Creating and leading a quality improvement culture at scale

Received (in revised form): 21st March, 2017

Elaine Mead

commenced her current role as Chief Executive of NHS Highland in January 2011 after six years as Chief Operating Officer. She was responsible for the delivery across the first fully integrated health and care system in Scotland. She is a passionate ambassador for quality and has led the development of the Highland Quality Approach, supporting NHS Highland to improve quality of care. She has looked world-wide for best practice and has hosted multiple study-tours to Highland and presented at important international conferences. As a committed practitioner of Quality Improvement, she is a certified Lean Leader and in 2014/15 was awarded a Fellowship by the International Society for Quality in Healthcare ISQua. In 2016, she took up position of visiting Professor at the University of the Highlands and Islands supporting the delivery of multi-professional health and care training across the Highlands and Islands. She is a Director of Scottish Institute Health Management.

NHS Highland, Assynt House, Beechwood Park, Inverness IV2 3BW, UK
Tel: +44 (0)1463 704977;
E-mail: emead@nhs.net

Cameron Stark

graduated in medicine from the University of Glasgow in 1985, and trained in Psychiatry and then Public Health in the West of Scotland. He has worked for NHS Highland since 1996. He manages the Health Intelligence and Epidemiology and Health Sciences teams in NHS Highland, and is responsible for the Kaizen Promotion Office. He is a Lean Leader and Coach, and co-wrote the Lean training materials used by NHS Highland. He has also co-written or edited five textbooks, various book chapters, and has published over 50 papers. He has a personal blog on Lean www.leanhealthservices.org

NHS Highland, Assynt House, Beechwood Park, Inverness IV2 3BW, UK
Tel: +44 (0)7930 289131;
E-mail: cameron.stark@nhs.net

Maimie Thompson

has been Head of Public Relations and Engagement for NHS Highland since 2012. This includes responsibility for media management and overseeing the engagement process for major service re-designs across Highland. She is a certified Lean leader and is a recipient of NHS Scotland manager of the year award. Before joining NHS Highland in 2003, she worked in the field of avian ecology, conservation and educational research.

NHS Highland, Assynt House, Beechwood Park, Inverness IV2 3BW, UK
Tel: +44 (0)1463 704722;
E-mail: Maimie.thompson@nhs.net

Abstract Current models of health and social care in Highland are not sustainable. The combined impacts of our ageing population, reducing workforce, problems with recruitment and financial pressures mean that the way we provide health and social care has to change. Despite the best efforts of staff, the current ways of working are not matched to future requirements; our models of care are also not as safe as they could be and are no longer sustainable or affordable. Better quality care is safer, more person-centred and can also cost less. By reducing harm, waste and unwarranted variation across the health and social care systems, it is possible to increase quality,

and at the same time reduce costs. Embedding new ways of working with front-line staff to make such changes in their practice, however, has been challenging. In this article we explore some of our approaches and learning around delivering and embedding quality improvement at scale during times of significant financial pressures. Maintaining a consistency of leadership to support coaching, as well as rigorous adherence to a chosen improvement methodology we believe are important elements of success.

KEYWORDS: Highland, integration, quality improvement, leadership, Lean, remote and rural

INTRODUCTION TO NHS SCOTLAND AND NHS HIGHLAND

National Strategic Context

NHS Scotland operates with an annual budget of around £12bn (The Scottish Government, 2014).[1] There are 14 regional-based health boards in Scotland with each board accountable to Scottish ministers reporting to the Cabinet Secretary for Health, Wellbeing and Sport. A national formula decides the allocation of funding for each regional board.

The strategic direction is set by the Scottish Government. The Scottish Government's 2020 vision published in 2011[2] articulated the ambition of 'Safe, effective and person-centred care which supports people to live as long as possible at home or in a homely setting.'

This vision was supported by a Healthcare Quality Strategy,[3] which called for accelerated quality improvement (QI) to ensure that care is person centred, safe and effective.

While these documents remain the central vision for the Health Service in Scotland, three reports published in 2016 strengthened the strategic direction and described the compelling case for change: Realistic Medicine — The Chief Medical Officer for Scotland's Annual Report for 2014/15,[4] The National Clinical Strategy for Scotland[5] and the Health and Social Care Delivery Plan by the Cabinet Secretary for Health, Wellbeing and Sport.[6]

The Health and Social Care Delivery Plan sets out the transformation required for health and social care to make care and services sustainable for the future. The plan is designed to help address the rising demand being faced by health and care services, and the changing needs of an ageing population and workforce.

Highland Context

NHS Highland serves the largest and most sparsely populated Scottish Health Board area, covering 41 per cent of the country's land mass. NHS Highland provides health and social care services to our resident population of 320,000. The diverse area NHS Highland covers includes Inverness, one of the fastest growing cities in Western Europe, and 36 populated islands (23 in Argyll and Bute and 13 in Highland, excluding the Island of Skye connected to the mainland by a road bridge since 1995).

Despite the often popular image of a rural idyll, deprivation, fuel poverty and inequalities also affect the population of the area, producing diverse challenges for service delivery.[7] The Health Board includes two Local Authority areas, Highland and Argyll & Bute.

In many parts of Highland, the NHS and other public sector agencies are major employers, and changes to services can adversely affect already fragile areas. As an important partner in maintaining the social and economic vibrancy of the areas concerned, health service quality or changes can and do generate considerable attention

from communities, local and national politicians as well as staff.

NHS Highland has a higher proportion of older people in the population than the Scottish average.[8] Seasonal work is common, and in some parts of Highland, where younger people have moved away for education and employment, there are considerable difficulties in recruiting to some roles. Rural areas are not for everyone, and some posts are increasingly difficult to fill. There are also challenges to fill posts in Raigmore Hospital (Highland's only District General Hospital) in Inverness, illustrating wider regional and national challenges.

NHS Highland's financial requirement is to deliver around £47m savings (7 per cent of a budget of £800m) in order to break even in 2017–2018 and around £100m over three years.

The combination of an ageing population, difficulties with recruitment compounded by financial challenges have created a pressing need to change.[9]

Sustainability and Transformational Change

There are three broad areas where NHS Highland has sought to take innovative approaches to support sustainability and transformational change:

- Delivering care in a remote and rural environment
- Delivering integrated health and social care
- Embedding QI to transform care

These issues are linked and need to be considered together when leading, planning and delivering health and social care at scale. The focus of this article is on leading and embedding QI work at scale. In order to set the scene, the work of NHS Highland on remote and rural and integrated care is briefly described.

Remote and Rural

Delivering care in remote and rural settings does not define NHS Highland but it certainly influences our approach to delivering and sustaining services.

Recruitment challenges are mounting and have been compounded by the steady move to increased specialisation. This has resulted in fewer generalist staff being available. Initiatives such as the development of Rural Practitioner posts, and rotations to Rural General Hospitals have helped to ease this problem, but will take some time to make a sustainable difference at scale. General Practitioner (GP) recruitment initially for small practices but now more widespread, is a particular challenge, but medical, midwifery, Allied Health Professional and Social Care posts are also increasingly difficult to fill, resulting in some posts being vacant for many months or never filled with a heavy reliance in locum cover.

Maximising both teamwork and technology to counter the impact of distance are part of the solution, particularly for some elements of pre-hospital care, out of hours and avoiding hospital admissions. These significant workforce challenges, which are not specific to NHS Highland, and in particular the growing shortage of GPs, are forcing us to redesign primary care services both in hours and out of hours.

One example is developing alternative models to having a GP resident on a small island, serving four small islands (Eigg, Muck, Rum and Canna). This solution grew out of time spent working with the team from South Central Foundation in Alaska. Learning from colleagues in Alaska and working in partnership with the islanders, has seen the development of rural support teams, a visiting GP service and training of local community members as health support workers.

This has not been an easy journey and has taken a number of years to embed but the signs are encouraging. On the whole

residents are satisfied with the quality and range of the GP service now in place including continuity. Attitudes to the service were generally positive and many residents across all the islands thought it was now a better service. Very few interviewees still called for a professional to be based on the island.[10]

This model has the potential to serve other islands and rural communities well. Our experience, however, is that it can be difficult to take a model developed in one rural area and try to apply it directly to a second area without people feeling a sense of imposition.

Delivering Integrated Health and Social Care

In 2012, under the lead agency model all adult social care services in the Highland Council area were transferred to NHS Highland from the Highland Council, and in a reciprocal arrangement, The Highland Council took on responsibility for the delivery of community children's services.[11–14]

For NHS Highland this meant taking on new responsibilities including the management of 15 care homes, the in-house care-at-home service, day care services, tele-care services and a wide range of contracts with the third and independent sectors.

It also involved 1,400 adult care staff transferring from Highland Council to NHS Highland while maintaining their terms and conditions. Alongside this, 200 NHS Highland staff were transferred across to the Highland Council. The foundation of this move was to deliver single management, single budget and single governance across our complex health and care system.

Integrated working has brought benefits. NHS Highland has been able to plan new service models at district level across all health and social care resources in the Highland Council area. This includes services designed to help people to stay in their own home for longer. When these redesigns are completed, it will allow the number of community hospitals, inpatient settings and hospital beds to be reduced.[15]

There is also closer working with third and independent sectors. One example is the introduction of the living wage for the independent care-at-home sector. The Highland Council, and subsequently NHS Highland, have experienced difficulty in recruiting sufficient people to provide care at home services in remote rural communities. Over the last few years, however, a new model has been developed enabling local communities to develop local services in partnership with NHS Highland and established providers, such as Highland Home Carers.[16]

BACKGROUND TO EMBEDDING QI TO TRANSFORM CARE

From 2006 to 2011, there was a series of national collaborative programmes. These included Planned Care (2006 to 2008), diagnostics (2006 to 2008) and 18 Weeks Referral to Treatment (2008 to 2011). These were aimed at reducing hospital waiting times for planned care (inpatients, outpatients and diagnostics).

While these were largely successful, their focus on national waiting times was perceived to be a barrier in gaining support from some front-line clinicians, who felt that single targets did not adequately reflect clinical complexity or priority. This factor, coupled with the tendency to be heavily dependent on project-specific staff, meant that the improvements tended to dissipate over time. This highlighted that the changes were not always sufficiently embedded in day-to-day practice.[17]

In contrast, an initiative launched at around 2008, The Scottish Patient Safety Programme (SPSP), was relatively successful in obtaining and maintaining gains. SPSP aims to reduce avoidable harm to patients

by improving the safety of patient care. This programme, which is ongoing, uses a blend of QI methodology, clinical engagement and measurement to implement agreed 'care bundles'. If these are applied consistently together for every patient and for every intervention, they have proven to reduce harm and improve safety. Examples include a care bundle intended to reduce Ventilator Acquired Pneumonia, a Central Line bundle, a Peripheral Venous Catheter bundle, and a fall bundle all intended to apply best practice to the day-to-day care of every relevant patient.[18]

Making the care of patients safer, improving patient experience and the subsequent reduction of costs gave common ground for management and clinical colleagues, providing the backdrop for the Highland Quality Approach (HQA).

DEVELOPING HQA

Alongside the Scottish Patient Safety Programme, the Health Board had also been inspired by the Institute of Health Improvement (IHI) Triple Aim, which proposes better care for individuals, better health for populations and lower per capita costs.[19] This had been translated by the Health Board through our strategic framework at the time as 'Better Health, Better Care, Better Value' in a paper approved by the NHS Highland Board in 2010.[20]

Early in 2012 the board had sufficient confidence in the way forward and agreed to send a small number of clinical leaders to the Virginia Mason Medical Center in Seattle to consider how they had been effective in developing a quality approach.

Virginia Mason Medical Center is a world leader in delivering safe, high-quality health care. Based on a manufacturing approach introduced by Japanese car giant Toyota, and later adapted by aircraft manufacturers Boeing, the Virginia Mason Production System is a systematic approach based on Lean to eliminate defects and waste.

One of the important features is that staff closest to the front line share a responsibility for the delivery of high-quality care and adding value for their customers.[21]

Up to a third of the expenditure on health services in some systems may be due to waste because of poor quality, or actions that add no value to patients.[22] Since they began to use the principles of Lean in 2002, Virginia Mason have reported significant improvements to quality while containing costs.[23] Other health care providers and consultants have reported similar results.[24,25]

Lean is an approach to service delivery and management that focuses on value to the service user. It aims to reduce non-value-added activities, or waste, and so increase the proportion of organisational effort that adds value.[26] The approach emphasises improvement of flow, and reduced waits and errors by careful attention to the detail of processes.[27]

Improvements are maintained by a management system that includes identification of problems and rapid problem solving. Organisational improvement activity is also aligned by a management system that includes cascaded objectives and agreement on method at each organisational level.[28]

Developing Capacity

In partnership with Virginia Mason, we started to develop local expertise initially by supporting the training of three QI enthusiasts. In December 2012, NHS Highland spent £18,300 on sending three important senior staff to Seattle for a two-month training programme. They were able to bring the detail and rigour of the process back into the organisation. This let us test out whether techniques that worked in US settings, would also deliver benefits for patients in Scotland.

The course included two one-week periods in Seattle, where staff received

intense tuition and practical experience alongside other participants working in health care. The remainder of the training programme took place in Highland, where staff carried out considerable 'homework' to put the learning into practice.

There were leadership and teaching sessions with colleagues and ongoing support from Virginia Mason Institute Faculty through Webinars. The events included work on several topics, including radiotherapy and pre-operative assessment.[29] These results gave us sufficient confidence in the potential value of the methods to decide to invest in training a wider group of staff.

It was impractical to send large numbers of people to the USA to train, so we identified partners in the UK. Virginia Mason had trained staff in the North-East of England and their methods had been codified in the North East Transformation System (NETS) and coaching was available through the Tees, Esk and Wear Valley NHS Foundation Trust (TEWV).

TEWV had developed their own Kaizen Promotion Office function, which supported change and had sufficient capacity to provide training and coaching to NHS Highland staff.

The initial work focused on the planning and delivery of Rapid Process Improvement Workshops (RPIWs). An RPIW takes place over five days with staff coming together to review and improve a particular part of a process in real time. It is designed around Plan Do Study Act (PDSA) improvement cycles supported by a detailed planning phase and with regular reporting at 30, 60, 90, 180 and 365 days.

NHS Highland undertook 65 Rapid Improvement Workshops between April 2013 and January 2017. While not all events have produced major improvements, there are examples of results obtained in one year follow up, as shown in Table 1.

To support these events, and to provide training to staff, NHS Highland now has 28 accredited Lean Leaders (including all executive directors) and a further 28 senior managers being trained. Running supervised RPIWs is part of the requirement to becoming an accredited Lean Leader.

A programme of Lean Intermediate Training is also underway, aimed at staff with management responsibilities within a service. This training is focused on how they will support their teams to make changes to their service, and how they incorporate QI into their own work. All training is now provided in-house.

Developing Annual Corporate Objectives

While the outputs from the individual RPIWs and other improvement work have been generally very positive, it was clear that it was also necessary to develop a clear alignment between corporate objectives and front-line delivery.

NHS Highland's Senior Leadership Team developed Annual Objectives using the Hoshin Kanri process, based on an assessment of current requirements, performance and demands.[30] These draft objectives were then shared with staff through a process known as 'catchball'.[31]

Catchball is a Lean system to greatly improve two-way feedback and ownership, especially for decision-making and policy deployment. Objectives were shared in structured sessions, and front-line staff were able to comment on and influence them. There were in total eight iterations of the original set of objectives. The personal contact and time taken to engage with staff produced marked changes, which then affected the annual plan.

Teams then produce their annual plans, based on the agreed objectives. In future we expect to involve an increased number of staff in the planning cycle.

Table 1: Examples of work measured one year after an improvement event took place

Area	Impact measured one year after improvement event
Rural General Hospital Outlier on average length of stay	Reduction in average length of stay from 8 to 5.3 days, allowing an 8 bed reduction. Proportion of people with Estimated Date of Discharge set on day of admission increased from zero to 95%
Out-Patient Clinic Administration Late cancellation or non-use of booked clinic rooms	Use of 23 clinic rooms increased from 73% to 90%, reducing weekend working and use of other premises.
Small Town General Practice	Average waiting time for an urgent appointment during the working week reduced from 198 hours to less than 12 hours. Patient satisfaction with appointment waiting times increased from 73% to 84%
Mental Health Services Assessment of people referred to specialist mental health services within a General Hospital, and communication of assessments to the wider mental health service.	Weekdays on which a 'huddle' was held with out-of-hours services, hospital and Community Mental Health Teams increased from zero to 100%, improving communication and decreasing risk. Average time from referral to assessment decreased from 101 minutes to 76 minutes.
Portering Services, District General Hospital Transfer of patients from ward to investigation/ appointment.	Proportion of patients ready for collection on ward increased from 55% to 88%. Proportion of patients reaching their appointment on time increased from 46% to 90%
Occupational Health Services	Time from receipt of referral to first appointment decrease from 26 day average to 9 day average, decreasing distress and time off work.

Daily Management

It is easy to overestimate the importance of making one 'big decision' and underestimate the value of making better decisions on a daily basis. To create sustainable improvements the challenge is how best to integrate work on QI into the organisation's daily work, while keeping the service functioning. The key is to embed better daily management and some of the ways we are delivering this include:

- Reviewing performance on the previous shift or day and identifying any problems that arose, and agreeing how to resolve them
- Making sure accountability for actions is clear
- Reviewing the work required that day, and agreeing any adjustments due to staff absence, or altered demand

Daily management is supported by daily huddles, production boards and standard work.[32]

INGREDIENTS FOR SUCCESS

To develop a more successful approach to creating a QI culture, our experience has revealed a number of recurring themes as follows.

Leadership commitment

The bravery of the leadership team and their confidence to work in an environment of uncertainty seems important as is the unwavering mutual support of each other.

Board awareness and support for quality

Ensuring that Board members agreed with the need for change, and endorsed the

quality approach has been critical, and has helped to gain support to invest in capacity to deliver change.

Inviting board members to act as outside eyes at improvement workshops, and participating in safety walk rounds has helped them to triangulate what they were hearing from the leadership team with what they heard from front-line staff.

It has been important to regularly update the Board on progress, illustrating with presentations from front-line staff. Now each public board meeting starts with a 15-minute report followed by discussion of the improvement work

Application of a methodology with rigour

There needs to be commitment to stick with the rigour of the chosen QI tools and techniques.

Active application of small cycles of change

All of the improvement work programmes, whether it is Lean or Scottish Patient Safety Programme, utilise small cycles of change alongside more complex tools and techniques.

Scaling up and sustaining gains

Implementing small cycles of change combined with daily management, identifying targets for future improvement, and catchball to promote organisational alignment can deliver more substantial gains.

Getting buy-in

Ensuring a wide understanding of the need to change, and offering coaching and direction about the way to study and act on any change has empowered staff to improve systems and ways of working in their own areas. It requires managers to move away from 'command and control' approach to one of leading and coaching.

Celebration of success

Continued celebration of success within the organisation and in the public is important to build confidence and generate energy and enthusiasm. Weekly report outs, a forum for presentation on improvement work to peers, is embedded. A monthly Highland Quality Award for exceptional improvement work or person-centred care has also been introduced.

LESSONS LEARNED

1. Delivering change and improvement within NHS Highland has required the board and senior leadership team to be committed to both the need to change and the approach to change.
2. Developing and embedding the HQA has required significant engagement at all levels and needs to be sustained.
3. Decision-makers often associate transformation as being something 'major' in scale and decisions, yet in the NHS attention to detail, reducing unwarranted variation and applying standard work can have more far-reaching impacts on both quality and cost. It seems critical not to underestimate the value of making better decisions on a daily basis.
4. The actual QI method chosen seems less important than the clear selection of one. Sticking to the rigour of the chosen methodology is critical. We have found that Lean is a good fit with the organisation, and causes no conflicts with the Scottish Patient Safety Programme, or the IHI improvement methods.
5. The detail of the individual initiatives must be embedded through daily management and link into the overarching strategic plan. Random

improvement projects, no matter how successful, will not deliver transformational change.

6. The RPIWs have been one way to gain support from the local teams. They have been able to see and feel how their direct influence in shaping changes has reduced their burden of work while improving services. In this regard participants work on a very level playing field that respects what people have to contribute rather than their grade or job title.
7. Executive Leaders have had to act in a truly facilitative way, and avoid the urge, after years of training, to solve problems from the front line.
8. Consistency of message and clarity of purpose across the organisation are key. Initially the appetite for involvement from front-line staff in the development of corporate objectives was underestimated.
9. Notably in the early days of the Scottish Patient Safety Programme, there was resistance to change. Managing change in clinical practice was (and is) one of the biggest hurdles to overcome even when safety was an essential driver for change.
10. Changing culture and embedding quality is a continuous journey. While there will be breakthrough periods, there are also inevitable setbacks. There is no single quick or big thing that delivers transformational change. By far the greatest challenge is to influence hearts and minds to get people to accept that the status quo is not sustainable. There is a pressing need to change clinical practice and ways of working and this needs to be managed on a daily basis.

CONCLUSIONS

Staff want to be able to do a good job and recognise that the systems often place an excessive and unnecessary burden of work on the whole team. Being able to remove their waste, and having permission to reorganise their own workplace has been empowering.

All large-scale public bodies find themselves managing in very difficult times with increasing demands including from more knowledgeable and connected communities. Therefore, it is incumbent upon leaders of these multimillion pound organisations to remember that they are the privileged custodians of the money of the tax-payers, and that they must develop cohesive strategies and make decisions that provide the best possible services for the best price, which will meet the needs and be sustainable for future generations.

References and notes

1. £3.9b was also spent on social care services (Expenditure on Adult Social Care Services, Scotland, 2013-14).
2. The Scottish Government. (2011) 'Achieving sustainable quality in Scotland's Healthcare: A "20:20" vision', Edinburgh: The Scottish Government, available at http://www.gov.scot/Topics/Health/Policy/2020-Vision/Strategic-Narrative (accessed 6th October, 2015).
3. The Scottish Government. (2010) 'NHS Scotland quality strategy – Putting people at the heart of our NHS. [Internet] 2010', available at http://www.gov.scot/Publications/2010/05/10102307/0 (accessed March, 2017).
4. Chief Medical Officer. (2016) 'Chief Medical Officer's Annual Report 2014 – 15', Realistic Medicine. Edinburgh: The Scottish Government.
5. The Scottish Government. (2016). 'A National Clinical Strategy for Scotland', Edinburgh: The Scottish Government.
6. The Scottish Government. (2016). 'Health and social care delivery plan. [Internet]', available at http://www.gov.scot/Resource/0051/00511950.pdf (accessed March, 2017).
7. Somerville, M. (2011) 'The Annual Report of the Director of Public Health 2011', NHS Highland, Inverness.
8. Somerville, M. (2012) 'The Annual Report of the Director of Public Health 2012', NHS Highland, Inverness.
9. NHS. (2017) 'NHS Highland Strategic Quality and Sustainability Plan: 2017/18 – 2019/20', NHS Highland, Inverness.
10. Bradley, S., Munoz, S. (2017) 'Small Isles Community Update 2', UHI Division of Health Research, Inverness.
11. NHS Highland. (2012) 'NHS Highland Briefing Note No 3', NHS Highland, Inverness.

12. Sarquella, E., Henderson, D., Fabà, M., Mead, E., Solanes, P., Plaza, A., et al. (2016) 'Health and Social integrated care in practice. Local Partnerships in action', *International Journal of Integrated Care*, Vol. 16, No. 6, A64. DOI: http://doi.org/10.5334/ijic.3015 (accessed March, 2017).
13. Ham, C., Heenan, D., Longley, M., Steel, D.R. (2013) 'Integrated care in Northern Ireland, Scotland and Wales. Lessons for England', The King's Fund, London.
14. Mead, E, Amelung, V.E., Stein, V., Goodwin, N., Balicer, R., Nolte, E., Suter, E, eds. (2017) 'Handbook integrated care', Springer, New York.
15. Thompson, M., Peters, B., Small, N., Rodgers, K. (2015) 'A problem shared', *International Journal of Integrated Care*, Annual Conf Suppl; URN:NBN:NL:UI:10.
16. Joint Improvement Team. (2016) 'Innovation in Care at Home', available at http://www.nhshighland.scot.nhs.uk/Publications/Documents/Innovation%20in%20Care%20at%20Home.pdf (accessed March, 2017).
17. Stark, C. Looking for lean. In: Graban, M., editor, 'Practicing lean', Amazon.
18. Scottish Patient Safety Programme. (2017) 'About Us. [Internet]', Edinburgh: Healthcare Improvement Scotland. [Cited 2017 17 March], available at http://www.healthcareimprovementscotland.org/our_work/patient_safety/spsp.aspx (accessed March, 2017).
19. Whittington, J.W., Nolan, K., Lewis, N., Torres, T. (2015) 'Pursuing the triple aim: the first seven years', *The Milbank Quarterly*, Vol. 93, No. 2, pp. 263–300.
20. NHS. (20111) 'NHS Highland Strategic Framework 2010/2011', NHS Highland, Inverness.
21. Kenney, C. (2010) 'Transforming health care: Virginia Mason Medical Center's pursuit of the perfect patient experience', Productivity Press, Boca Raton.
22. Berwick, D.M., Hackbarth, A.D. (2012) 'Eliminating Waste in US Healthcare', *The Journal of The American Medical Association*, Vol. 307, No. 14, pp. 1513–1516.
23. Plsek, P.E. (2013) 'Accelerating health care transformation with lean and innovation: The Virginia Mason Experience', Productivity Press, Boca Raton.
24. Toussaint, J. (2010) 'On the mend: revolutionizing healthcare to save lives and transform the industry', Lean Enterprise Institute, Cambridge.
25. Graban, M. (2016) 'Lean hospitals', 3rd Ed., Boca Raton: Productivity Press.
26. Jones, D. , Mitchell, A. (2006) 'Lean thinking for the NHS', NHS Confederation, London.
27. Scoville, R., Little, K. (2014) 'Comparing lean and quality improvement', IHI White Paper, Institute for Healthcare Improvement, Cambridge.
28. Toussaint, J.S., Berry, L.B. (2013) 'The promise of lean in healthcare', *Mayo Clinic Proceedings*, Vol. 88, No, 1, pp. 74–82.
29. Stark, C., Gent, A., Kirkland, L. (2015) 'Improving patient flow in pre-operative assessment', *BMJ Quality Improvement Reports*, Vol. 4. DOI:10.1136/bmjquality.u201341.w1226.
30. Akao, Y. (2004) 'Policy deployment for successful TQM', London: Taylor and Francis.
31. Jackson, T.L. (2006) 'Hoshin kanri for the Lean enterprise', Productivity Press, Boca Raton.
32. Mann, D. (2014) 'Creating a lean culture', Routledge, London.