)	97.0 (12060)	14.1 (13.2 to 15.0)	<0.001	Rapid rise before 2000
Foot vascular status assessed	47.2 (7668)	74.7 (12060)	27.4 (26.1 to 28.8)	<0.001	Slow continuous improvement
Foot neurological status assessed	38.2 (7668)	73.8 (12060)	35.6 (34.3 to 36.9)	<0.001	Slow continuous improvement
Retinal screening	66.7 (7668)	75.8 (12060)	9.1 (7.8 to 10.4)	<0.001	Improvement after redesign in 2003
Glycated haemoglobin<=10%	90.4 (4511)	93.6 (11365)	3.2 (2.2 to 4.2)	<0.001	Worse till 2001, improving since
Glycated haemoglobin<=7%	42.9 (4511)	48.5 (11365)	5.7 (4.0 to 7.4)	<0.001	Worse till 2001, improving since
Systolic blood pressure <=140mmHg	50.7 (4685)	57.7 (10489)	7.0 (5.3 to 8.7)	<0.001	Slow continuous improvement
Diastolic blood pressure <=80mmHg	57.8 (4685)	68.8 (10489)	10.9 (9.3 to 12.6)	<0.001	Slow continuous improvement
Cholesterol <=5mmol/l	30.7 (2031)	72.8 (11000)	42.0 (39.9 to 44.2)	<0.001	Slow continuous improvement
Mean glycated haemoglobin (%)	7.57	7.43	-0.14 (-0.18 to -0.10)	<0.001	Worse till 2001, improving since
Mean systolic blood pressure (mmHg)	144.6	140.3	-4.3 (-4.8 to -3.9)	<0.001	Slow continuous improvement
Mean diastolic blood pressure (mmHg)	81.2	76.1	-5.1 (-5.3 to -4.8)	<0.001	Slow continuous improvement
Mean cholesterol (mmol/l)	5.61	4.60	-0.9 (-1.02 to -0.96)	<0.001	Slow continuous improvement

*Process measures = percentage of patients with record of process in previous 12 months; intermediate outcome measures = percentage of patients with measurement in last 12 months achieving target value

Bonferroni corrected threshold for significance p=0.003

Comparisons of quality in Tayside and elsewhere in the UK are difficult because audit is generally less complete in other regions. Comparisons of intermediate outcomes are particularly problematic because of sensitivity to case-mix variation. Additionally, the 2004 general practice contract incentivises many of the measures presented here, although it is notable that quality improvement in Tayside long predates financial incentives.[22] Table 5 compares process quality in Tayside against the English National Diabetes Audit and the Scottish Diabetes Survey in 2004, and is consistent with TDMCN having above average quality in this period.

Table 5: Comparison of Tayside, English National Diabetes Audit (NDA), and Scottish Diabetes Survey process data for adult type-1 and type-2 diabetes combined

Process done*	Tayside June 2004 N=12,871	English NDA 2004 N=253,000	Scottish Diabetes Survey 2004 (Scottish mean) N=161,946
Glycated haemoglobin measured	96%	76%	74%
Cholesterol measured	91%	75%	69%
Blood pressure measured	93%	86%	78%
Creatinine measured	96%	75%	69%
Retinopathy screening	83%	47%	60%

*Previous 12 months for Tayside and English NDA, previous 15 months for Scottish Diabetes Survey

b) Shifting care for uncomplicated type-2 diabetes into primary care

Rates of hospital referral for people newly diagnosed with type-2 diabetes fell dramatically between 2002 and 2006, with a smaller 13% fall in the proportion of patients attending the hospital in the previous 15 months (table 6). However, because of rising prevalence the total numbers of patients with type-2 diabetes being treated in hospital remained unchanged,

despite an additional 3191 patients being exclusively treated in primary care (a 66.2% increase).

Table 6: Hospital attendance for people with type-2 diabetes 2002-2006

	2002	2006	Change in % attending hospital
Hospital referral at diagnosis (patients newly diagnosed in calendar year)			
Referred	597 (47.0)	126 (9.8)	-37.3 (95% CI -33.8 to -40.8)
Not referred	672 (53.0)	1162 (90.2)	p<0.001
Hospital review in 15 months prior to 31st Dec (all patients)			
Hospital review*	5665 (54.0)	5615 (41.2)	-12.8 (95% CI -11.6 to -14.1)
Exclusive primary care	4819 (46.0)	8010 (58.8)	p<0.001

* Includes shared care with general practice

Overall, there was rapid improvement in simpler processes of care, with slower and continuing improvements for complex processes where achievement requires more intensive professional education or redesign of relevant parts of the care pathway. The impact on intermediate outcomes is significant but smaller, particularly for people with type-1 diabetes. There has been a major shift to primary care for people with type-2 diabetes. However, because of static resources in the face of rising prevalence, hospital clinics continue to work at capacity which has prevented full implementation of the redesigned care pathway.

Next steps

Participants in the evaluation identified three weaknesses of the initial TDMCN model, which are currently being addressed by the network. First, the initial emphasis was overwhelmingly

on professional engagement, reflecting QI frameworks and service organisation at the time.[17] Since 2003/4, the network has actively increased patients' involvement in network planning and in their own care, notably through redesign of patient education, implementing automatic production of individualised patient information from the web-based clinical record, and creating a patient portal. This reflects growing appreciation of the potential for patient and public involvement to improve quality of care.[25 26] Second, the professionals initially engaged by the network were predominately clinicians, with less attention paid to NHS management. This proved limiting when additional resources were required to fully implement care pathway redesign in the face of rapidly rising prevalence. Recent more active network collaboration with NHS management has led to Health Board investment to facilitate fuller implementation of the new care pathway. Finally, type-2 diabetes care was initially prioritised, which is reflected in slower improvement in quality of care for people with type-1 diabetes. Type-1 diabetes is now a network and national[21] priority, although quality improvement will at least partly depend on the ability of the network to free specialist resource by shifting an even greater proportion of routine type-2 diabetes care into primary care. The impact of these next steps will be the subject of future evaluation.

Wider implications

To the best of our knowledge, this is the first systematic, independent evaluation of a managed clinical network anywhere in the UK where patient outcomes have been studied.[17] TDMCN implemented and sustained QI activity at all levels of the system of care. Although participants said that they could not easily identify which QI intervention had had the most impact, they did highlight the central role of information technology in supporting QI.

However, participants were clear that IT alone did not change practice. More important was the way in which TDMCN successfully engaged clinicians across the region and across professional boundaries, persuading them to commit to improving quality of care for increasing numbers of people with diabetes without significant additional resources. One significant driver for this was the provision of a range of educational interventions, but the key facilitator was network leadership by enthusiastic clinicians, with a clear vision for an effective and equitable system of diabetes care, and a commitment to collaboration demonstrated by leadership being shared between specialists and general practitioners. Although the generalisability of networks remains uncertain, TDMCN's experience therefore shows the potential of diabetes clinical networks to engage with clinicians across whole systems and deliver changes in professional practice and better patient care by deploying an appropriate range of IT-facilitated QI activities.

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We suggest the figures be included in a web-only supplement

Figure 1: Change in simple process measures for people with type-1 diabetes (percentage of patients receiving care process in previous 12 months)

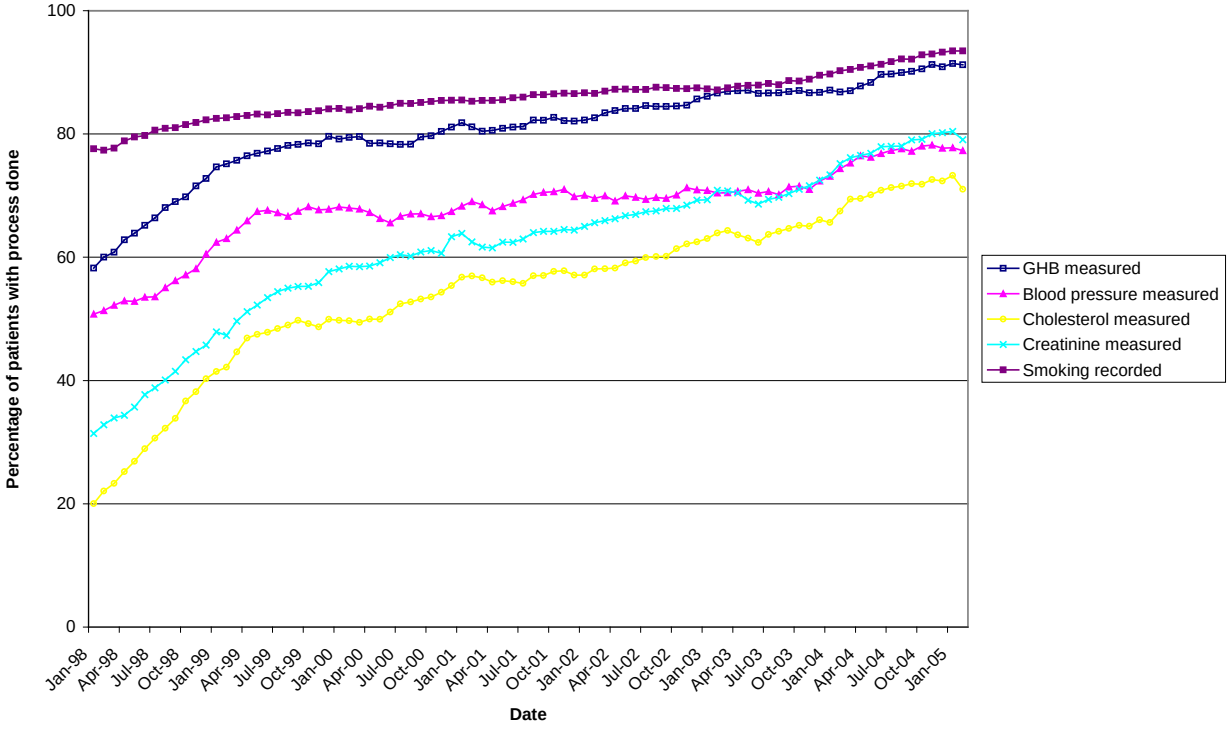

Figure 2: Change in complex process measures for people with type-1 diabetes (percentage of patients receiving care process in previous 12 months)

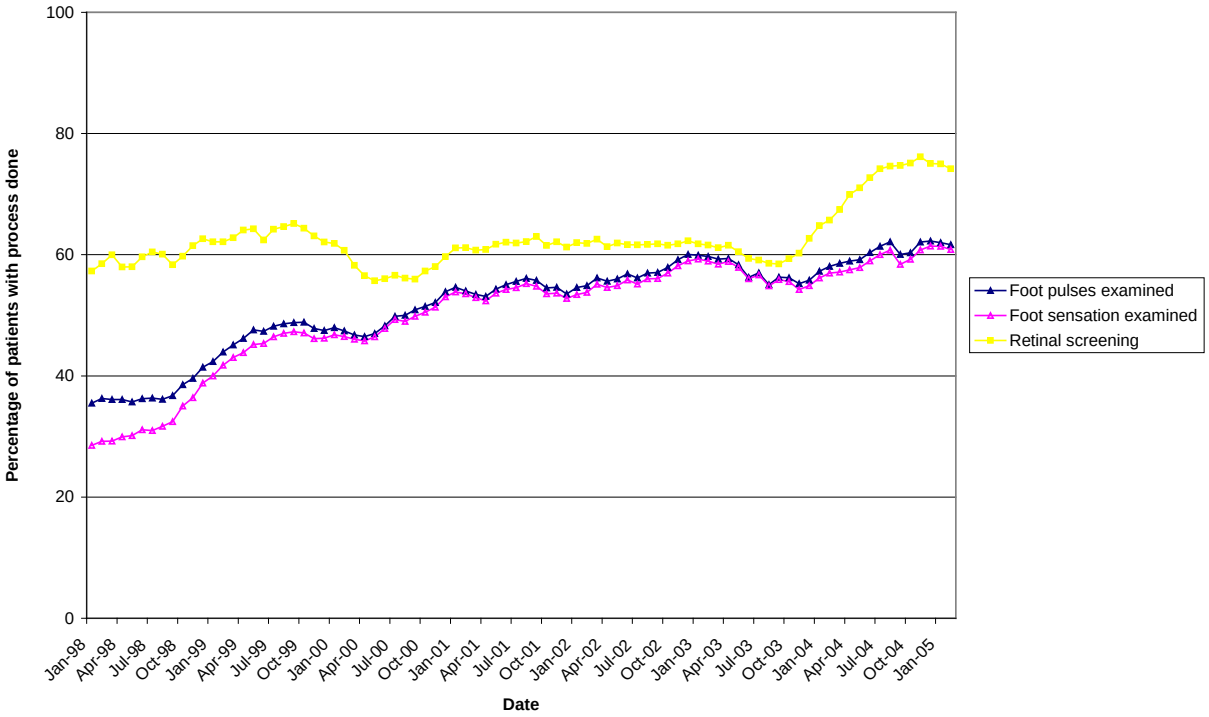

Figure 3: Change in intermediate outcome targets for people with type-1 diabetes (percentage of patients with measurement in last 12 months who achieve target)

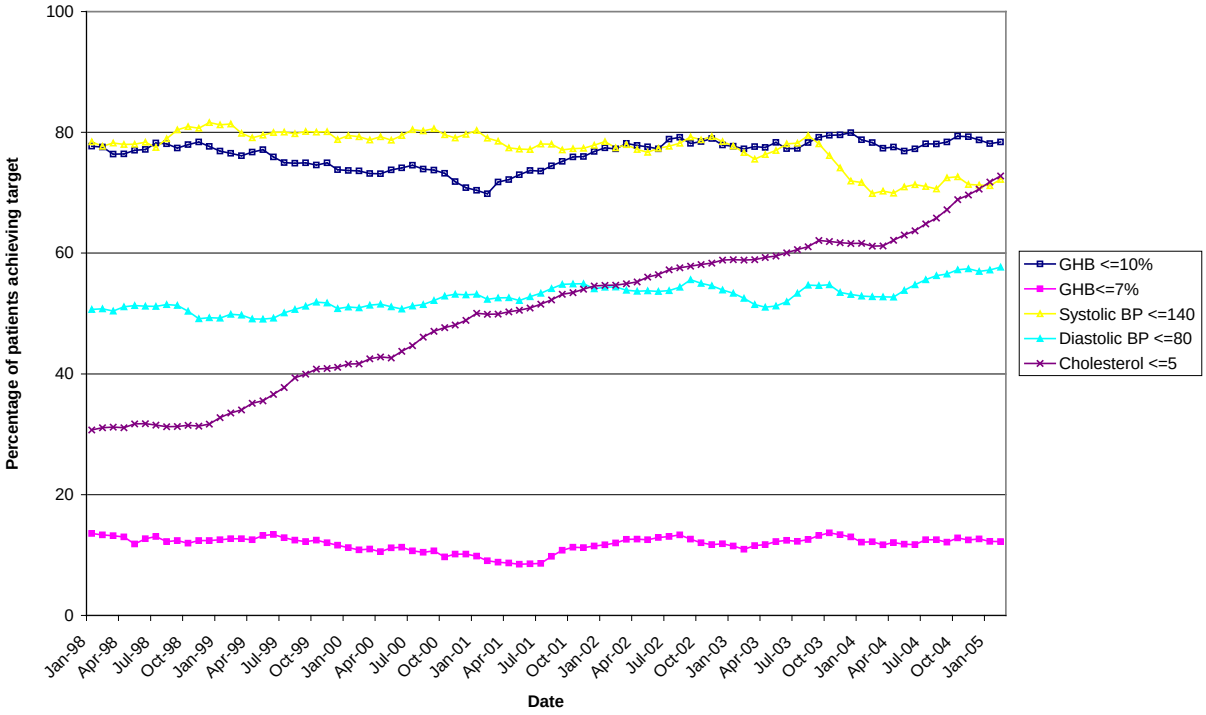

Figure 4: Change in mean intermediate outcomes for people with type-1 diabetes (percentage of patients with measurement in last 12 months who achieve target)

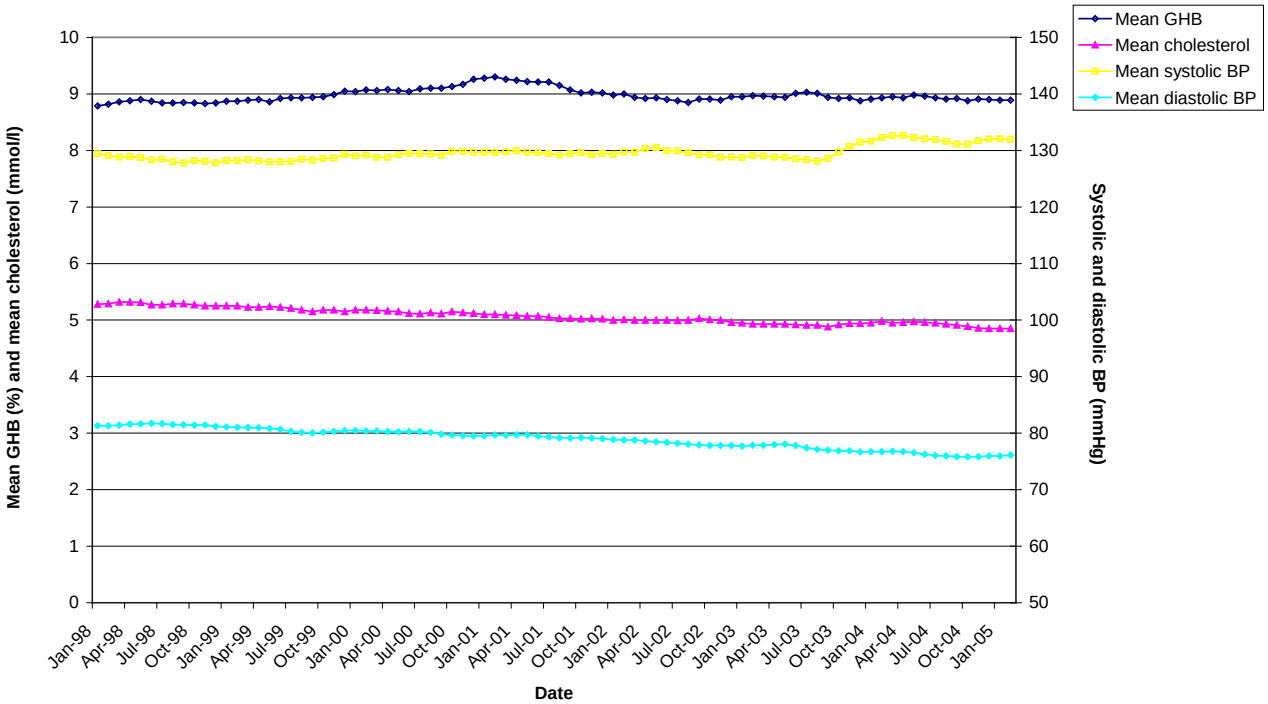

Figure 5: Change in simple process measures for people with type-2 diabetes (percentage of patients receiving care process in previous 12 months)

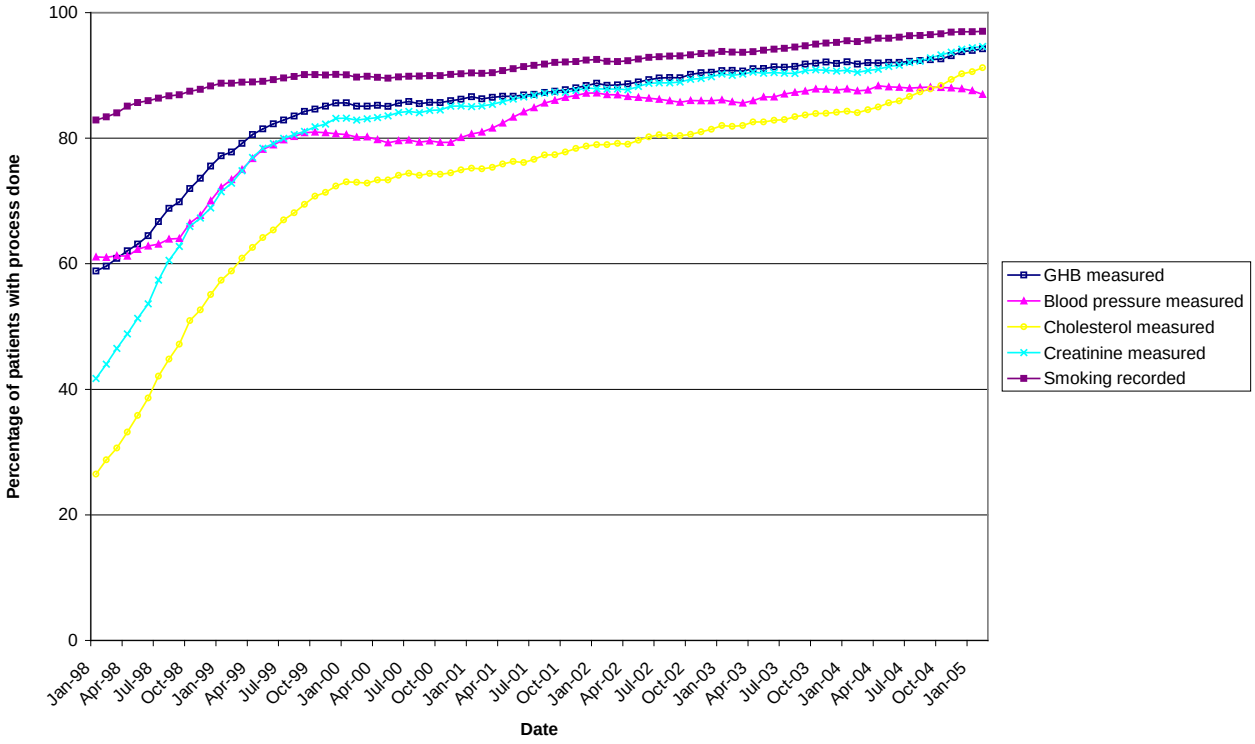

Figure 6: Change in complex process measures for people with type-2 diabetes (percentage of patients receiving care process in previous 12 months)

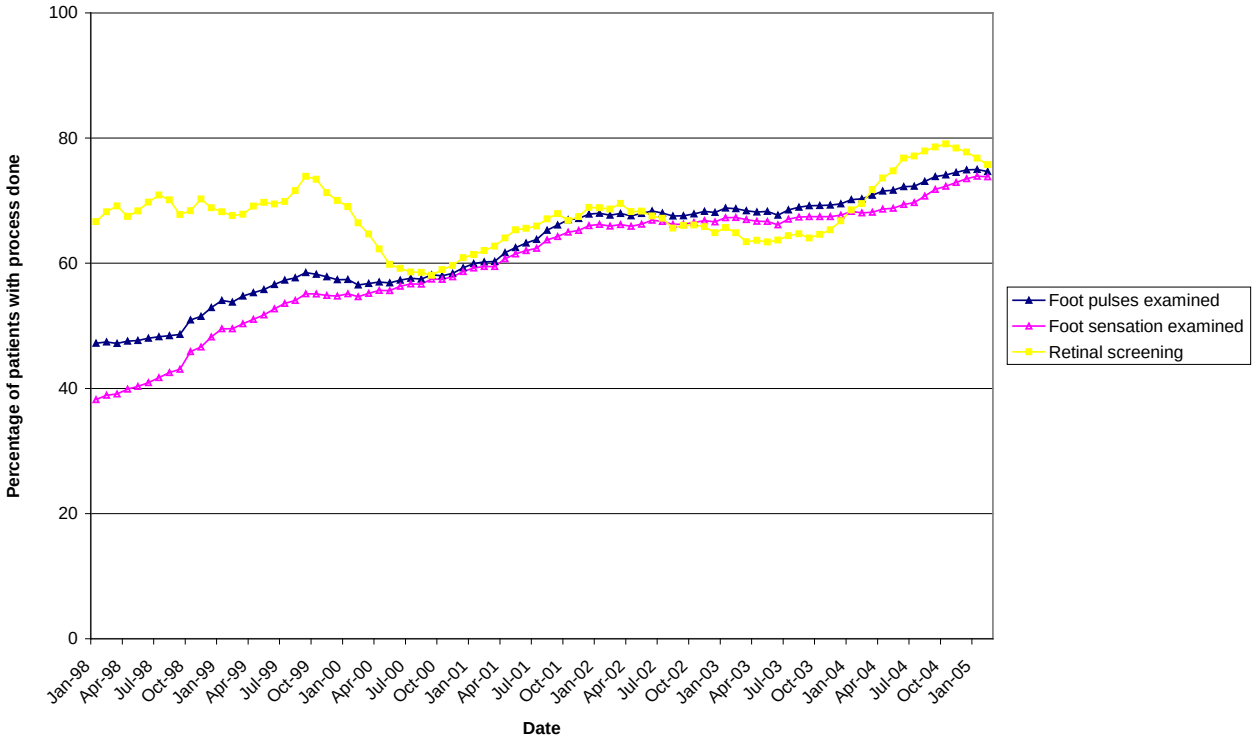

Figure 7: Change in intermediate outcome targets for people with type-2 diabetes (percentage of patients with measurement in last 12 months who achieve target)

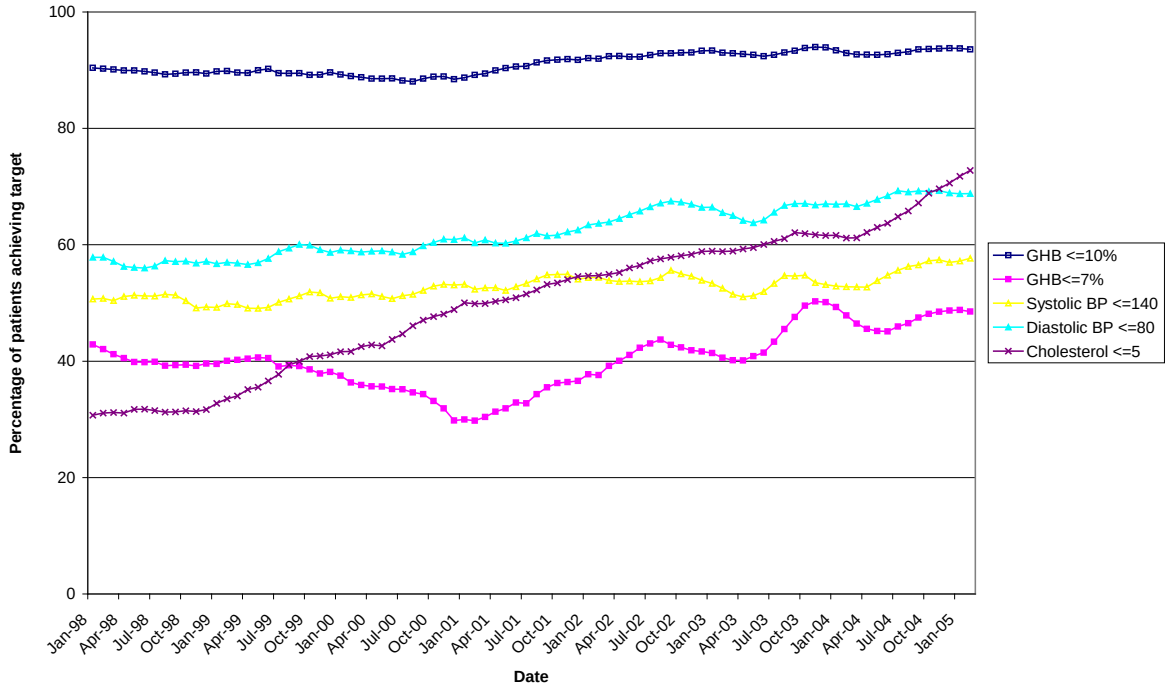

Figure 8: Change in mean intermediate outcomes for people with type-2 diabetes (percentage of patients with measurement in last 12 months who achieve target)