Implementing a web-based system to support the Tayside MCN

Claudia Pagliari, Karen Hunter, Deborah Clark, Douglas Boyle, Scott Cunningham, Andrew Morris

ARTICLE POINTS

1 Managed clinical networks (MCNs) for diabetes may improve patient care.

2 To be effective, MCNs must be supported by high quality IT that allows sharing of information, cross-boundary communication and user support.

3 DARTS 2000 is a multifaceted system that is actively facilitating diabetes management as part of the Tayside MCN.

4 The system has been adopted as the national standard in Scotland.

5 It may provide a model for other areas involved in implementing MCNs for diabetes.

KEY WORDS
- Diabetes
- Organisation of care
- Managed clinical networks
- DARTS 2000
- Tayside MCN

Claudia Pagliari is a Lecturer in the Department of General Practice, Karen Fletcher is Manager of the Tayside MCN, Deborah Clark is a GP and Researcher, Douglas Boyle and Scott Cunningham are Senior Programmers with the DARTS/MEMO collaboration, and Andrew Morris is a Professor in Diabetes Medicine, all at the University of Dundee.

Introduction

Managed clinical networks (MCNs) have been identified as the key to improving diabetes care services and health outcomes in Scotland. Crucial to their success is IT that enables sharing of relevant clinical information between healthcare professionals. Tayside benefits from the historical use of a universal patient identifier that allows record linkage. A multifaceted, web-based system was developed to capitalise on this and act as the hub of the Tayside MCN. Extensive pilot testing of the prototype before release enabled early system improvements and informed the development of a regional implementation plan. Uptake of the system since implementation has been excellent. This may provide a model for other areas involved in implementing MCNs for diabetes.

The Acute Services Review Report (Scottish Office Department of Health, 1998) identified managed clinical networks (MCNs) as the key to implementing high quality patient care across a range of health conditions. MCNs are defined as:

> ***'Linked groups of health professionals and organisations from primary, secondary and tertiary care, working in a coordinated manner, unconstrained by existing professional and [administrative] boundaries, to ensure equitable provision of high quality clinically effective services…'***

As this definition suggests, the MCN is an abstract concept, rather than an operationalised set of organisational structures or procedures, although it is guided by several broad principles, namely:

- Active management
- Improved service quality, access and coordination
- Patient involvement
- Evidence basis
- Outcome measurement and audit
- Quality assurance
- Multidisciplinarity.

These ideas were elaborated in the recently published Scottish Diabetes Framework, which outlines a commitment to establishing MCNs for diabetes in all Scottish NHS boards by September 2004 and recognises the importance of IT as a means of facilitating communication and information sharing (Scottish Executive Health Department, 2002).

The Tayside Diabetes MCN and DARTS 2000

The Tayside Diabetes MCN is held up as a model for other areas in the Scottish Diabetes Framework. Historically, Tayside has been the most advanced NHS area in terms of IM&T infrastructure capability and implementation across the board. This has been helped greatly by universal and mandatory usage of the unique patient identifier known as the community health index (CHI) number, which allows record linkage.

The Diabetes Audit Research Tayside (DARTS) project, initiated in 1995, has taken advantage of this unique capability to produce a register of comprehensive clinical records for all patients with diabetes in the region, which has been validated by manual comparison with case notes (Morris et al, 1997). While initially conceived as a resource for research and audit, the benefits of using the register as a tool for improving diabetes management were recognised at an early stage and it was utilised for 4 years to produce paper-based

reports summarising practice and regional statistics on diabetes management which, in conjunction with outreach facilitation, helped to encourage problem identification and target setting in primary care.

The potential impact of this approach was, however, constrained by asynchronous data feedback and input and non-universal access to reports. The DARTS 2000 project aimed to take this facility several steps forward by creating an interactive, web-based source of timely, patient-specific, practice-specific and regional data that could meet both clinical and strategic decision support needs at the point of care and beyond.

It also aimed to harness the capacity of such a system to house other helpful management tools, such as guidelines, electronic images, patient information materials and information on key services and personnel. The potential of such a system to act as a common information gateway for all clinical stakeholders within a MCN was acknowledged at the outset. The broad features of the website, along with selected screens are summarised in *Figures 1 and 2*.

Involving users in system development

Failure to engage in user-informed evaluation of emergent health informatics tools can have negative consequences for future implementation, related both to poor usability or clinical utility and sub-optimal stakeholder buy-in (Friedman and Wyatt, 1997). While developing high-quality, user-informed technology is one key to successful implementation, 'people and organisational issues' influencing professional behaviour change are equally important, and their identification at an early stage is essential to allow appropriate interventions to be put in place (Lorenzi and Riley, 2000; Kaplan et al, 2001). For example, it has been estimated that up to 50% of technically sound systems have foundered on staff revolt, boycott, sabotage or dissatisfaction (Dowling, 1980).

For these reasons, a detailed evaluation study was undertaken in the prototyping or pilot testing phase of the new resource (Pagliari et al, 2003). This involved an action-research process led by independent academic evaluators who worked closely with development and implementation teams as a means of facilitating improvements to the system and refining implementation processes. Like many similar evaluations in the applied context, the timescale of the study overlapped with that of a planned rollout; hence this approach was particularly appropriate. The study was conducted in the primary care context since this was the main focus of the rollout.

Designing tailored implementation plans

There is emerging scientific literature on the relative effectiveness of alternative strategies for changing professional practice (NHS Centre for Reviews and Disssemination, 1999). The general conclusion of reviewers in this area is that multifaceted strategies, linked to local barriers and facilitators, are likely to be the most effective means of implementing changes in professional behaviour. While much of this work has been conducted in the context of guideline implementation, the same principles are applicable to the implementation of clinical information systems.

As the first stage in planning the rollout of the DARTS 2000 system, a draft evidence-based implementation strategy was prepared, encompassing educational outreach, professional meetings, reminder systems, audit and feedback, and opinion leader advocacy. This took account of the literature while capitalising on processes already in place (via the existing DARTS network) or previously used successfully in the local context. The feedback gathered in the course of the pilot study helped to refine this draft.

Pilot study and key findings

The pilot study was conducted in one local healthcare cooperative encompassing five general practice surgeries with 38 eligible staff (18 GPs, 8 practice nurses and 12 practice administrators).

A mixed-methods approach was used, including survey, remote observation and semi-structured interviews. The study was conducted in two phases (demonstration site, live site) with a system iteration

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3 The potential of such a system to act as a common information gateway for all clinical stakeholders within a MCN was acknowledged at the outset.

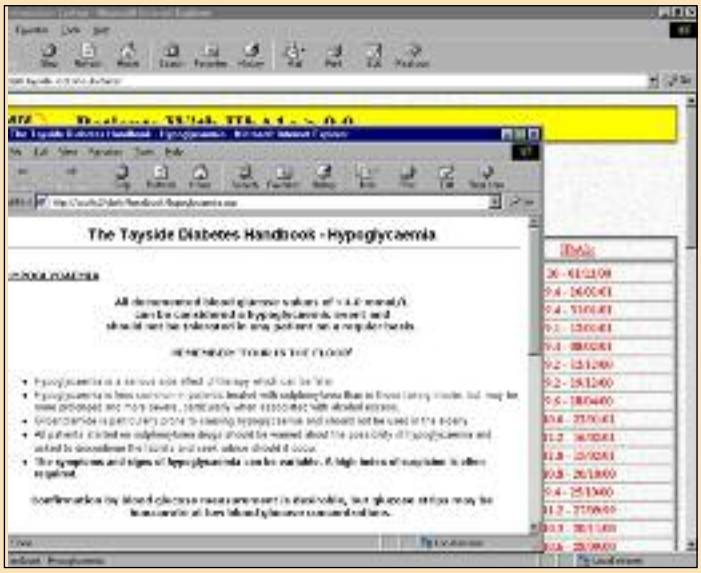
4 Involving users in system evaluation can help to identify technical problems and troubleshoot human and organisational barriers to behaviour change.

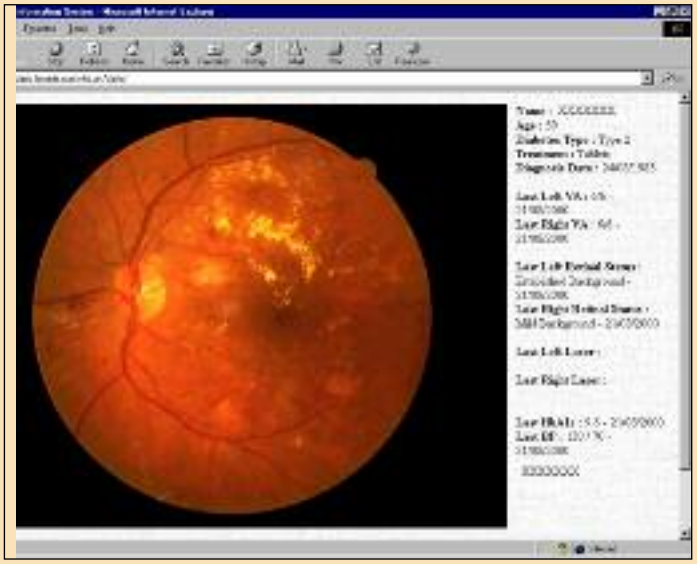
5 A detailed evaluation study was therefore undertaken in the prototyping or pilot testing phase of the new resource.

Figure 1. Features of DARTS 2000

- *Patient-specific clinical information at the point of care (e.g. treatments, outcomes)*
- *Shared data from primary & secondary care (general practice, hospital clinics, laboratories, retinal screening services, podiatry etc.)*
- *Organisational information (e.g. diaries, clinics)*
- *Guidelines and summaries of evidence (e.g. Tayside Diabetes Handbook, links to national guidelines, hover descriptions)*
- *Practice statistics, regional comparisons, audit facilities*
- *Patient information leaflets*
- *Visual clinical support tools (e.g. CVD risk calculator, trend graphs, retinal images, foot screening diagrams)*
- *Links to professional bodies and diabetes support agencies*
- *Information about the DARTS project & MCN (development information, news, personnel, local research)*
- *Multiple search facilities*

etc…





Restricted access is available via http://www.diabetes-healthnet.ac.uk/main.htm

following each. After a period of exposure to a demonstration site containing dummy data, participants were sent a mixed-format questionnaire assessing: their computer familiarity/access/use; attitudes and experiences regarding DARTS 2000; perceptions of the usability, utility and format of the site; perceived barriers and facilitators to implementation: and consent to remote monitoring.

Computer/web familiarity and access were generally good. The majority of respondents rated the usability, utility and format of the site positively. Content analysis of free responses revealed four main types of comment relating to:

- Factual accuracy
- Desired features
- Usability
- Format.

Content analysis of perceived barriers and facilitators to implementation revealed three main themes for each:

- *Barriers:* lack of time; access to equipment and training; fear of computers.
- *Facilitators:* one-to-one training; rapid and timely information from system; users' positive experiences/growing familiarity.

All respondents agreed to be observed remotely. Access to live data was enabled following the first system iteration.

Remote observation

Usage by known individuals was recorded and analysed by professional group and website subfeature to reveal variations in general and specific patterns of access. Altogether there were 3900 'hits' by study participants in the 3-month observation period. Administrators were the most frequent users (1390), followed by GPs (1263), then practice nurses (1248).

Semi-structured interviews

After 2 months' exposure, nine key respondents were purposively sampled with the aid of observation logs to include high/low/non-users from each of the three professional groups (GPs, nurses, administrators). Interviews covered:

- Experiences and perceptions of the website and of the current implementation process
- Usage in practice

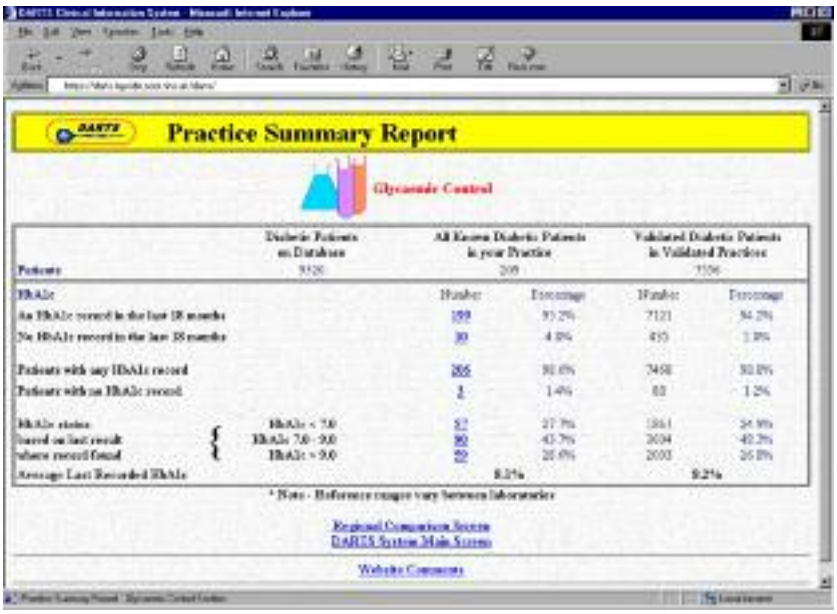


Figure 2. A further sample screen from the DARTS 2000 website.

- Perceived barriers and facilitators to regional implementation.

Overall, two main types of feedback were received via this route: (a) comments on the value of the resource itself and the place it takes in the care of people with diabetes and (b) suggested system changes. Qualitative analysis revealed the following key points:

- ***Attitudes:*** Generally very welcoming.
- ***Perceived advantages/expectations:*** Improved communication between primary and secondary care; reduced duplication of investigations and tests; improved care; improved ability to do audit.
- ***Usability:*** No major problems. Most suggestions focused on the need for clarification.
- ***Interface:*** Generally positive. Negative comments received about menu bar colour/size and certain graphics.
- ***Content:*** Comments mainly concerned the appropriateness of data fields.
- ***Timeliness:*** Several respondents complained about the time taken for information from secondary care to appear, but attributed this to problems with hospital administration rather than the system per se.
- ***Common uses:*** All respondents reported inputting clinical data directly, although practices varied in the balance of responsibility for this between clinical and clerical staff. Most clinicians reported

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1 Participants were initially surveyed to assess their responses to a dummy site. This identified welcoming attitudes, suggestions for improvement and barriers and facilitators to implementation.

2 After exposure to the live system key respondents (GPs, nurses and administrators) were interviewed.

3 No major usability problems were reported. Suggestions focused on the need for clarification. All interviewees reported inputting some data directly. Clinicians reported sharing screens with patients.

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1 The pilot study was instrumental in developing the strategy for implementation.

2 Detailed analysis of remote observation data allowed informed models of the place of the system to emerge.

3 This helped the implementation team to better tailor their training strategy to suit specific user groups and to educate practices as a whole regarding alternative models for distributing effort.

4 DARTS 2000 has now been successfully rolled out across Tayside with very good uptake and few technical problems.

using patient screens during the consultation.

- ***Incorporation into workflow/where used:*** Most clinicians reported using the system during the consultation to pull patient records or for other features (e.g. details of the eye van, patient leaflets). Most used the data input features between consultations and the educational and research facilities at other times.
- ***Professional-patient communication:*** Most clinicians reported sharing screens with patients and receiving positive reactions.
- ***Barriers to implementation:***
  Technical: compatibility with existing general practice administration system, password problems
  Organisational: time pressure, uncertainty over remit
  Human: computer phobias, habits, negative attitudes.
- ***Facilitators to implementation:***
  Support: rapid and helpful advice from IT and implementation teams
  The system itself: ease-of-use; speed; timeliness
  Habits: integration into routines
  Evidence of benefits: following usage
  Marketing: greater promotion
  Additional training: one-to-one preferred.

How the pilot study aided the implementation process

In addition to providing specific feedback on aspects of the system itself, which enabled the developers to make important modifications before rollout, the study was instrumental in developing the strategy for implementation.

The initial prototype had been developed on the basis of existing data and the ideas of the multidisciplinary steering group and developers; however, no models had been formulated to describe the place of the system in the organisation (who would use which features; for what purpose; where).

There were clearly mixed views on this, as indicated by the initial survey and informal discussions with the implementation and development teams. For example, the latter initially speculated that most users would access the system outwith the consultation, that it would be mainly used for data processing and audit and that there would be no demand for the educational facilities on the parts of the site available via the world wide web; however, none of these assumptions were supported. Likewise, most clinical users reported accessing the site during consultations and sharing appropriate screens with patients, demonstrating the value of the system as a tool for clinical support and patient-centred care.

Detailed analysis of remote observation data enabled profiling of usage patterns by particular groups and, triangulated with interview results, allowed informed models of the place of the system to emerge. This helped the implementation team to better tailor their training strategy to suit specific user groups and to educate practices as a whole regarding alternative models for distributing effort (e.g. best deployment of clerical staff).

The survey and interviews also highlighted a desire for one-to-one training, as opposed to the group training originally envisaged, and interviews confirmed the value of outreach education for novice users. In response to the initial survey, a 'comments' button was added to each web page, allowing page-specific feedback and technical queries to be sent rapidly to the development and training teams.

Interviews confirmed the value of this to participants, who identified rapid IT support as an important facilitator. The survey and interviews also identified perceived time pressures as potential barriers to system adoption, which led to the negotiation of protected training time by the implementation team.

Marketing was recognised by interviewees as an important driver for implementation. This led to an emphasis in subsequent professional meetings on demonstration of new features and system benefits (another key facilitator), rather than training per se, with a strong focus on improvements made as a result of clinical and other user feedback. This has been reinforced by a regular newsletter, which also acts as a reminder system.

Implementation since rollout

DARTS 2000 has now been successfully rolled out across Tayside with very good

uptake and few technical problems. All 72 practices in the region are registered to use the system and the majority are actively using it for the management of patients with diabetes.

Usage of the system since rollout in November 2000 is shown in *Figure 3*. As of 12.10.02, there have been 308 154 user operations performed on patient data, indicating the clinical utility of the system. Although the majority of users are in primary care, the system is being used by all providers, as shown by the following access breakdown: primary care (123 721); secondary care (42 741); PAMS (118 188); others (23 504).

Anecdotal accounts indicate that, in addition to its other benefits, user involvement in the process of development has created a high level of stakeholder ownership, which has facilitated the implementation process. A number of new features have been added since the conclusion of the pilot study; however, monitoring of access patterns is ongoing and all users are actively encouraged to submit electronic feedback as a means of monitoring usability and functionality issues.

DARTS 2000 and the MCN

The site now forms the hub of the Tayside Diabetes MCN and is used by all stakeholders as a means of: sharing appropriate clinical information with each other and, where appropriate, with patients; facilitating audit and quality improvement; disseminating evidence; reporting on progress; and communicating information about network activities. In this respect the features of the web resource closely parallel those regarded as essential attributes of a successful MCN.

While primary care has, thus far, been the main focus in terms of implementation efforts, increasing computerisation in secondary and tertiary care is beginning to facilitate usage of the system across the board, bringing the MCN more closely in

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2 Increasing computerisation in secondary and tertiary care, however, is beginning to facilitate usage of the system across the board.

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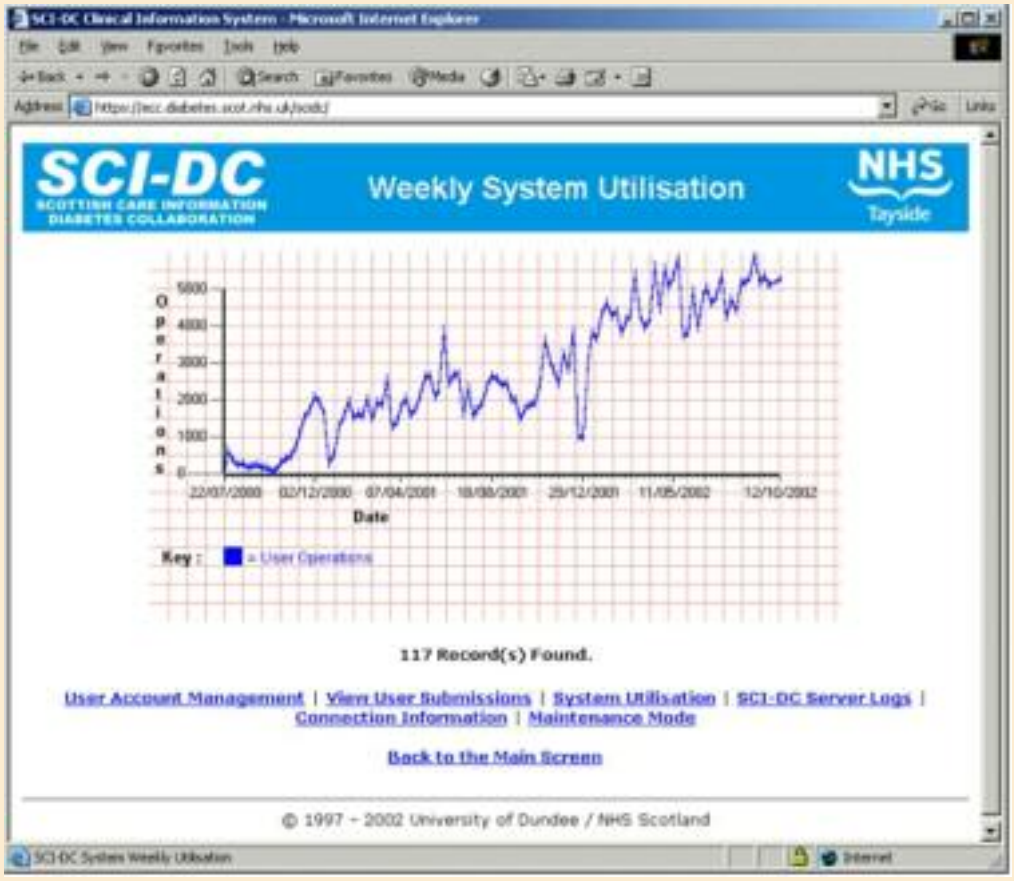

Figure 3. Weekly system utilisation since rollout (note recent name change to SCI-DC).

line with the ideal model, as indicated by the access figures given above. Similarly, while the consultation/evaluation exercise was conducted primarily from the point of view of professional users, direct patient involvement in system design and evaluation is the next key objective and is recognised as essential to support the MCN (see below).

Where next?

The Scottish Diabetes Framework has been strongly influenced by developments in Tayside and sets out the commitment that 'a national IT system to support all aspects of diabetes care will be fully implemented throughout Scotland by December 2005'.

This system, which is to be known as SCI-DC, will be based on DARTS 2000 and is currently being developed in Dundee under the auspices of the DARTS programmers. In anticipation, the name change has already been actioned (see *Figure 3*). This coincides with the National IM&T Strategy, which encompasses a commitment to implementing the CHI, or universal patient identifier, across all Scottish regions by March 2003 (NHSS, 2001).

These developments are taking place in conjunction with two associated national initiatives: the Electronic Clinical Communications Implementation Programme (http://www.show.scot.nhs.uk/ecci/) and the Scottish Care Information Programme (http://www.show.scot.nhs.uk/sci/). Lothian, Glasgow, Fife and Forth Valley are poised to receive live access to the system within the next year and it will be rolled out to the remaining 11 health board areas by the target date.

While the current system encompasses web-accessible static patient information leaflets and links to diabetes support groups, a focused project to develop and evaluate novel consumer health informatics tools for DARTS 2000/SCI-DC is underway. This will encompass a needs assessment to determine patients' information requirements, preferences and access, followed by a systematic and user-informed prototyping study. Funding is being sought for a trial to determine the impact of such resources on patient outcomes. Implementation of these resources will allow the system to fully meet the requirements of a MCN by encompassing all stakeholders.

Conclusion

DARTS 2000 is a multifaceted system capable of providing core resources for a successful MCN. A multi-method consultation and evaluation exercise with users helped to:

- Improve the system to better meet users' needs
- Develop models of the place of the system in the organisation
- Tailor effective training strategies (targets, content, format, setting) and
- Refine a multifaceted implementation strategy (outreach, reminders, marketing etc.)

Following successful implementation, the resource is actively facilitating diabetes management as part of the Tayside Diabetes MCN. User involvement has led to high levels of stakeholder ownership.

The system has been adopted as the national standard and is currently being adapted to fulfil the commitment set out in the National Diabetes Framework. The system and its methods of development, implementation and seamless integration with the local MCN may provide a model for other areas involved in implementing managed clinical networks for diabetes. ■

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