

Lean in British Columbia's Health Sector

Annual Report 2010–11

BC Ministry of Health

September 2011

Lean in British Columbia's Health Sector

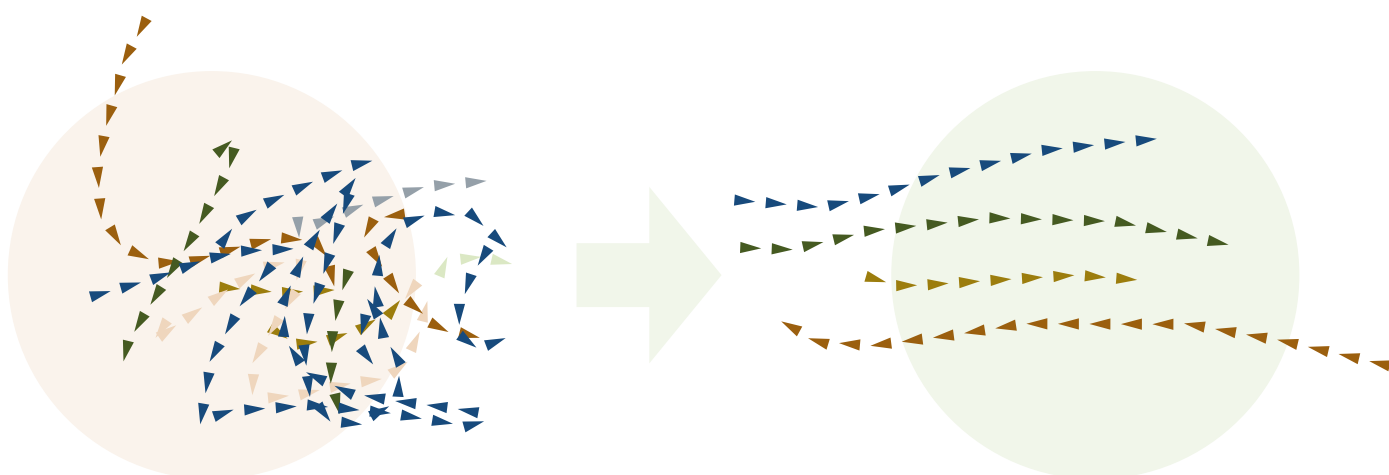
Annual Report 2010–11

This report presents Lean process redesign work carried out in the British Columbia health authorities in 2010/11.

For more information contact Kevin.Samra@gov.bc.ca.

September 2011

BC Ministry of Health



Preface

In the health sector, Lean is a patient-focused approach to systematically eliminating waste in health care organizational processes in order to improve quality, productivity and efficiency. In essence, Lean involves mapping out the patient journey from the time they enter the system until they exit the system in order to identify activities that provide value to the patient and eliminate those that add no value (waste). Once wasteful activities are removed, remaining steps are made more efficient and integrated so that services flow smoothly. This means that services are “pulled” only when needed by patients. The final step of Lean is the pursuit of continuous improvement by repeating the cycle to get it more and more streamlined.

In November 2010, Leadership Council¹ decided to support the use of Lean within the health authorities as a process redesign tool. One of the strategic actions or Key Result Areas (KRAs) for achieving the Ministry of Health’s Innovation and Change Agenda is concerned with reducing waste and increasing value in the health care sector using Lean methods. A key deliverable for this KRA is an annual report for Leadership Council that outlines how Lean has been used in the province. This report presents seven case studies that have been identified by the health authorities as compelling and successful Lean initiatives.

¹ Membership consists of the Health Authority CEOs, the Deputy Minister of Health, and Ministry of Health Executives.

Contents

1	Preface
4	Executive Summary
10	Overview of the Lean Approach in British Columbia
12	Provincial Health Services Authority
14	CASE STUDY 1 — Lab Tests in the BC Children's Hospital Pediatric Intensive Care Unit
21	CASE STUDY 2 — Provincial Specialized Eating Disorder Program for Children & Adolescents
32	Vancouver Coastal Health
33	CASE STUDY 3 — Early Intervention & Rehabilitation Program
43	Interior Health
44	CASE STUDY 4 — Pre-Surgical Screening & Operating Room Booking at the Kelowna General Hospital
52	Vancouver Island Health Authority
53	CASE STUDY 5 — Improving Overall Referral Time from Acute Care to Activation Services

60	Northern Health
61	CASE STUDY 6 — Referral to Home & Community Care
67	Fraser Health
68	CASE STUDY 7 — Breast Health Care Optimization in Surrey
78	Conclusions
81	Appendix 1 Innovation & Change Agenda
82	Appendix 2 Lean Network Members
83	Appendix 3 Glossary
85	Appendix 4 Lean Storyboard Template
87	Appendix 5 List of Health Authority Storyboards 2010/11
91	Appendix 6 References

Executive Summary

Lean is an approach to systematically eliminating waste in organizational processes in order to improve quality and productivity, and reduce costs. At the heart of Lean in health care is the mapping of a patient's journey through the system in order to identify steps that are of value to the patient, and those that add no value (i.e., are waste). Examples of waste in health care are duplicate tests, patient waits, and underutilization of staff skills and knowledge. Once wasteful activities are identified and removed, remaining steps are made more efficient and integrated so that services flow smoothly. The next stage in Lean is the pursuit of continuous improvement by repeating the cycle so that processes are more and more streamlined.

Lean may be used to redesign a discrete process, as a strategy for improving the patient care journey across service lines, or it may form the management philosophy and culture of an organization. Applying Lean through process improvement events equips staff with the tools and knowledge they need to embed continuous process improvement in their everyday work.

In November 2010, Leadership Council decided to support the use of Lean within the health authorities as a process improvement tool, while allowing the health authorities the latitude to determine where along the Lean spectrum (from tool to strategy to management philosophy) to position their Lean initiatives. Also in 2010, the Ministry launched the Innovation and Change Agenda¹, comprised of strategic actions (Key Result Areas) for achieving the Ministry's vision of "A sustainable health system that supports people to stay healthy, and when they are sick, provides high quality publicly funded health care services that meet their needs". Key Result Area (KRA) 6 is concerned with reducing waste and increasing value in the health system using Lean methods.

Key deliverables for KRA 6 for fiscal 2010–11 included the development of a provincial Lean network and working groups, and the production of an inventory of Lean events and an annual report for Leadership Council. The Lean Network² was established in early 2011 with representation from each of the health authorities and the Business Transformation Branch of the Ministry of Health. The Network assists the Ministry in supporting the coordination of provincial Lean activities, facilitating information sharing across health authorities, and championing the use of Lean within members' regions. Working groups on education, measurement for evaluation, and integrating Lean into capital projects have also been formed to assist the Lean Network in achieving its goals.

1 See Appendix 1 for an overview of the Innovation and Change Agenda.

2 See Appendix 2.

In 2010/11 the health authorities completed more than 125 Lean events, which have been documented using a “storyboard” template developed by the Lean Network. This report is based on seven case studies that the Lean Network leads have identified as compelling and successful. The case studies are summarized below, with a brief overview of how Lean activities are organized in each of the health authorities.

Provincial Health Services Authority

PHSA aims to adopt Lean as a mindset of continuous improvement in a management system that empowers staff at all levels to remove waste and maximize what is valued by the patient. Lean is delivered through the imPROVE program, which was created to help PHSA become more efficient, improve the health of employees and patients, eliminate waste, and add value to the organization by finding new solutions to everyday problems. Lean has begun to be applied in all of the major PHSA agencies and services, with the goal that it be system wide one day. Twelve value streams and over 60 rapid process improvement workshops were undertaken across PHSA in 2010/11. The 15-member imPROVE team is part of PHSA's Strategic Planning and Transformation Support and Innovation department, and reports to the Chief Executive Officer of PHSA.

For this report, PHSA has chosen two Lean projects, one at the unit level and a second, program wide. The unit-level Lean project took place in the BC Children's Hospital Pediatric Intensive Care Unit. Caregivers reviewing patient blood work during patient care rounds had observed that there was no standard for the amount of lab work that was ordered for non-cardiac post-operative patients. In addition, the technique for obtaining blood samples was thought to be causing incorrect test results, and duplicate blood tests were being run on the same patient. Through the Lean process improvement workshop, standard blood work has been established for these patients, the method for sampling blood from arterial lines has been improved, and duplicate blood testing has been reduced by 90%. Cost reductions are estimated at \$32,400 per year, based on 3,600 patient days per year and the elimination of 2,160 unnecessary tests.

The other PHSA Lean case study took place in the Provincial Specialized Eating Disorders Program for Children and Adolescents. The program received funding in 2008 of approximately \$1.5 million from the Ministry of Health to increase tertiary care, including expanding intensive in-patient treatment, and developing a full day-treatment program. PHSA's imPROVE method was used to achieve the program expansion while aligning the Eating Disorder program's approach with best and promising practices for treating eating disorders in children and adolescents. Process improvement workshops were carried out on 11 program processes with the goal of improving access to care, implementing best and promising practices, and standardizing care processes. The Lean events led to a reduction in wait time from referral to assessment from 66 to 8.5 days, a reduction in wait time from assessment to first treatment from 48 to 8.5 days, the development of two care pathways for eating disorder patients, and the standardization of several care processes.

Vancouver Coastal Health

Senior leaders and executive at Vancouver Coastal Health have committed to using Lean principles, are moving toward integrating Lean principles into their leadership approach, and have integrated Lean into the health authority's strategic plan. Vancouver Coastal Health and Providence Health Care have a core Lean Team that works with local leaders to improve processes within their areas. While the local areas use somewhat different approaches, the overall goal is to engage an increasing number of staff and physicians in daily improvement opportunities. Thirty-three Lean initiatives are currently underway in Vancouver Coastal Health and two in Providence Health Care.

Vancouver Coastal Health's Lean case study is about process improvements made in its workplace-based Early Intervention and Rehabilitation Program (EIRP) for disability management. The cost of long-term disability premiums had increased by 80% over the previous four years in the health authority, and operational problems within the EIRP had been reported by unions and managers. The objective of the Lean event was to minimize the time an employee is away from work for health-related reasons, and reduce long-term disability costs. The Lean process resulted in higher participation rates in the EIRP (participation is assumed to reduce absence duration), a reduction in absence duration, and a reduction in long-term disability claims. The reduction in new claims in 2010 is estimated to produce savings for Vancouver Coastal Health of \$17.6 million (amortized from 2010 until 2020).

Interior Health

Interior Health's CEO and Senior Executive Team (SET) have officially endorsed Lean as a management system with the objective of improving quality, safety, and patient and staff satisfaction. SET has identified a service-line approach to implementing Lean as being more effective than concentrating on single, local improvements that might not affect the overall patient experience. The majority of Lean resources in Interior Health are therefore focussed on two service lines that have been selected by SET: 1) Frail Elderly Activation¹, and 2) hips and knees surgery. Twenty-eight major process improvement events will be carried out within these service lines over the next two years. However, Lean work is also taking place within the capital building process for the new patient towers at the Kelowna General and Vernon Jubilee hospitals, and on an ad hoc basis in response to requests by Interior Health staff and leaders.

The Interior Health Lean case study is about a Lean event that was carried out to prepare for moving the pre-surgical screening and operating room (OR) booking departments into the new patient tower under construction at the Kelowna General Hospital. The upcoming move was viewed as an opportunity to make

¹ Optimizing the functional status of elderly patients by keeping them active and independent in order to prevent functional decline that results in the need for placement in an alternative level of care.

the pre-surgical screening/OR booking journey more patient and family centered, improve collaboration among colleagues in the two departments, and ensure that ineffective processes were not taken into the new building. As a result of the Lean initiative, more than 60 improvements have been implemented, such as changing the layout of the waiting room to increase patient confidentiality, creating division of labour checklists for clerks, and streamlining administrative processes.

Vancouver Island Health Authority

The Vancouver Island Health Authority's Strategic Process Improvement Department, which supports Lean in the health authority, currently consists of two full-time equivalents (FTEs), with an additional two FTEs planned for 2011/12. Lean projects in VIHA vary in scope from local (e.g. lab test turn-around-time) to cross-sector (e.g. care transitions among acute, community, and residential care). About 20 Lean events were reported in VIHA during fiscal year 2010–11. In the future, VIHA plans to continue to align Lean and other process improvement activities with the VIHA Five-Year Strategic Plan. Lean will be applied as a strategic enabler in support of VIHA's four System Wide Initiatives¹, and as a tactical improvement tool directed at high-priority service processes.

VIHA's case study is about the redesign of the process for referring patients from acute care in the Nanaimo Regional General Hospital to the Activation Unit at Dufferin House, a residential care service provider located next to the hospital. Before the Lean event, the process for referring and transitioning patients was not clear, the steps were time consuming, and the paperwork was intensive. The result was delays in patients accessing Activation Unit services, and inappropriate referrals. Following the Lean initiative, patients are now "pulled" to Dufferin House when a space becomes available, rather than being "pushed" from acute care to Dufferin House. This change has resulted in the reduction of elapsed time from when an acute care patient is designated for activation, until they are discharged from acute care and admitted to the Activation Unit, from an average of 7.4 days to 3.9 days. This means that acute care beds are now available for more patients.

Northern Health

The Lean program in Northern Health uses Lean tools and concepts to improve selected processes rather than using Lean as a system-wide management philosophy. The goal of the program is to build capacity in all staff in order to further develop an organizational culture that encourages, supports, and expects the application of continuous quality improvement. The Lean program is led by the Regional Manager of Process Improvement, however this position is not solely dedicated to Lean, and Northern Health does not have a dedicated cadre of Lean quality improvement advisors. Instead, Northern Health draws on the

¹ Infection Prevention and Control, Care Delivery Model Redesign (to ensure the right staff are in place to meet patient needs), Care Continuum Transformation (to ensure that there is a clear care plan to return patients — particularly seniors — home as soon as they are able), and Staff Safety and Wellness (VIHA, 2010).

expertise of Lean-trained champions on an ad hoc basis. Northern Health's five-year Lean Implementation Plan aligns future Lean projects with the Northern Health 2009–2015 Strategic Plan, as well as meeting sectoral and regional process redesign interests.

Northern Health's case study is about a Lean event which aimed to reduce both lead time for patients to be referred to Long Term Care Home Support Services, and billing errors. There had been problems in the referral process since June 2010, when Northern Health began using a new process which staff found to be cumbersome, disjointed and frustrating. While the problems primarily affected the Prince George Home and Community Care office, rural offices were also affected when information processing interfaced with the Prince George site. The primary objective of the project was to improve information flow and eliminate errors so that clients would receive home support services in a timely manner. The result was that the lead time from when a patient is referred to Long Term Care Home Support Services until they first receive services has been reduced from 68 days to 14 days. Billing errors were also reduced.

Fraser Health

In Fraser Health, Lean is applied independently (without central coordination) in business and clinical units wishing to review and optimize their core operational processes. Lean training has been provided to more than 250 Fraser Health employees since 2005, and the health authority plans to integrate a basic Lean course into its management development program, as well as develop a Lean community of practice. Process improvement work in Fraser Health is also supported by an operations engineering team which provides advanced business analytics to key areas in the organization. At least 24 system or process optimization activities were identified for fiscal 2010–11 in Fraser Health.

For this report, Fraser Health has selected a project which aims to improve time to diagnosis for women in Surrey with breast cancer. While best practice indicates a 15-day target for time to diagnosis, data from the BC Cancer Agency showed that in Surrey fewer than 10% of women had been receiving a diagnosis within 30 days. To address this problem, a model was developed for a Breast Health Centre in the newly opened Jim Pattison Outpatient Care and Surgery Centre based on "triple assessment". In this model, patients are offered three diagnostic services — imaging, cytology and physical examination — during a single visit.

In Summary

Lean has historically been applied most extensively in the private sector, and predominantly in the manufacturing industry. Over time, it has been applied in other sectors and industries, and there is a growing body of evidence that it may be successfully applied to the health care sector. Much of the evidence demonstrating that Lean can improve the quality of patient care and reduce costs has been accumulated in the privately-funded health system in the United States. This report contributes to that body

of evidence by showing that Lean also works in British Columbia's publicly-funded health care system. In the case studies featured in this report, Lean has been used to improve patients' access to services, reduce costs, implement evidence-based processes, and improve the patient experience. Since the evidence suggests that Lean process redesign can be a powerful tool for implementing change, health authorities should continue to use Lean methods and tools to improve quality, productivity and efficiency.

The case studies presented in this report also highlight several factors that need to be in place for Lean to be most successful in the health authorities. These include: securing executive support; dedicating staff to Lean; involving staff and other stakeholders in Lean events; viewing the change process through the lens of the patients and families served; linking Lean projects to the organization's strategic goals; collecting good data upon which to base decisions; communicating with staff, before, during, and after a Lean event; assigning responsibility for measuring and auditing progress; and continuing to refine improvements to put into practice the philosophy of continuous improvement.

While the health authorities continue to identify and carry out Lean initiatives, the Ministry and health authorities will continue to collaborate, and share knowledge and best practices through the Provincial Lean Network. In the short term, the Network and its working groups are focussing on:

- » Developing a common introductory-level Lean curriculum and Lean toolkit which may be used by all the health authorities;
- » Developing a framework for improving the measurement of results and evaluation of Lean initiatives;
- » Creating a report for Leadership Council recommending how Lean can be better integrated within the capital planning process; and
- » Developing a Lean community of practice and web-based hub to allow health authority participants and the Ministry to better connect to solve problems, share ideas, and transfer best practices.

The Lean Network will be discussing the case studies described in this report, and other compelling health authority Lean initiatives undertaken in fiscal 2010/11, to determine which may be suitable for broader adoption. Once identified, these initiatives will be monitored to ensure gains are sustained over time, and to support Network recommendations to Leadership Council about initiatives that potentially could be implemented across health authorities to reduce waste and increase value for patients.

Overview of the Lean Approach in British Columbia

*The world we have created is a product of our thinking;
it cannot be changed, without changing our thinking.*

— Albert Einstein

Health expenditures in British Columbia are growing as a proportion of the provincial budget, and cost pressures are likely to mount as demand for care changes over time. A challenge is to improve access to quality patient care while fostering the sustainability of the publicly-funded health care system.

Lean is a patient-focused approach to systematically eliminating waste in organizational processes, in order to improve quality and productivity and reduce costs. Lean was developed by Toyota Production Systems as a management philosophy, and has since been implemented in health care organizations in the United States, Canada, Australia and elsewhere.

At the heart of Lean is an evaluation of organizational processes in order to identify the steps that are of value to the customer, and those that are non-value-adding. In health care the customer may be patients and their families, or internal staff, depending on the process¹. Non-value-adding steps are called waste, and the goal of Lean is to eliminate, simplify, reduce or integrate these steps². Some examples of waste in health care are duplicate tests, patient waits, excess time taken to locate supplies, and the underutilization of human resources.

Achieving success with Lean takes humility and perseverance. It is difficult, but when done properly, it is a powerful enabler of continuous improvement within an organization. The application of Lean, through rapid process improvement or *Kaizen*³ events, equips staff with the tools, methods, and experiences of success that enable them to embed continuous process improvement in their everyday work.

Lean may be used as a tool to redesign a discrete process or as a strategy for improving a patient care journey across service lines, or it may form the management philosophy and culture of an organization. In November 2010, Leadership Council decided to support the use of Lean within the health authorities as

1 Institute for Healthcare Improvement (2005)

2 Stamatis (2011, p. 149)

3 Items in italics are defined in the glossary in Appendix 3.

a process redesign tool, while allowing the health authorities the latitude to determine where along the spectrum (from tool to strategy to management philosophy) to position their Lean initiatives.

Also in 2010, the Ministry launched the Innovation and Change Agenda, comprised of 15 strategic actions (Key Result Areas) for achieving the Ministry's vision of "A sustainable health system that supports people to stay healthy, and when they are sick, provides high quality publicly funded health care services that meet their needs". Key Result Area (KRA) 6, "Drive Lean across the Hospital Service Sector", is concerned with reducing waste and increasing value (efficiency and effectiveness) in the health care sector using Lean methods. Although most Lean events are conducted within the hospital service sector, a decision was made to also report on events in other areas of the health sector that contribute to the overall goals of the Innovation and Change Agenda.

For fiscal 2010–11, key deliverables for KRA 6 included:

- » Providing an inventory and status of Lean initiatives that are underway or completed in each health authority;
- » Producing an annual report on Lean for Leadership Council;
- » Establishing a network to coordinate and steer Lean activities across the province;
- » Forming working groups for Lean education and facilities.

The Lean Network was established in early 2011 with representation from each of the health authorities and the Business Transformation Branch of the Ministry of Health (See Appendix 2 for Network membership). The purpose of the Network is to assist the Ministry in supporting the coordination of provincial Lean activities, facilitate information sharing across health authorities, and champion the use of Lean within members' regions. The Network has formed three working groups to support health authorities on their Lean journeys and help complete key activities. These working groups focus on education, measurement for evaluation, and integration of Lean into capital projects.

In 2010/11 the health authorities completed more than 125 Lean events. Appendix 4 includes a "storyboard" template developed by the Lean Network to be used for documenting Lean events for information sharing across health authorities. Also provided are a few bullets that highlight the types of gains that are reported in these stories. Appendix 5 provides a complete list of storyboards completed by the health authorities for events undertaken in 2010/11, all of which are available upon request.

Provincial Health Services Authority

The Provincial Health Services Authority (PHSA) operates provincial agencies including the BC Children's Hospital, the BC Women's Hospital & Health Centre, BC Transplant, and the BC Cancer Agency. It is also responsible for specialized provincial health services like the BC Ambulance Service, which are delivered in a number of locations in the regional health authorities, as well as specialized programs that operate across several PHSA agencies.

PHSA began to apply Lean tools in isolated process improvement projects in 2006, and then in 2007 launched the imPROVE program. imPROVE was created to help PHSA become more efficient, improve the health of employees and patients, eliminate waste, and add value to the organization by finding new solutions to everyday problems. PHSA aims to adopt Lean as a mindset of continuous improvement in a management system that empowers staff at all levels to remove waste and maximize what is valued by the patient. Lean has begun to be applied in all of the major PHSA agencies and services, with the goal that it be system wide one day.

PHSA's approach to Lean is to identify all waste from the patient's perspective as the patient travels through the system. PHSA commonly uses a number of Lean tools to identify and remove waste: *value stream mapping*, *Rapid Process Improvement Workshops (RPIWs)*, *3P*, and *5S*.

The general Lean process is consistent across PHSA's agencies, programs, and services and proceeds as follows. Agency leadership identify *value streams* of strategic importance, the patient journey within this value stream is mapped, and improvement goals and targets are established. Key issues are then addressed in RPIWs. Twelve value streams are currently completed per year in PHSA's agencies, hospitals and services, with up to eight RPIWs per value stream held each year. The number of RPIWs undertaken annually across PHSA has increased from 11 in fiscal 2006/07 to more than 60 in fiscal 2010/11.

RPIWs include three preparatory weeks of data collection and observation, followed by the RPIW event week, in which team members actively generate, implement, test, and evaluate solutions. Solutions that are proven successful are planned to be implemented by the end of the RPIW week. Sponsors (i.e., vice presidents, medical directors, and managers) of the value stream participate by attending sponsor status meetings to obtain updates on progress, provide direction for change, and remove any barriers to progress.

A formal process has been established within PHSA for monitoring and follow up once an RPIW is complete. Goals and targets for each value stream are tracked monthly, and there is a standard audit schedule that

starts immediately after each RPIW and follows primary measures of the process change for one year. Results are reported to area managers at weekly *gemba* walks in which all RPIWs in progress are reviewed by area managers. Successes and challenges are discussed with the designated audit leader of the workshops, and steps are taken immediately to deal with sustainment issues. Results are reported and tracked from the front line to the senior executive team. Agency “performance walls” have been established to help executive track progress toward achieving value stream goals and targets, and program-level or service-line performance walls are used by program leaders to review progress in achieving value stream and RPIW goals with their staff.

PHSA also uses 3P and 5S Lean methodology. 3P has recently been applied to site redevelopment at the BC Children’s and BC Women’s hospitals, the first organizations in Canada to take this approach to a major capital project. Three major 3P events completed to date have informed the indicative design¹ of the new hospital, taking into account flows of services, patient arrival, flow of inpatients, and flow of procedures and interventions requiring sedation or anaesthesiology. The goal of applying Lean at the design stage is to ensure that the facility design supports minimal waste.

Each chosen Patient Service Line has a schedule of 5S events that reduce inventory and improve efficiency and patient safety. 5S events may be part of an RPIW or may be stand-alone events.

The imPROVE team is part of PHSA’s Strategic Planning and Transformation Support and Innovation department, and reports to the Chief Executive Officer of PHSA. All Lean work is currently supported by the imPROVE team, which includes the imPROVE Promotions Office Director, four agency directors, two imPROVE leaders, six facilitators, a 5S coordinator, and administrative support.

An external consultant has provided senior leadership guidance, assisted in establishing the imPROVE promotions office, delivered Lean leader training, and provided support during the RPIW events. However, the imPROVE team is in the process of transitioning away from this consultant to using its own staff to provide in-house Lean consultation and training.

All leaders from executive to the selected front-line leaders complete Lean Leader Training and Certification, consisting of three days of classroom instruction and a one-day oral examination. In order to be certified, leaders are required to apply their learning in a value stream mapping session and participate in leading an RPIW. To date there are 157 PHSA leaders on the Lean Leader Certification Track, 19 of which are PHSA Senior Executive. As more program leaders complete their Lean certification, they will be able to initiate and

¹ “A preliminary design used to illustrate architectural and design concepts for the purpose of communicating needs and preliminary ideas” (VIHA, 2007).

complete RPIWs with less support from the imPROVE team. All RPIW participants receive theoretical and practical training on Lean methods and tools on the first morning of the RPIW event.

The focus of the next phase of the imPROVE strategy includes:

- » Continuing to develop and deliver Lean education and training in house;
- » Strengthening alignment of the value streams with the organization's strategic priorities for improved quality, safety, delivery, efficiency, and patient/staff satisfaction;
- » Focussing on the most important improvement goals and deploying these goals and targets for action to every level of the organization;
- » Continuing to implement daily management systems for tracking progress toward achieving targets at the front line, while engaging staff in regular tracking and continuous improvement of results;
- » Building expertise in 3P to support care teams in redesigning patient care processes, maximizing waste reduction, and applying Lean principles in preparation for the new Children's and Women's hospital site.

Two Lean events have been selected as case studies to showcase Lean in PHSA. The first describes a localized process improvement carried out in the BC Children's Hospital; the second describes the review of a whole program, the Provincial Specialized Eating Disorders Program.

CASE STUDY 1 — Lab Tests in the BC Children's Hospital Pediatric Intensive Care Unit

BC Children's Hospital, an agency of the PHSA, provides expert care for the province's most seriously ill or injured children, from newborns to adolescents. Based in Vancouver, BC Children's Hospital reaches across the province with vital health services that may not be available anywhere else in BC.

The Pediatric Intensive Care Unit (PICU) is an area within BC Children's Hospital that specializes in the care of critically ill infants, children, and teenagers. The PICU is generally directed by one or more pediatric intensivists, and staffed by doctors and nurses who are specially trained and experienced in pediatric intensive care. The unit also has other health care practitioners such as nurse practitioners, respiratory therapists, and physician assistants on staff.

Impetus for Lean

Caregivers reviewing patient blood work during patient care rounds in the PICU had observed that there was no standard for the amount of lab work ordered for non-cardiac post-operative patients, nor was there a daily review of the type and frequency of tests ordered for these patients. The lack of standard work affected patient safety, quality of care, use of staff time, and costs.

In addition, daily auditing of the number of blood tests carried out showed that tests done on the Point of Care (POC) testing system were frequently sent to the lab to confirm the POC results. POC testing was established in the PICU to improve the efficiency of processing blood tests. The POC testing system was validated prior to being put into service using a standard methodology of comparing results between the POC and the main lab analyzer. Results showed a statistically insignificant difference between the two analyzers when the same blood sample was analyzed. The reason for the duplicate testing was discrepancies between the POC and lab results. The discrepancies led to the belief that the POC results were inaccurate, which caused staff to draw duplicate samples for testing by the POC and the lab.

The cause of discrepancies between the POC and lab results was the procedure for obtaining an arterial blood sample. An evaluation of the procedure revealed that the technique used for obtaining the sample could result in dilution of the sample blood by the solution that runs through the arterial line. The dilution caused the discrepancy between the POC and lab results for the same test.

The lack of standard blood work orders and duplicate testing resulted in concerns about patient safety and the appropriate use of staff time. For example, every test requires a given volume of blood; for smaller patients with lower total blood volumes, repeated and unnecessary blood sampling presents a patient safety risk because it can result in the need for a transfusion of red blood cells to replace the blood removed. In addition, improper sampling technique could potentially skew test results and affect clinical treatment decisions.

Further, repeated sampling wastes the time of PICU registered nurses who are taking multiple blood samples from patients. Duplicate testing by the POC and the lab wastes the time of either the respiratory therapists running the samples on the POC analyzer, or the Children and Women's Laboratory staff.

Objectives

The three objectives of this RPIW were to:

- 1 **Establish standard blood work for non-cardiac post-operative patients.**

Standard blood work orders for non-cardiac post-operative patients would constrain the number of blood tests that patients would undergo. This would limit patients' blood loss,

the amount of time spent by PICU RNs obtaining samples, and the time required by PICU respiratory therapists and Children and Women's Lab staff for processing samples.

2 **Improve the blood sampling technique.**

A revised blood sampling method would improve patient safety by providing uncontaminated blood samples, and result in more reliable and accurate blood testing by both POC and lab testing methods.

3 **Eliminate the need for confirmation testing of samples.**

Eliminating the need for confirmation testing of samples would limit patients' blood loss and result in less staff time wasted processing duplicate lab samples. It would also reduce the lead time for obtaining certain blood work results, as the RN would use the POC results which can be obtained in minutes, rather than the lab results, which can take up to an hour to obtain.

Lean Events

A four-week RPIW was carried out, with three weeks of preparation and a one-week RPIW event as per the standard PHSA imPROVE process. Some of the Lean tools used were:

- a Time Observations Forms, for observing the movement of staff, the steps in a process, and how long each step takes.
- b Standard Work Sheets, which show the movement or transport of patients and supplies.
- c Percent Load Charts, which are used to determine how long a cycle of work takes from beginning to end, in comparison with the time available to do that work.
- d Kaizen Idea Sheets, which record ideas for improvement.

In this RPIW, the Lean team did not inform the nurses about what exactly they were looking for in order to eliminate or reduce the Hawthorne effect.¹

Solutions

The RPIW team and PICU staff were consulted prior to the RPIW event week in order to solicit potential solutions or implementation methods. During the RPIW week these potential solutions were trialed. These are the solutions that were implemented.

¹ An effect in which subjects modify their behaviour in response to being under observation.

1 **Standard blood work was established for non-cardiac post-operative patients.**

Medical staff were consulted on the appropriate blood work standards for non-cardiac post-operative patients. Standard blood work orders were created, which indicated that there shouldn't be any blood work ordered for these patients without a physician's review of the patient. For patients for whom blood work was deemed necessary, physicians should carry out a standard daily review of the patients' blood orders at rounds, which would better relate the need for blood work to patient acuity. Visual controls were developed as a reminder to physicians to review blood work requirements daily. This solution was developed and rolled out on day two of the RPIW week and evaluated by the end of the week.

2 **The method for sampling blood from arterial lines was improved and documented.**

RPIW team members experimented with and observed alternate arterial blood sampling techniques. PICU staff were asked to trial the new procedures and provide feedback. After isolation of the proper technique, the new standard work was documented. A schedule for rollout was developed, which involved training sessions for PICU staff by RPIW team members.

3 **Staff were educated about the accuracy of POC testing.**

Some staff were hesitant to rely on the POC testing because they didn't understand the capabilities of the system. This was exacerbated by the problematic sampling technique that had been introducing variability into the integrity of the blood sample. The belief that the POC testing system was unreliable was overcome by sharing and discussing the data that had validated the accuracy of POC testing, and performing live demonstrations of how blood sampling could be contaminated based on the former sampling technique.

Results

Overall, the goals of the RPIW were met. Table 1 below indicates measures taken during the RPIW week.

- » The number of duplicate tests done (per patient per day) was reduced from a baseline (pre-intervention) of 0.6 to 0 on the final day of the RPIW. This was the primary indicator for this RPIW.
- » The number of tests requested by a nurse but not ordered by a physician (per patient per day) was reduced from the baseline of 0.76 to 0. This confirms that standard blood work is being followed, as all tests require an order.
- » The total number of lab samples done (per patient per day) was reduced from 7.3 to 4.0, exceeding the target set of 5.94 per patient per day. This is a reduction of 46%.

TABLE 1. PROGRESS REPORT AND RESULTS SHEET

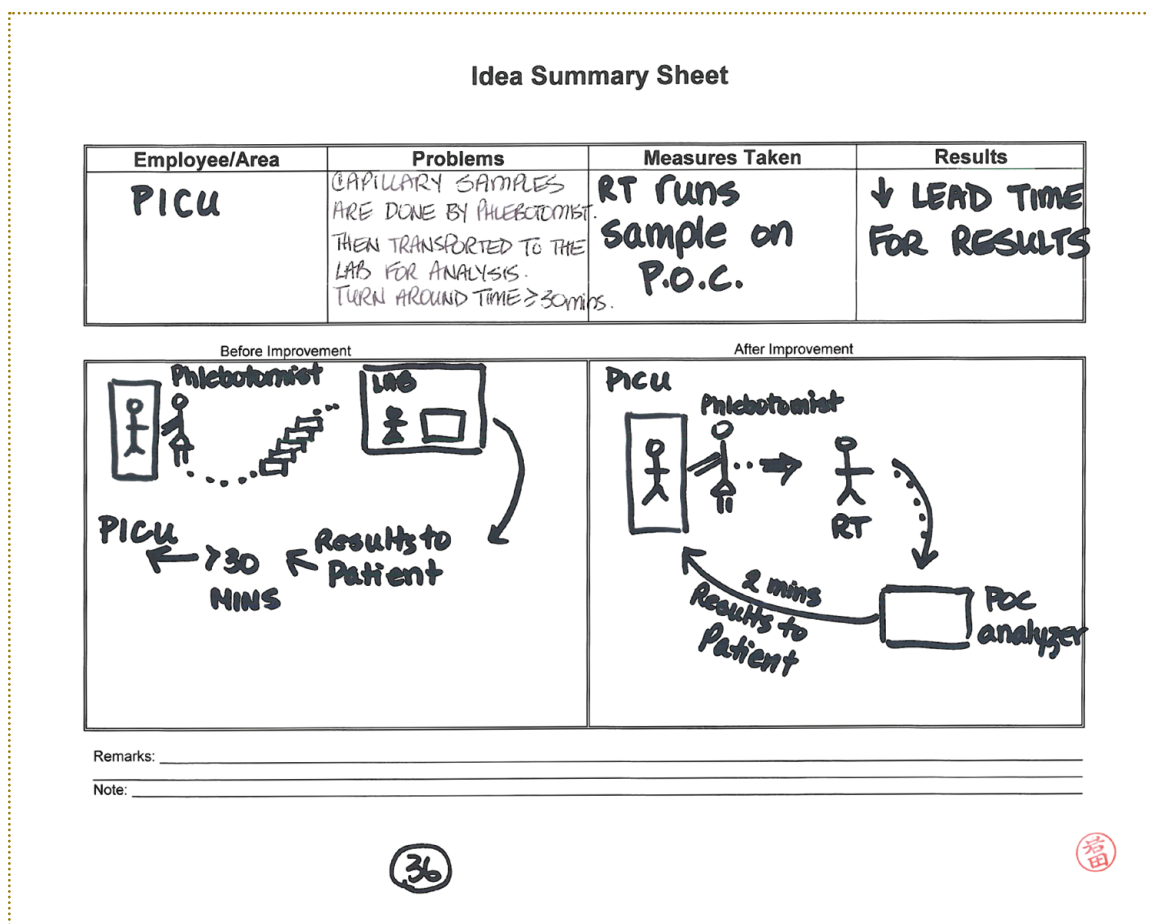
Team Name: Over Production of Lab Specimens
 Department: PICU

Date: November 29th to December 3, 2010
 Team Leader: Gordon Krahn

Measures	Baseline	Target	Day 1	Day 2	Day 3	Final	Percent Change
Leadtime Time test results required until results required until results available when lab is used to confirm POC (mm:ss)	53:00	06:30	—	—	—	(06:30)	89 %
Procedure to obtain electrolyte values obtained by accessioning (hh:mm:ss)	01:24:00	0:07:24	00:07:24	—	—	(0:07:24)	91 %
Quality (# Defects) Number of test done not ordered (per/pt/day)	0.76	0.0	0.67	1.11	0.11	0.0	100 %
Number of duplicate tests done to confirm POC (per pt/day)	0.60	0.0	0.56	0.67	0.33	0.0	100 %
Total number of lab samples done (per pt/day)	7.3	5.94	7.2	5.78	4.56	4.0	46 %
Cycle Time Capillary sample time (mm:ss)	28:00	07:24	07:24	—	—	07:24	74 %

In addition, the time taken to obtain some sample results was reduced because samples are being processed on the POC analyzer instead of being sent to the lab for analysis. For example, the lead time (the time from when tests results are requested, to when tests results are available) for obtaining electrolyte values was reduced from 1 hour and 24 minutes, to 7 minutes and 24 seconds. Figure 1 was created during the RPIW and illustrates the change in process. Rather than the capillary samples being given by the phlebotomist to the lab for analysis, they are given to the respiratory therapist (RT) to run on the POC analyzer.

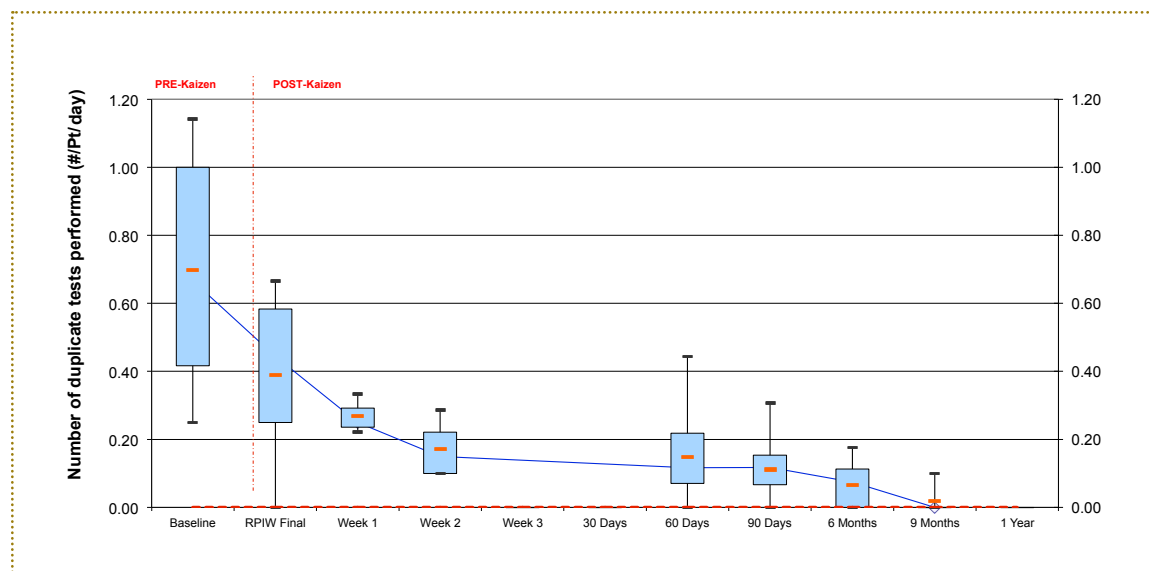
FIGURE 1: CHANGE IN PROCESS FOR TESTING CAPILLARY SAMPLES



In the longer term post-RPIW, clinical observation has shown that all PICU RNs are now using the revised standard work for arterial line sampling.

Audits of the number of duplicate tests performed per patient per day have shown a general decreasing trend since the RPIW week. Figure 2 illustrates the decline in duplicate tests from a baseline of 0.67 (per patient per day) pre-RPIW to 0.07 (per patient per day) six months post-RPIW. The PHSA imPROVE standard is to audit RPIW results for one year post-RPIW events. After a year, leadership decide to either stop auditing because targets have been achieved and the new standards adopted, or continue to audit because targets have not been achieved and continuous improvement is required.

FIGURE 2: DUPLICATE TESTS PERFORMED IN THE PEDIATRIC INTENSIVE CARE UNIT



Based on these figures, cost reductions as a result of this RPIW are estimated at \$32,400 per year, based on 3,600 patient days per year and the elimination of 2,160 unnecessary tests.¹

Lessons Learned

- » Communication with and involvement of PICU staff was vital during preparation weeks and the RPIW week.
- » A regimented post-RPIW rollout plan was necessary to ensure that there was communication with all staff working on all shifts about the new procedures and education about the accuracy of the POC testing.
- » A lead person who was fully informed needed to be on duty during every shift in order to answer questions about changes implemented as a result of the RPIW.

¹ $0.67 - 0.07 = 0.6$ unnecessary tests saved per patient per day X 3600 patient days per year = 2160 tests

Lean Event Team Members

- » Gordon Krahn (Team Lead) – PICU Quality and Research Initiates Coordinator
- » Simon Ip (Sub Team Lead) – imPROVE Facilitator
- » Janet Butts – PICU RN
- » Ratinder Dhaliwal – PICU Unit Clerk
- » Sarb Randawha – PICU RN
- » Rita Janke – Sunny Hill Patient Safety and Quality Assurance Leader
- » Heather Beals – Respiratory Therapist

CASE STUDY 2 — Provincial Specialized Eating Disorder Program for Children & Adolescents

The Provincial Specialized Eating Disorders Program is the provincial resource for children and adolescents with eating disorders (anorexia nervosa, bulimia nervosa, and related eating disorders). The program's mandate is to provide leadership in clinical services, education, family-focused child and adolescent health promotion, and research and outreach activities. The Child and Youth Mental Health Programs are located at BC Children's Hospital, and are part of BC Mental Health & Addictions Services, an agency of the PHSA.

Impetus for Lean

The Provincial Specialized Eating Disorders Program received funding of approximately \$1.5 million in April 2008 from the Ministry of Health to increase tertiary care, including expansion of intensive in-patient treatment from 10 to 14 beds, and development of a full day-treatment program with the capacity for six patients. A strategic planning document written in October 2008 outlined proposed structural and staffing changes for the program, with a focus on building capacity and sustainability, improving access and flow, and following best practices and evidence-based treatments. Figure 3 and Table 2 present the program's service model and patient capacity in each treatment stream.

FIGURE 3: SERVICE MODEL OF THE PROVINCIAL SPECIALIZED EATING DISORDER PROGRAM

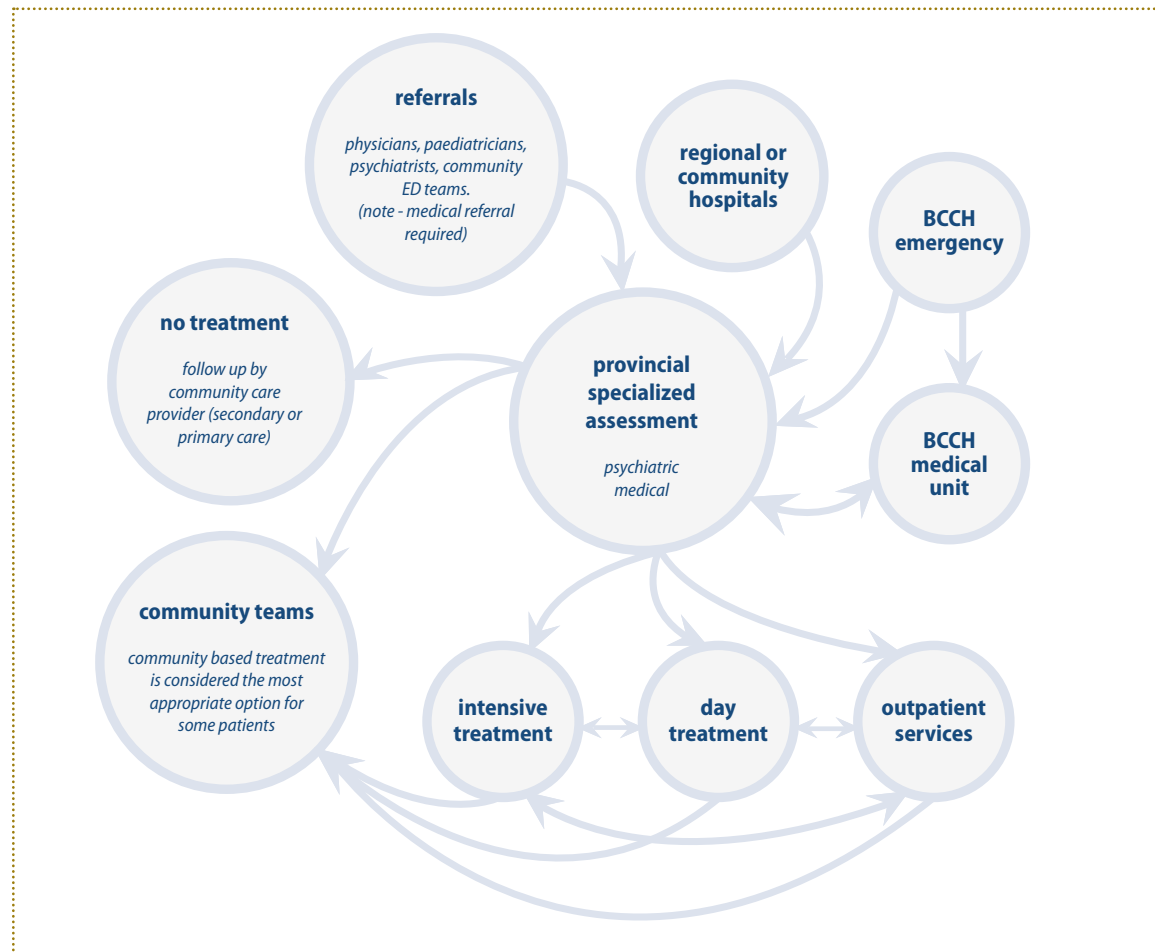


TABLE 2: PATIENT CAPACITY ACROSS THE PROGRAM

Service	Intensive Treatment		Outpatient	
Type	In-patient 24 hour, hospital-based comprehensive interdisciplinary care		Day Treatment Intensive outpatient treatment. Patients are medically stable and do not require hospitalization but can benefit from a "step up" from outpatient or a "step down" from in-patient treatment options. Patients participate during the day and stay involved in family, academic, and social activities outside of program hours.	Outpatient Clinic Treatment is customized to the needs of each child or adolescent and his/her family.
Capacity	14 beds		6 spaces	~99 active patients

Objectives

An initiative to expand the program commenced in January 2009 and had two primary goals:

- » To expand in-patient and day treatment services, and
- » To align the program's philosophical and treatment approach with best and promising practices for treating eating disorders in children and adolescents.

Improving quality, continuity and access were considered critical in this process of change. Service redesign goals were subsequently established featuring accessible services, continuity of care, and alignment with best practice.

BC Mental Health & Addiction Services leadership determined that the PHSA imPROVE model would best meet the needs of the program in making the required program changes and improvements. The Specialized Eating Disorders Program was thus the first of the Child and Youth Mental Health Programs at BC Children's Hospital to implement imPROVE.

Lean Events

The first step in implementing imPROVE was to train Eating Disorders Program leaders in the fundamentals of Lean health care through the PHSA Lean Leader Certification Program. The second step was to gain an in-depth understanding of the current situation from the patients' and families' perspectives. This was achieved through a value stream mapping session in which the Lean leaders from the Eating Disorders and Child and Youth Mental Health Executive tracked the patient and family journey from the point of referral in the community until discharge from the program. Using this value stream map, RPIW topics were chosen and prioritised for the upcoming year. Ten of these RPIWs are reported on here, and they focussed on:

- » the reduction of lead time (improving access),
- » establishment of best practices in treatment (improving quality),
- » the standardization of care (improving safety and quality),
- » efficiency.

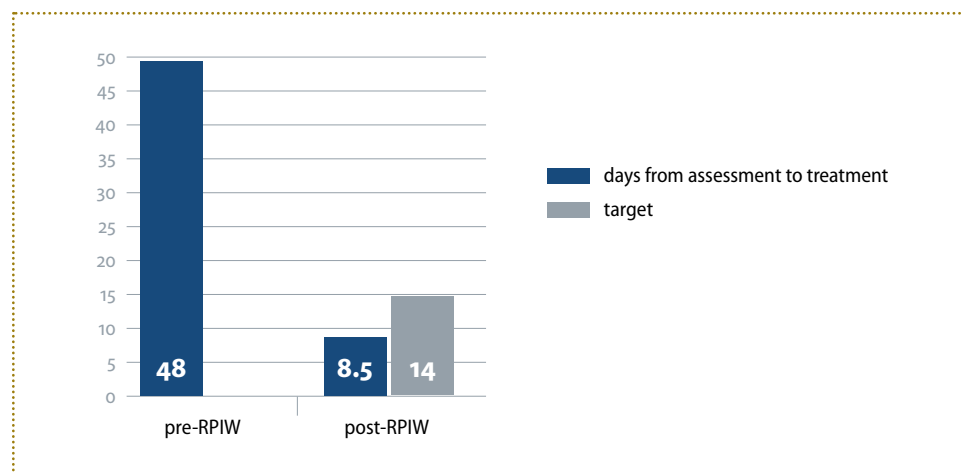
Each RPIW workshop was five days long. The aim was that over 75% of the identified process changes would be implemented by the end of the workshop.

Improving access to care

RPIW One focused on reducing wait time from a patient's referral to initial assessment, with the ultimate goal of reducing the wait time for treatment. The RPIW produced excellent results: the average wait time from referral to assessment was reduced from 66 days to 8.5 days, and the time taken to complete an assessment was reduced from 6.5 hours to 3 hours. The program's capacity to assess patients doubled, and patient travel during the assessment was reduced from 1954 steps to 300.

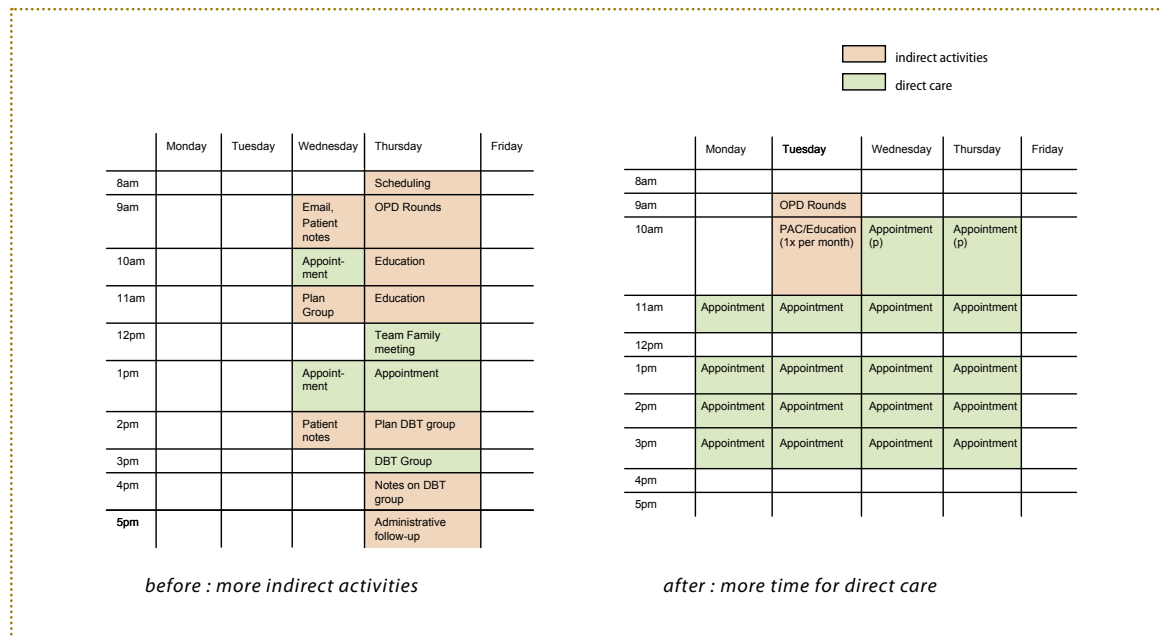
RPIW Two focused on reducing the variation in lead time from assessment to first treatment in outpatients by any of the treatment providers (psychiatrist, psychologist, social worker, or dietician). Assessment to treatment time was reduced initially from 48 days to the target of 14 days; this reduction was first maintained and then reduced further to 8.5 days (see Figure 4).

FIGURE 4: DAYS FROM ASSESSMENT TO TREATMENT IN THE EATING DISORDERS PROGRAM



RPIW Three focused on increasing capacity (hours of direct patient care) in the outpatient clinic so that patients could be seen by appropriate care providers at optimal and consistent intervals. The RPIW resulted in the time allocated for direct service to patients increasing from less than 40% of total available time to a benchmarked standard of 60% (see Figure 5). There have been no wait times for clinicians or evidence-based therapies (e.g., Family-Based Therapy) since the RPIW.

FIGURE 5: SCHEDULES SHOWING MORE TIME FOR DIRECT SERVICE TO PATIENTS



Establishing best or promising practices in eating disorder treatment

RPIW Four focused on the development of two tools:

- 1 Care pathways (standard treatment plans) for anorexia nervosa and bulimia nervosa. These care pathways are now posted prominently on the in-patient unit and are utilized as a tool for care planning during a patient's stay (See Figure 6 for the anorexia nervosa care pathway).
- 2 A weekly tracker form that captures clinical data about individual patients. The data inform discussions at weekly clinical rounds and are used by clinicians in sessions with patients and families.

Anorexia Nervosa In-Patient Care Path

	Level 1	Criteria to Progress	Level 2	Criteria to Progress	Level 3	Criteria to Progress	Level 4	Criteria to Progress	Level 5	
Nutrition	1-1 Meal Support for 1 st meal or snack. Dietician chooses meals and snacks. Staff set-aside meals and snacks, supply spreads, removes lids, and check for completion. Patient must remain at table. Meal: 30 minutes Snack: 20 minutes Just meal support required. Meal: 60 minutes Snack: 30 minutes	100% completion of meals and snacks	Patient chooses meals and snacks. Patient removes lids for meals and snacks, and supply spreads. Staff set-aside meals and snacks and check for completion. 100% completion of meals and snacks Minimum of 1kg per week weight gain	Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. 100% completion of meals and snacks Minimum of 1kg per week weight gain	Patient serves own snacks. Staff serves meals and check for completion. Patient may leave table early. Meal: 15 minutes Snack: 10 minutes	Patient serves own meals and snacks. Patient may leave table early. Meal: 15 minutes Snack: 10 minutes	Patient may choose snack substitutions as available. Patient may have all lunches on or off the unit in designated areas of the hospital. Patient may have cafeteria lunches at school. Patients have morning and evening snack, and dinner on the unit.			
Medical/Tests	Stage A - Patient weighed weekly. - Patient height measured every 2 months. - Vital Signs as per doctors individual doctor's orders. - Blood Work as per individual doctor's orders. - Additional medical monitoring as per individual doctor's orders.	Criteria to Progress	Stage B - Patient weighed weekly. - Patient height measured every 2 months. - Vital Signs as per doctors individual doctor's orders. - Blood Work as per individual doctor's orders. - Additional medical monitoring as per individual doctor's orders.	Criteria to Progress	Stage C - Patient weighed weekly. - Patient height measured every 2 months. - Vital Signs as per doctors individual doctor's orders. - Blood Work as per individual doctor's orders. - Additional medical monitoring as per individual doctor's orders.	Criteria to Progress	Stage D - Patient weighed weekly. - Patient height measured every 2 months. - Vital Signs as per doctors individual doctor's orders. - Blood Work as per individual doctor's orders. - Additional medical monitoring as per individual doctor's orders.	Criteria to Progress	Stage E - Patient weighed weekly. - Patient height measured every 2 months. - Vital Signs as per doctors individual doctor's orders. - Blood Work as per individual doctor's orders. - Additional medical monitoring as per individual doctor's orders.	
Activity	- Patient remains on this unit with minimal physical activity. - Patient may take one separate twenty minute break in designated areas of hospital grounds during daylight hours (page, parental consent, and MH Act dependent).		- Patient may take one separate twenty minute break in designated areas of hospital grounds during daylight hours (page, parental consent, and MH Act dependent). - Patient may take two separate thirty minute breaks in designated areas of hospital grounds during daylight hours (page, parental consent, and MH Act dependent).		- Patient may take two separate thirty minute breaks in designated areas of hospital grounds during daylight hours (page, parental consent, and MH Act dependent). - Patient may take two separate forty minute breaks in designated areas of hospital grounds during daylight hours (page, parental consent, and MH Act dependent).		- Patient may take two separate forty minute breaks in designated areas of hospital grounds during daylight hours (page, parental consent, and MH Act dependent).			
Passes	- No passes. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings.		- Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings.		- Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings.		- Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings. - Patient assessed for readiness to attend cooking group, restaurant group, and snack outings.			
Parent Responsibility	- Wait for... - Meet with...		- Complete minimum of one supported meal and one supported snack with staff prior to any snack and meal passes offered.		- Parents required to bring one prepared meal for themselves and their child, to be eaten with staff on the unit.					

detailed criteria to progress

activity guidelines

clear role & training of parents

Version 2: Development date: September 17th 2019; Authors: Life Farms and Eating Disorders Program team

A program social worker describes MFGT:

The eligibility criteria (see Figure 7) are used during initial assessment; monthly audits show that all families are now assessed to determine their suitability for participation. Prior to the RPIW, suitability for participation was assessed in an unsystematic fashion.

FIGURE 7: ELIGIBILITY CRITERIA FOR MULTI-FAMILY GROUP THERAPY

MFGT Criteria

- ☐ Medically stable and not actively suicidal
- ☐ Age < 18 years old
- ☐ Patient does not have significant comorbid psychopathology that interferes with
- ☐ Parents are able to exercise appropriate authority over their children in other domains of life (ie curfew, school, home rules, etc) and do not have significant psychopathology
- ☐ Parents are willing to supervise most meals at home
- ☐ Divorced or separated parents are amicable enough to not undermine each other in re-feeding process

Note: some families can do MFT while the patient is still on ITS (as long as the patient is medically stable and not suicidal).

Most likely to succeed	Not likely to succeed
Able & willing to attend all sessions	Unable to attend all sessions Non-compliance or treatment refusal (family is not able/willing to be present) Consider proficiency in English
Diagnosed with Anorexia Nervosa, Bulimia Nervosa or EDNOS (Eating Disorder Not Otherwise Specified) Need parental control to eat Need refeeding; needing symptom management 80-95% ideal weight Medically stable Could be ITS/DTP/OPD	Psychiatric diagnosis that interferes with treatment, including active self-harm or suicidal behaviour Other severe behaviour issues
Pre-contemplative families (would benefit from other families' experiences) Siblings who are struggling; older or close in age	Acrimonious divorce; parents cannot work together to offer support
Older and younger (12 and under) groups not mixed	Older and younger (12 and under) within one group

Recommend MFGT? ☐ YES ☐ NO

Comments:

best practice guidelines outlined

recommendation at assessment for next MFGT

Despite the increase in participation, each of the Multi Family Group Therapy sessions has been run within the existing budget (\$20,000 per year), with the most current session seeing a further savings of \$7,000 due to a re-evaluation of who is essential to the success of the sessions. The social worker described the process:

"We have ... us[ed] Lean Management in order to increase the [Eating Disorders] program's capacity to offer MFTG. Initially we just did one group a year, this year we are beginning to offer two per year. We started out using six masters prepared therapists per group as per the best practices reviewed during the RPIW process and now we have streamlined our professional resources to deliver the same service using four therapists. In addition we have added another layer to our program by engaging community therapists as observers, which increases the capacity of the BC therapeutic community to offer best practice care in eating disorders."

Standardizing care processes

In RPIW Two, discharge guidelines were developed to aid in the timely closure of patient files once patients have been discharged. These guidelines have been used consistently to close files and guide notification of parents, caregivers, and community treatment providers.

RPIW Six focused on ensuring that thorough face-to-face handovers are completed by nurses and youth and family counsellors at the start and end of their shifts in the Intensive Treatment Service (in-patient) program. In order to reduce variation in the time from the “end of shift report” to “documentation of the patient hand over” assessment by nurses and youth and family counsellors, the Eating Disorders team established a face-to-face patient care transfer and created an initial shift-assessment tool with documentation guidelines. Audits since July 2010 indicate that the team is consistently 100% defect free in using this standardized approach to the transfer of patient care between staff. Implementing this nursing best practice aligns the program with Accreditation Canada Required Organizational Practices.

An Eating Disorder nurse comments on the positive outcome of the RPIW:

“In June, 2010 we standardized the process of hand over between the Eating Disorder Inpatient Nurses and Youth and Family Counselors during shift handovers. Previously we had a wide variety of practices with regards to initial assessments and handover. Now we have a standard process and clear expectations that staff complete a face-to-face handover, which is an effective way to ensure safety gaps are closed. We have maintained this best practice now for almost a year and I continue to do monthly audits of shifts to check for completeness and consistency. I also note any issues or patterns in order to follow-up with staff which informs my role as a Clinical Resource Nurse. I am impressed with how well staff have met and exceeded expectations, completing their initial shift assessment charting immediately after their report, especially given that the RPIW target was 90 minutes and they are often completing within 15 minutes.”

RPIW Seven featured the development and implementation of a standardized care plan that documents an individual patient’s journey through the in-patient program. The care plan was successfully implemented along with a standardized process for updating the plan, including responsibilities and accountability. Audits show that staff have been consistent in regularly updating the care plan since the RPIW. Lead time for updating care plans was reduced from 12 days to seven days, and this target has now been exceeded post-RPIW, with current audits showing daily updating. The care plan has also improved the quality of interdisciplinary collaboration at regular inpatient clinical rounds and has been correlated to patient goals established at rounds.

RPIW Eight focused on eliminating documentation errors in the tracker form created in RPIW Four, to ensure that accurate, reliable and timely patient information is available for clinical decision making. Best practice in nursing documentation standards was incorporated by developing and implementing a Daily Flow Chart tool, which guides recording of the core components of daily treatment. Use of the Daily Flow Chart tool has helped to improve the accuracy of the weekly tracker form.

RPIW Nine focused on the transfer of care from one Eating Disorders program to another or to another Child and Youth Mental Health program. The aim was to eliminate defects in the process by using a standard transfer form that includes all the necessary elements, which are the following:

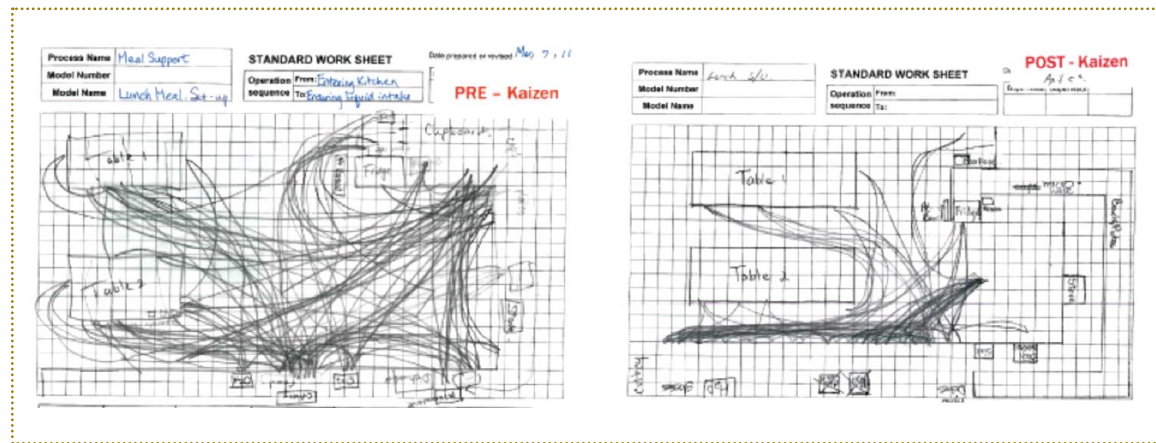
- » Patient key information
- » Safety precautions
- » Risk assessment
- » Medication administration
- » Confirmation of doctors' orders
- » Complete chart ready
- » Patient and family notification, and
- » Personal belongings packed.

All internal transfers since the RPIW have been defect free and this process has been replicated across all Child and Youth Mental Health programs, ensuring compliance in all programs with Accreditation Canada's Required Organizational Practices.

Improving efficiency

RPIW Ten focused on reducing the set-up time for the daily meals provided to in-patients, with a target reduction from 22 to 17 minutes. The target was exceeded by using such Lean techniques as *single-piece flow* (each place setting is completely set up, one at a time) rather than *batch and queue* (setting all forks, then knives, then plates, etc.), which enabled a great reduction in footsteps. The spaghetti diagrams in Figure 8 show the difference for a set-up.

FIGURE 8: EFFORT REQUIRED TO SET UP FOR MEALS, BEFORE AND AFTER THE LEAN EVENT



Footsteps required for meal set up have been reduced from 832 to 495, with a redirection of 100 hours per year of staff time for direct care service, which equates to roughly \$3,500 in soft savings.

As part of the roll-out of this improvement process, a series of standard work documents was created, as well as a five-minute training video highlighting other essential process steps, such as proper hand hygiene.

Results

The expansion of the Provincial Specialized Eating Disorders Program for Children and Adolescents provided a unique opportunity to implement the imPROVE Lean methodology to achieve service redesign goals including accessible services, continuity of care, and alignment with best practice. Lean methodology was used to implement appropriate and timely assessments, standard daily patient care processes, and timely and safe transitions. The wait time from referral to assessment in Eating Disorders has been reduced from 66 to 8.5 days, with gains sustained to date.

Although initial investment of Ministry of Health funds was necessary for the expansion, adopting Lean has produced gains both in improved access and in bringing about a culture shift to one of daily continuous improvement. Lean is now firmly embedded as a continuous quality and safety improvement methodology in the Provincial Specialized Eating Disorders Program for Children and Adolescent, and audits for all 10 RPIWs have continued to meet or exceed targets set.

The Eating Disorders program is sustaining results by involving leaders and staff in daily and weekly tracking of results. A performance wall was set up in the main hallway of the Eating Disorders program and is accessible to staff, patients, and families. The performance wall shows the alignment among the Eating Disorders Program goals and the PHSA Strategic Plan, BC Mental Health & Addictions Services Strategic Plan,

and Accreditation Canada standards. Successes, roadblocks and risks are highlighted, with accountability for taking action identified and recorded on the wall. The results of the RPIW audits are reported on a weekly basis to program management and a cross-functional team from the Eating Disorders Program. This tiered reporting structure enables all the staff on the unit to clearly see the links from their improvement efforts to the health authority strategic aims and directions.

Lessons Learned

- » There must be a clear link from each RPIW to strategic goals for all the employees to see.
- » Viewing the change process through the lens of the patients and families served, and keeping the focus of the improvement work on the patient and family's care journey, is of utmost importance and helps focus and energize all team members on a common goal and shared interest.
- » Report on successes, challenges and risks, up and down, weekly.
- » Assign responsibility to dedicated employees for auditing changes, managing documents, and reporting any roadblocks associated with the roll out of a change process.
- » The Program Director and Clinical Director must be leaders and partners in RPIWs and follow-on planning.
- » When program leadership and staff have understood and adopted the philosophy of continuous improvement within the daily function of the program, this encourages strategic, timely, and appropriate improvements beyond the RPIW process.
- » Continue to improve and refine the solutions generated during RPIWs on an ongoing basis to further improve through a clearly articulated change process.

Lean Event Team Members

The RPIW teams consisted of two trained leaders, a Lean Support Facilitator from the imPROVE team, and five to six full-time participants from each work unit. Over the course of the RPIWs the Eating Disorder program engaged a substantial proportion of staff at every level of the program, with 78% of staff participating in a full RPIW week.

Vancouver Coastal Health

Lean began at Vancouver Coastal with a grant from the Ministry of Health to educate a group of individuals in Lean while improving care. Within Vancouver Coastal, Providence Health Care and Medical Imaging have also run their own Lean programs. Providence Health Care's Lean work in the Laboratory successfully reduced costs and decreased turnaround times, while Medical Imaging initially focused on initiatives that increased productivity, resulting in an increase in access to care and revenues. Medical Imaging has continued this work after the Lower Mainland consolidation that has resulted in it providing services to Provincial Health Services Authority, Providence Health Care, Vancouver Coastal Health, and Fraser Health, while still being the responsibility of Vancouver Coastal Health.

Initially the focus of Lean in Vancouver Coastal Health was on improvements to specific processes in areas that were willing to participate, however the scope of Lean is evolving. Key senior leaders at Vancouver Coastal Health and Providence Health Care have committed to using Lean principles and have taken Lean education. The Executive Team and local senior teams are moving towards integrating the principles of Lean into their leadership approach, and the Senior Team has recently integrated Lean into its strategic plan. Strategic Plan Objective 4.1 reads "Embed LEAN thinking at all levels to fulfill objectives and to deliver quality outcomes". The Vancouver Coastal Health Board has also requested Lean education and is actively supporting the spread of Lean initiatives within the region.

Vancouver Coastal Health has an internal educational program on various Lean tools, however most education is provided "just in time" within Lean projects. Vancouver Coastal Health has 25 staff that are *Black Belt* and *Green Belt* trained or in training; these staff play a key role in leading Lean initiatives, and most are part of the Lean Team. Providence Health Care has seven quality improvement staff who support Lean work and other quality and safety methodologies. Medical Imaging has 35 staff that are *Green Belt* trained and one *Black Belt* trained practice leader.

Vancouver Coastal Health and Providence Health Care have a core Lean Team that works with local leaders to improve processes within their areas. While local areas are using somewhat different approaches, the overall goal is to engage an increasing number of staff and physicians in daily improvement opportunities. Initiatives often encompass improvements to several processes and can take place in short, intense sessions or over a period of weeks or months. There are two Lean initiatives currently underway in Providence Health Care, eight in Medical Imaging, and 33 at Vancouver Coastal Health. Vancouver Coastal Health and Providence Health Care are also jointly engaged in Lean initiatives in Regional Mental Health & Addiction for Housing and Acute Care, Early Stroke Prevention, and Health Records/Coding. The principles of Lean have also been integrated into a Vancouver Coastal Health collaborative practice initiative.

Vancouver Coastal Health has selected a corporate initiative, a review of the processes and data used in the Early Intervention and Rehabilitation Program, to illustrate the health authority's use of Lean.

CASE STUDY 3 — Early Intervention & Rehabilitation Program

A pilot Early Intervention and Rehabilitation Program (EIRP) for disability management was introduced at Vancouver Coastal Health in April 2009 following the signing of a memorandum of understanding with unions in February of 2009. The program is workplace-based and utilizes a collaborative union and management approach which focuses on early and safe return to work post injury or illness. The EIRP provides early intervention services and maintains the attachment to the workplace of employees who are absent due to disability. The window of opportunity for most successfully returning an employee to the workplace is an absence of less than 30 days. The longer an employee is absent from work, the less likely he or she is to return at all. Failure to return an employee to work is costly to:

- » The employee, in terms of psychological and social costs;
- » The health authority, in terms of disability management costs and associated benefit costs;
- » The public, in terms of the availability of human resources and funding to provide health services.

The EIRP addresses all aspects of the disability management process: employees struggling to stay at work because of an injury or illness; the initial days an employee is off work because of an injury or illness; time spent in treatment, rehabilitation and vocational retraining; and return to work. The EIRP facilitates:

- » Employees' access to appropriate diagnostic, treatment and rehabilitation services;
- » Employees' access to opportunities for engaging in meaningful temporary or transitional work within their restrictions and limitations;
- » Removal of barriers to returning to work; and
- » An ongoing connection with the workplace.

EIRP benefits Vancouver Coastal Health employees and managers as well as the patients, residents and clients they serve.

Impetus for Lean

The cost of long term disability (LTD) premiums has increased exponentially (80%) over the last four years in Vancouver Coastal Health, and the average LTD claim duration for the health care industry is much greater than the national average across all industries.

In addition, operational problems within the EIRP were reported by unions and managers. There were delays in the return-to-work process, and there was no follow up on some EIRP clients. Disability Management staff were reporting an increasing workload that was attributed to an increased number of participants in general, as well the inclusion of service to employees “struggling at work”. The workload (over 100 cases per advisor, and some staff with more than 150 cases) was causing staff frustration and anxiety, leading to clients’ prolonged absences from work, and affecting the overall quality of service. Union and manager satisfaction with the service had decreased, and there had been an increase in grievances specific to delays in “duty to accommodate” cases.

Three major problems were identified in the EIRP:

- » *Problem 1* – There were no agreed-upon standards for how the work should be done, which resulted in each staff member doing the work differently.
- » *Problem 2* – There was no strategy for unifying case management information throughout the process. This resulted in clients being lost within the process, and a lack of useful information for tracking outcomes and decision making.
- » *Problem 3* – The data related to care management were mainly in paper format, and there were multiple incompatible and inconsistent systems for tracking data. There were also issues with the current data system: a lack of data integrity, a lack of sustainability within an Access database, duplicate data because of the stand-alone systems, and a requirement for manual enhancements to optimize information flow from PeopleSoft.

Objectives

The primary objectives of the Lean initiative were to:

- » Minimize the amount of time that an employee is away from work for health-related reasons;
- » Gain efficiencies and establish best practices for managing employees’ time away from work;
- » Decrease LTD and WorkSafe BC costs by \$6.3 million over three years;
- » Ensure that data entry is accurate for improved quality and ease of reporting.

The Lean initiative included reviewing workflow efficiencies and streamlining the various data sources that were in multiple formats. The project covered the five phases of the disability management process, which comprises 80% of the EIRP's workload:

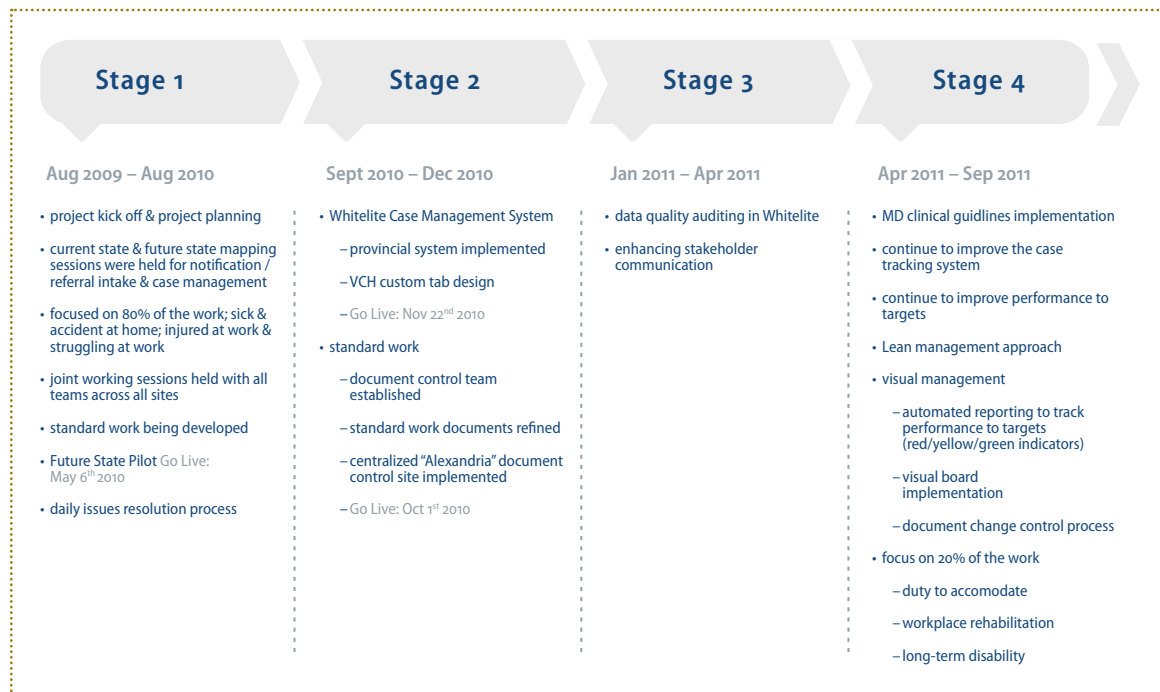
- 1 Notification or referral and intake;
- 2 First contact with the employee;
- 3 Providing resources and services;
- 4 Planning and monitoring;
- 5 Return to work.

The Lean initiative began in August 2009.

Lean Events

Figure 9 outlines the four stages of the Lean initiative, which included Kaizen events, Lean education, value stream mapping, standardization of work, and the development of action plans.

FIGURE 9: FOUR STAGES OF THE LEAN INITIATIVE

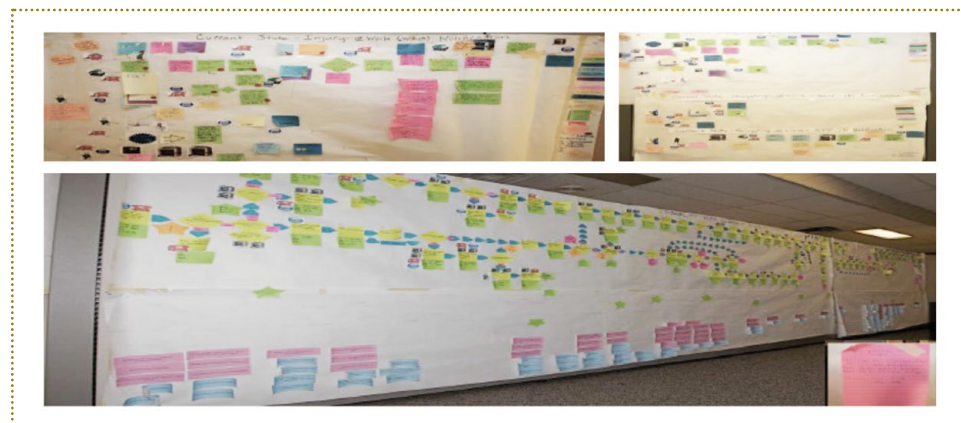


Kaizen events were held as half-day and day-long workshops. During these workshops, the team identified and removed waste in disability management processes in order to be able to provide services of the highest quality to clients in the least amount of time. Within these Kaizen events, teams were taught the basics of Lean principles and Lean tools, including value stream mapping and Lean principles related to this initiative.

For value stream mapping, the disability management process was defined as the time from when an employee first calls in sick, to the time the employee returns to work. Value stream mapping included the following steps:

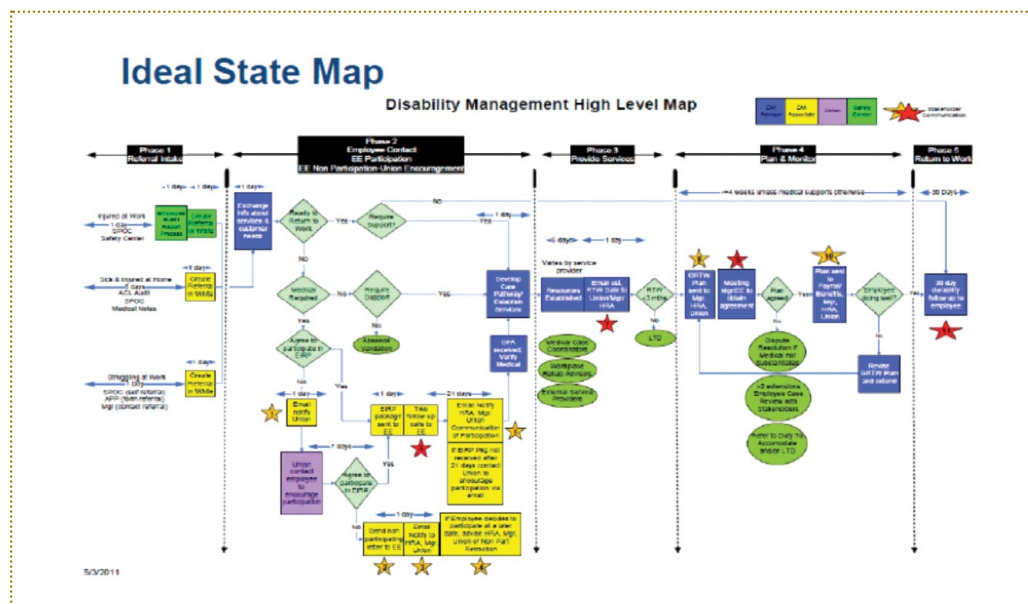
- 1 **Defining the service family:** Employees enter the EIRP through various streams. Three of these entry streams — sick and accident (non-work-related), injured at work, and struggling at work — were defined as a service family. This service family comprises 80% of the work EIRP staff handle. To keep the mapping process within manageable boundaries, only this service family was mapped. The remaining 20% of the work, which includes long-term disability, workplace rehabilitation, and duty to accommodate, are to be addressed once the first 80% of the work has been improved (in Stage 4 of Figure 9).
- 2 **Creating the Current State Value Stream Map:** Current state value stream maps (i.e., before improvements were made to processes) were created by interdisciplinary teams to visually depict the steps and information flow in processing a referral (see Figure 10). Both value adding and non-value adding steps were recorded. The mapping showed that each Disability Management staff member had a unique style in completing the process, despite standardization being critical for achieving the objectives. The current state value stream maps formed a baseline for improvement and for the creation of maps depicting an ideal future state.

FIGURE 10: CURRENT STATE VALUE STREAM MAP



- 3 **Creating the Future State Value Stream Map:** In designing the future state, team members identified improvements to be made to processes that would shorten the overall lead time (i.e., time required for clients to proceed through the disability management process). They also developed standard operating procedures and work instructions, and standard tools (letter templates and email notifications) and timelines. The future state (see Figure 11) was designed with targets identified for each of the five phases of the Disability Management process and an issues resolution process was established for regular recording of issues and prompt responses to concerns.

FIGURE 11: FUTURE STATE VALUE STREAM MAP



A gap analysis was then conducted by comparing the current state map to the future state map. Action plans were developed that would support the transition to the future state process. The action plans were implemented through the following steps:

- 1 Management agreed on the future state process;
- 2 An implementation team was formed to drive the implementation process;
- 3 Pilot projects were selected and implemented for three to four months;
- 4 The pilot implementation results were evaluated, and lessons learned used to implement the full-scale "go live";
- 5 Feedback and improvement ideas were encouraged through an issues resolution process that used a visual board to track issues, action steps, accountability, and timelines.

There was an opportunity to implement a standardized data platform, the Provincial Standard Occupational Health and Safety data platform (White.net). The team reviewed the existing single data systems and realised that implementing White.net was critical to achieving the Disability Management future state process. In addition, a custom tab in White.net was designed to enhance case tracking, tracking to targets for each process step, and address Vancouver Coastal Health's unique EIRP requirements. This new system will provide workload data for managerial decision making.

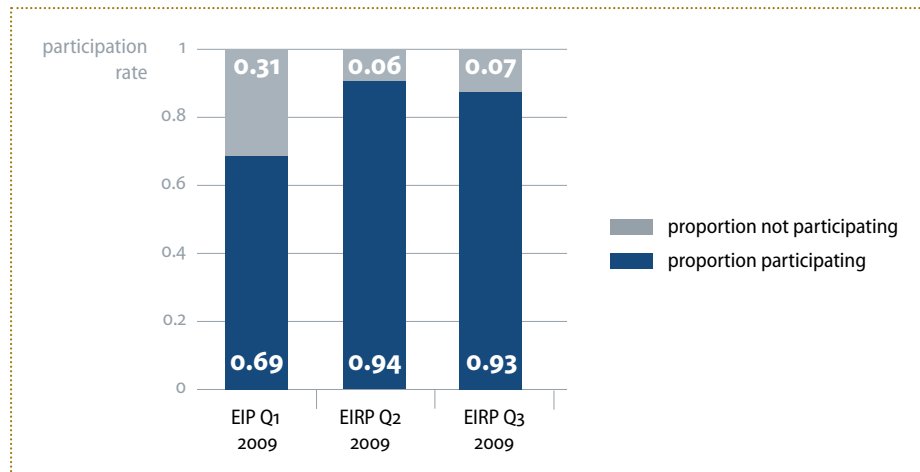
Results

The results of the initiative are being measured through EIRP participation rates, average absence duration, and the number of open and accepted LTD claims. There are several challenges associated with reporting these metrics over the long term, as historically the volume of Disability Management work was not measured. Then, the first database that was built crashed in August 2010. The new data base went live on December 29, 2010 and file entry was completed March 16, 2011. Data quality was a challenge initially while staff adapted to the new system. Improving the quality of the data is now a focus and an area of continuous improvement.

Key findings are listed below:

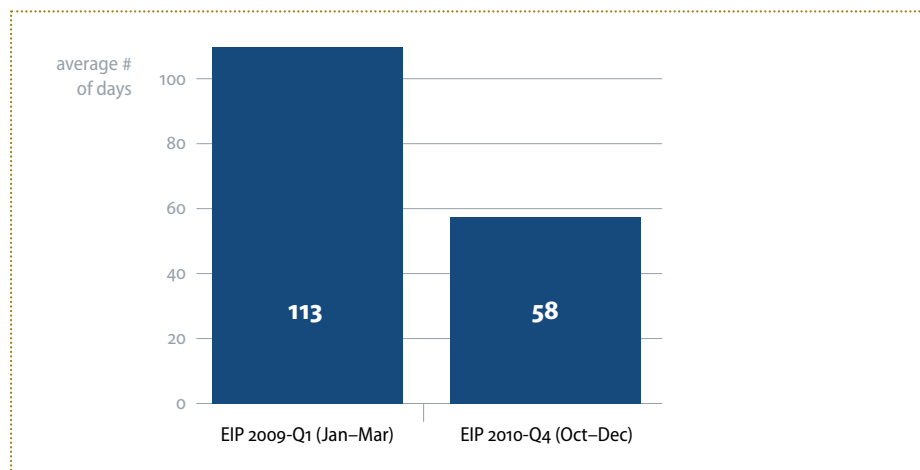
- 1 **Participation Rates:** The notification/referral intake process includes identifying and triaging individuals who could potentially benefit from Disability Management support services. Intake occurs when a client agrees to participate and accepts any of the support services provided by the program. The goal is to achieve higher participation levels, with the assumption that participation will speed return to work. Figure 12 indicates the proportion of employees who could potentially benefit from Disability Management support services who agreed to participate in the former Early Intervention Program (EIP) run by an outside contractor, Health Benefit Trust, and EIRP. EIRP was introduced April 2009 (Q1) and the Lean initiative began in August 2009 (Q2).

FIGURE 12: PARTICIPATION RATES IN THE EARLY INTERVENTION PROGRAM AND EARLY INTERVENTION AND REHABILITATION PROGRAM



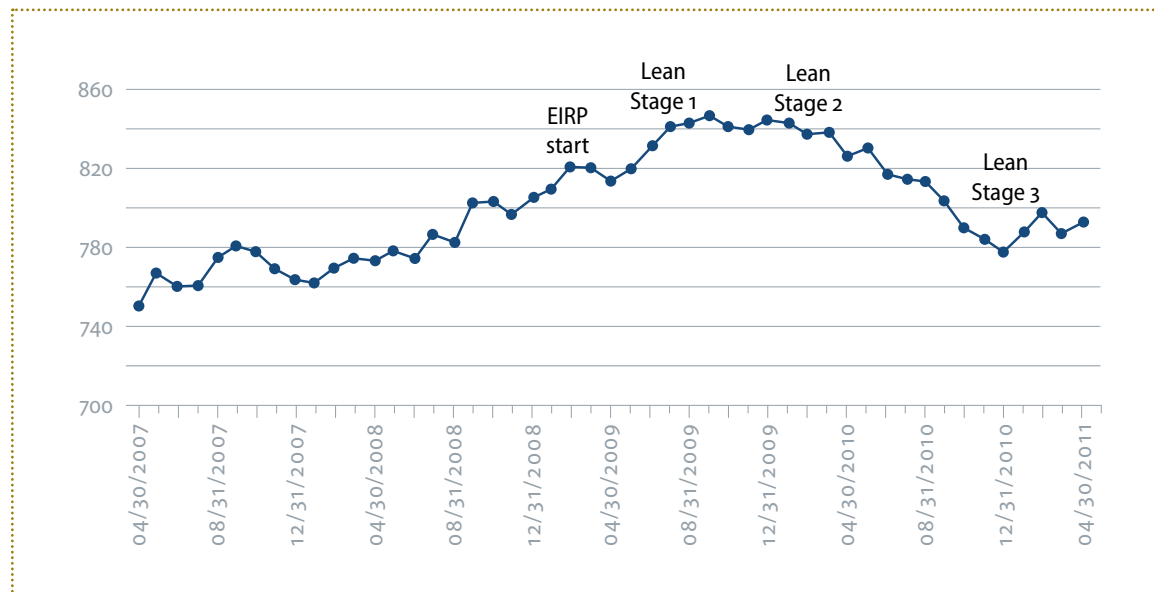
- 2 **Absence Duration Average:** Figure 13 shows the average number of days elapsed from the employee's first day off, to their return to full duties, for employees who were ready to return to full duties (pre-EIRP, and post-EIRP with Lean implementation). By standardizing processes, Disability Management is applying internationally recognized best practices in Vancouver Coastal Health. It is anticipated that once these guidelines are more consistently implemented, wait times within the processes that affect the duration of a client's absence directly will be substantially decreased or even eliminated, thus reducing average absence duration further.

FIGURE 13: DURATION FROM FIRST DAY OFF TO RETURN TO FULL DUTIES



- 3 **Number of Open and Accepted LTD Claims:** Figure 14 shows that the incidence of LTD claims stabilized and then decreased following Stage 1 and Stage 2 of the Lean initiative. These LTD gains were achieved despite unanticipated increased participation in the EIRP and the inclusion of a “struggling at work” category that resulted in high number of case files per advisor. The assumption is that the reduction in LTD claims is a result of the Lean initiative.

FIGURE 14: OPEN ACCEPTED LONG-TERM DISABILITY CLAIMS



- 4 **Dollars Saved in LTD Claims:** Healthcare Benefit Trust has estimated that reductions in new claims in 2010 will save Vancouver Coastal Health \$17.6 million amortized from now until 2020. Combined with the reduction in 2009, Vancouver Coastal Health will reduce its liability and premium costs by \$2 million per year each year for 10 years. In addition, because the work is now performed in house rather than being outsourced, direct costs have been reduced by \$350,000 per year.

Lessons Learned

- » Use data to make decisions. The perception of the Disability Management team staff was of a high workload but no data were available to validate their concerns. An electronic database was implemented in which staff documented their activity. The activity data were matched with the standard process targets to support timely interventions. The data supported staff's ability to manage their work within target timelines, and permitted documenting the resource requirements for this work. Based on the workload data, a business case articulating the need for additional staff was successful.
- » Involve the end users. Stakeholder and customer engagement in the project was important. It was critical to ensure that individuals had time to review the options under consideration, and opportunities to list issues that arose from new processes and resolve them in a timely manner. Working with the users during off hours or visiting their locations of practice made it easier for them to provide input.
- » Ensure executive buy-in. Weekly steering group meetings were held to communicate project status and issues, reinforce goals and objectives and provide continuous support for the project.

Lean Event Team Members

The participants involved in this process included the following:

- » *Disability Management Staff:* Disability Management Advisors and Associates, Occupational Health Advisors, Workplace Rehabilitation and Musculoskeletal Injury Prevention Advisors, and Team Assistants were all involved in working group sessions and Kaizen events.
- » *Event Coordinators:* The Manager of Disability Management and Lean Transformation Services Coordinators worked collaboratively to plan and lead the initiative. The team co-lead the events with the Lean Coordinators supporting the ability of the manager to learn by doing. The managers increased their role within the initiative as knowledge transfer progressed.
- » *Union Representatives:* Union representatives were involved in most working group sessions and Kaizen events. Their input, which included communication requirements with the union and clients, was integrated into the future state processes. Integrating union representatives

into the planning process assisted with ensuring that the processes met the needs of the staff and clients while meeting the requirements of the collective agreement and fostering positive working relationships.

- » *Managers and Human Resources Representatives:* Managers and Human Resources representatives were involved in initial working group sessions and Kaizen events. They were engaged again after the processes were implemented to resolve initial problems.
- » *Senior Executives:* The Executive Director of Disability Management and the Executive Director of Lean Transformation Services provided their full support in all aspects of the project, especially resourcing and guiding its direction. Their support was critical, especially during the future state implementation phase.

Interior Health

Interior Health began its Lean journey in 2007 with the application of Lean tools to single departments and processes such as the Laboratory, Pharmacy, Booking and Disabilities Claims Management. Based on positive outcomes from these initiatives, a Lean Leadership Forum was held in the spring of 2009 to get a better sense of the appetite for increasing the use of Lean. In the fall of 2009, the decision was made to apply Lean on a broader scale by implementing Lean as part of the capital building process for the new patient towers at Kelowna General Hospital and Vernon Jubilee Hospital (the KVH project). This decision was evidence that Interior Health was ready to move away from the application of Lean as a process redesign tool toward the utilization of Lean as a management system and a catalyst for cultural change. Supporting this shift, the Transformation, Innovation and Change department was formed in October of 2009 in order to provide centralized coordination of Lean activities across Interior Health.

Knowing firsthand the benefits that can result from implementing Lean in health care, and in response to the Ministry of Health's direction on Lean (Key Result Area 6), Interior Health's CEO and Senior Executive Team (SET) have officially endorsed Lean as a management system with the objective of improving quality, safety, and patient and staff satisfaction. Applying a strategic lens to the application of Lean, a service-line approach has been identified by SET as having the greatest effect because it focuses on the patient's experience through the continuum of care—from the community, into acute care, and back into the community—rather than concentrating on single, local improvements that may not affect the overall patient experience. SET has selected two service lines, based on an in-depth assessment of the needs of Interior Health's patient population. These are 1) Frail Elderly Activation¹, and 2) Hips and Knees Surgery. The service-line approach will be applied within four geographic locations in Interior Health with a total of 28 major Lean events taking place over the next two years.

Although the majority of Lean resources will be focused on these service lines, Lean work will continue as part of the KVH project, and other ad hoc Lean projects requested by staff and leaders across the organization will be supported based on a priority needs assessment. Because resources are limited, it has been difficult to support all requested Lean projects and initiatives, however the move to the service-line approach has resulted in an increase in dedicated resources to support this work.

In addition to the two Lean leaders already in place within the Transformation, Innovation and Change department, short-term funding has been provided for certification of six more Lean practitioners, as well as for administrative costs associated with a centralized Lean Promotion Office. Development of the Lean

¹ Optimizing the functional status of elderly patients by keeping them active and independent in order to prevent functional decline that results in the need for placement in an alternative level of care (Counsell et al., 2006; King, 2006).

Promotion Office will support the long term strategy of building the internal capacity needed to grow Lean as a management system. With work on the service lines beginning in the summer of 2011, the Lean Promotion Office has been responsible for coordination and deployment of Lean events, implementation of ongoing education and training, and development of standard tools and processes. The Lean Promotion Office will also, in conjunction with provincial partners, develop and coordinate a formal evaluation framework that will clearly define measures of Lean outcomes and better identify targets and measures of success.

To this point, there have been major accomplishments involving Lean in Interior Health including, but not limited to, the Lean events on the KVH project (in Central Sterilization, Ambulatory Care, Pre-Surgical Screening & Operating Room Booking), several events at Royal Inland Hospital in Kamloops (Operating Room, Post-Anaesthetic Recovery and Medical Device Reprocessing) and significant work with Central Okanagan Community Care. Accomplishments include removing excess inventory, improving turnaround times for blood and other tests, and reducing arrival to discharge time for gastrointestinal patients.

The Lean case study selected by Interior Health focuses on the patient journey through Pre-Surgical Screening and Operating Room Booking, in preparation for the move of these departments into the new patient tower at Kelowna General Hospital.

CASE STUDY 4 — Pre-Surgical Screening & Operating Room Booking at the Kelowna General Hospital

The Kelowna General Hospital Pre-Surgical Screening program ensures that patients have the proper screening tests done before surgery, and receive information about what to expect when they come in for surgery. The program's aim is to screen all elective surgical patients in a consistent manner across Interior Health; this preparation helps eliminate cancellations and decreases delays between cases due to re-questioning of patients by nurses. Eighteen to twenty patients are seen per day in the program. Operating Room (OR) Booking is responsible for booking OR time and Pre-Surgical Screening appointments.

Impetus for Lean

A new patient tower, the Centennial Building, is under construction at the Kelowna General Hospital, and the Pre-Surgical Screening and OR Booking departments are among the many departments moving into the new building. This value stream — the patient's journey through the OR Booking office and the Pre-Surgical

Screening program — was selected by the Kelowna General Hospital Leadership Team as a priority area for improvement to ensure readiness for the new building.¹

Objectives

The move was seen as an opportunity to make the Pre-Surgical Screening/OR Booking journey patient and family centered, reduce the time it takes the patient to proceed through the journey and the distance they have to travel within the hospital, decrease cancellations, and improve patient satisfaction.

It was also an opportunity to gain insight into Pre-Surgical Screening and OR Booking inter-departmental processes so that collaborative relationships could be developed among colleagues, and staff engagement improved. Although from a patient's perspective the two departments worked on two aspects of the same process, the departments had been working in silos that resulted in little collaboration and communication.

Further objectives were to ensure that only effective processes were taken into the new building, streamline work where necessary, ensure that the right person would be doing the right job, and develop staff skills that would continue and sustain improvements in the new building.

Lean Events

The intent throughout this Lean project was to have the people who do the work lead and develop the change process, with ongoing support provided by the internal Interior Health Lean Implementation Specialists.

The Lean event began with education, which included an exercise simulating an actual Lean process redesign that allowed participants to practice using Lean tools and methods. Education on change and change management was also provided. Change management included developing communication materials such as the poster shown in Figure 15, which outlines the goals of the Lean project, elaborates a vision of success, describes what will be needed from staff, and states what the process is not about (blame, increasing the workload, job elimination or decreasing funding).

¹ This Lean work was sponsored by the Kelowna/Vernon Hospitals Project.

FIGURE 15: CHANGE MANAGEMENT POSTER



The change management process also included a discussion of the consequences of not carrying out the Lean process redesign, as well as the opportunities presented by making a change (See Appendix A, in this section). This created a shared vision of the need for carrying out the Lean events.

Education was followed by value stream mapping and data collection using Lean tools that identify waste — spaghetti mapping, timed observations, calculation of steps, and "voice of the customer", a process in which patients and families are interviewed in order to understand their needs and wants and allow them to share their experiences.

During the five-day Kaizen week, staff looked at the issues identified in the value stream, and brainstormed solutions using Lean tools and concepts that eliminate waste: *5S*, *poka-yoke*, *visual management*, *single-piece flow*, *standard work*, set up reduction, and idea generation (see Figure 16). Improvement ideas were prioritized, and then tested using the *Plan-Do-Study-Act (PDSA)* model.

FIGURE 16: IDEA GENERATION



Solutions

A long list of improvements was identified during the Kaizen week. All of the changes listed in Appendix B have been implemented at the current site in order to enhance the preoperative patient journey and staff satisfaction, and improve system flow. These are some of the highlights:

- » Instead of the patient travelling to the lab for requisitions, the lab now comes to Pre-Surgical Screening, eliminating the journey for the patient.
- » The OR Booking room layout has been redesigned to decrease the noise level and increase confidentiality. Changes have been made both to the existing site and to the drawings for the future site in the Centennial Building.
- » The waiting room layout has been rearranged, resulting in a shorter walking distance for staff, better confidentiality for patients, and improved collaboration between the two unit clerks.
- » A division of labour checklist has been created for unit clerks.
- » Administrative processes that were determined to be unnecessary have been eliminated, such as reviewing charts that had been signed off.

Some of the changes identified during the Kaizen week remain to be implemented in the pre-surgical area to ensure the group is ready for its new space. The Manager and Patient Care Coordinator are providing support as the group continues to implement ideas and refine the current processes. In the meantime, staff have commented, "This project has improved the collaboration between departments and within the department significantly."

Results

Developing appropriate metrics has been a challenge, as has obtaining baseline information so that change could be measured. This aspect of Lean process redesign is an ongoing learning experience for Interior Health.

Lessons Learned

- » Change management education was very important for encouraging staff to buy in to the process and move forward.
- » The Lean process and tools were excellent for guiding staff in generating great ideas for solving problems.
- » Being able to relieve staff from their regular duties so that they can focus on the Kaizen week process is crucial.
- » Guaranteeing no job losses builds trust and engagement in the process.
- » Drop-in sessions can help with soliciting the input of doctors, who can be difficult to involve because of their schedules.

Lean Event Team Members

- » Leaders of the Process – Lean Implementation Specialists, Karen Kowal and Rob Mitchell
- » Change Management Leader – Leader of Change Imperatives, Jason Kennedy
- » Sponsor – Administrator of Kelowna General Hospital, Mary Jane Cullen
- » Sponsor – Chief of Staff, Dr. Jan McIntosh
- » Sponsor – Director, Sharon Cook
- » Process Owners and Team Members – Managers, Sharon Wilkinson and Nancy Serwo

- » Team Members
 - » Patient Care Coordinator, Kim Petryshyn
 - » Anaesthesiologist, Dr. Aaron Jackson
 - » OR Booking Staff, Lou Stafford
 - » Pre-Surgical Staff, Paula Cyra, Heather Cooke, Debbie Leimert, and Roosje Harman
 - » Workplace Health and Safety, Karen Leach-MacLeod
- » On-Call Team Members
 - » IMIT
 - » Patient Registration
 - » Surgical Daycare Staff
 - » Diagnostic Imaging

Appendix A

Threats and opportunities of carrying out or not carrying out the Lean process redesign.

Threats & Opportunities		
	Threat	Opportunity
Short Term	<ul style="list-style-type: none"> » Burn out » More frustration » Patient – poor experience » Increased cost – over time/patient/resources » Increased workload » Negative impact on other departments » Complaints » Decreased morale 	<ul style="list-style-type: none"> » Patient satisfaction » Improving process » Autonomy to meet challenges » Job satisfaction » Higher/increased trust/more control/confidence » “Smarter not Harder” » Decrease cancellations » Decrease patient anxiety » Decrease redos » Decrease complaints » Improve staff relationships

Threats & Opportunities		
	Threat	Opportunity
Long Term	<ul style="list-style-type: none"> » Burn out » Less staff » Staff retention » Less Money » Apathy » Poor customer preception 	<ul style="list-style-type: none"> » Sense of accomplishment » Move into new area » Increase patient confidence » Societal competence » Decrease waitlist » Increase morale/teamwork » Honouring Interior Health Values

Appendix B

A sample of the 60 improvements identified during the Kaizen week. All these improvements have been implemented.

Action	Quality Dimension	Results
Ergonomic Assessment to relocate/reposition fax machine	Work Life	Less stretching/reaching for staff
Public access phone line with message to re-direct calls	Work Life	Many calls were ending up here that were wrong numbers
Rearrange layout of waiting room and 2nd desk	Client Centered	Less walking distance for staff, better confidentiality for patients. Improved collaboration between two unit clerks
Better directions for volunteers. Check adequacy of signage. Provide consistent directions for patients	Client Centered	Created standard work for directions for volunteers to give to patients when they are directing them to PSS
Restructure OR Booking layout (plan)	Client Centered	Flow for the patients and the staff for the new building
Email req. to patient or fax to patient — especially for patients unable to come between 8:00am–4:00pm	Client Centered	In progress
Lab to come to PSS. Need to print out paperwork for patients to take over to lab — eliminate? Because Lab already has labels.	Client Centered	The lab now does all the lab reqs for PSS right in the PSS area...eliminated travel and waiting time for the patient
Develop new labeling system — see unit clerk graph	Continuity of Service	Other 625 hours of clerk time or \$12, 787.50
Open communication channels between anesthetists and RN. Consult with nurse at the end of the day.	Continuity of Service	Increased communication to provide better patient flow
Put computer in Anaesthesia exam room to look-up tests or relocate their new one	Effectiveness	The right person being able to access the right data at the point of conversation with the patient
Skip 48 hour check for diagnostics. Order all diagnostics day of visit after nurse interview.	Effectiveness	Elimination of duties and double checks
Patient information guideline to be followed by each team member	Effectiveness	Standard work completed to ensure the patient's experience is the same for everyone
Standard of work around what patients require update phone call. Standard times for lab result requests	Effectiveness	Standard work
Division of Labour checklist for unit clerks	Efficiency	Created opportunities to share workload and cross train

Action	Quality Dimension	Results
Clear visuals/communication notes. Clear expectations (if someone signed it off, it is done)	Efficiency	Creating better visuals for chart
Visual flags for what all needs to be addressed. Make a key. Day of week check is due on tag — day of week tag.	Efficiency	Needs, for example: » Diagnostics pending » New booking form » Various info from other institutions Standard work done up so staff know when to follow up on results
Better visuals for each chart's needs (e.g. stickies turned horizontal). Possibly better filing system (e.g. only T&S, BHCG, X-ray...?)	Efficiency	
Make an average time chart/list for diagnostics and how long it normally takes to get them back — not constantly checking Meditech	Efficiency	
Formulate what papers go in each cubicle (e.g. VRE, sleep apnea, medication record, valuables to bring in)	Efficiency	5S — everything has a place and it is marked so staff know where to go to get these items
OR to print own copies of slate as needed	Efficiency	Duplication of services — 2 areas printing the same slate
All OR Booking forms sent to PSS by 1500h	Efficiency/Work Life	Ensures staff have time to complete their work before the end of their day
Stop reviewing signed off 24 + 48 hour charts	Efficiency	Process is now eliminated
Stop calling back patients if only to remind them to CALL-IN the day prior to OR	Efficiency	Process is now eliminated
Utilize/educate float nurse more than we do	Efficiency	Update float nurse on PSS processes and standard work
Electronic submission of OR Booking package with mandatory fields	Efficiency	Working on
Telehealth	Efficiency/Client Centered	Opportunity for patients to do visit from another location
Phone in each interview room	Efficiency	Staff can make calls without leaving their desks
Portable phones for nurses	Efficiency	Staff can get patient's chart and do follow up while moving
Contact Lab and IT re: transfusion print out	Efficiency	Standard Work

Vancouver Island Health Authority

Lean is one of a number of process improvement approaches that has been applied in the Vancouver Island Health Authority (VIHA) in recent years. Early and successful Lean projects were carried out within Medical Imaging (2007), Cataract Surgery (2008), and the Laboratory (2009). VIHA's Lean projects now vary in scope from local (e.g. lab test turn-around-time) to cross-sector (e.g. care transitions among acute, community, and residential care).

The Strategic Process Improvement department where Lean resides currently consists of two full-time equivalents (FTEs), with an additional two FTEs planned for 2011/12. VIHA has delivered general Lean education and training to about 120 staff within fiscal year 2010–2011 through a combination of in-service, multi-day classroom, and on-line self-paced learning formats. VIHA is currently building internal capacity using dedicated in-house Lean practitioners and interim external consulting support.

That support for Lean exists throughout VIHA is demonstrated by the dispersion of Lean activity throughout many of the health authority's program areas. During fiscal year 2010–11, about 20 Lean events — value stream mapping and rapid process improvement workshops — were reported in VIHA. Each Lean project has specific process metrics or targets identified, and VIHA has a suite of macro-level dashboard indicators for leadership and board use. VIHA also tracks capacity building and Lean activity metrics such as numbers of staff undergoing Lean training, and the number of Lean events conducted. Post-event surveys of Lean event participants have demonstrated a growing appreciation for Lean principles and methodologies among staff and leadership. A limitation in the use of Lean is that VIHA departments and programs find it challenging to pull operational staff from the floor for Lean events.

In the future, Lean and other process improvement resources and activities will continue to be aligned with the VIHA Five-Year Strategic Plan. Lean will be applied as a strategic enabler in support of VIHA's four System Wide Initiatives¹, and as a tactical improvement tool directed at high-priority service processes. VIHA will also continue as an active participant in the provincial Lean Network.

The case study that VIHA has selected to showcase in this report is a Lean process redesign that resulted in an improvement in the flow of patients from acute in-patient in the Nanaimo Regional General Hospital to residential care activation, freeing up hundreds of acute inpatient days per year.

¹ Infection Prevention and Control, Care Delivery Model Redesign (to ensure the right staff are in place to meet patient needs), Care Continuum Transformation (to ensure that there is a clear care plan to return patients — particularly seniors — home as soon as they are able), and Staff Safety and Wellness (VIHA, 2010).

CASE STUDY 5 — Improving Overall Referral Time from Acute Care to Activation Services

Dufferin Place is a residential services facility located next to the Nanaimo Regional General Hospital. The Activation Unit at Dufferin Place is a Residential Care service that helps patients who require a sustained rehabilitation period but whose medical and diagnostic needs are stable. In the activation program, patients engage in normal everyday activities to increase their functioning and ensure a successful home transfer.

Program services include:

- » Therapies to improve strength, balance, walking and endurance;
- » Therapies to improve independence in activities of daily living such as dressing, bathing, and cooking;
- » Assessment and fitting for an appropriate wheelchair or walking aid as needed;
- » Assessments for the use of aids and adaptations;
- » Comprehensive planning to facilitate a safe discharge;
- » Medication self management prior to discharge; and
- » Leisure education training and community integration.

Patients are referred to the Activation Unit from acute care in the Nanaimo Regional General Hospital. When a patient's referral to the Activation Unit has been initiated but they have not yet moved, the patient remains in hospital acute care with an Alternate Level of Care — Activation designation.

Impetus for Lean

The process for referring and transitioning patients from acute care in the Nanaimo Regional General Hospital to the Dufferin Place Activation Unit was not clear, the steps were time consuming, and the paperwork was intensive. The result was delays in patients' accessing Activation Unit services, and inappropriate referrals. If acute-care patients are delayed in accessing Activation Unit services, they utilize more Alternate Level of Care — Activation hospital days. If they are inappropriately sent to activation, they have to be either transferred back to acute care, or stay for extended periods in activation, which holds up spaces in the Activation Unit that could be used for other, more appropriate admissions.

Objectives

The desired outcomes of this Lean event were:

- 1 An Activation Unit referral and access process that:
 - » Could be completed in less than four days, was efficient and effective, and required less paperwork;
 - » Reduced acute in-patient days designated as Alternate Level of Care — Activation by 30%; and
 - » Ensured role clarity in the referral process.
- 2 Standard operating procedures and a key-points sheets (i.e., a procedural checklist) that would document and communicate the new referral process to all units in Nanaimo Regional General Hospital operations;
- 3 Training materials and a training program for personnel on all shifts and in all departments; and
- 4 Metrics and leading indicators that would indicate changes in Average Length of Stay (for Acute and Alternate Level of Care — Activation days) and total Alternate Level of Care — Activation days.

Lean Events

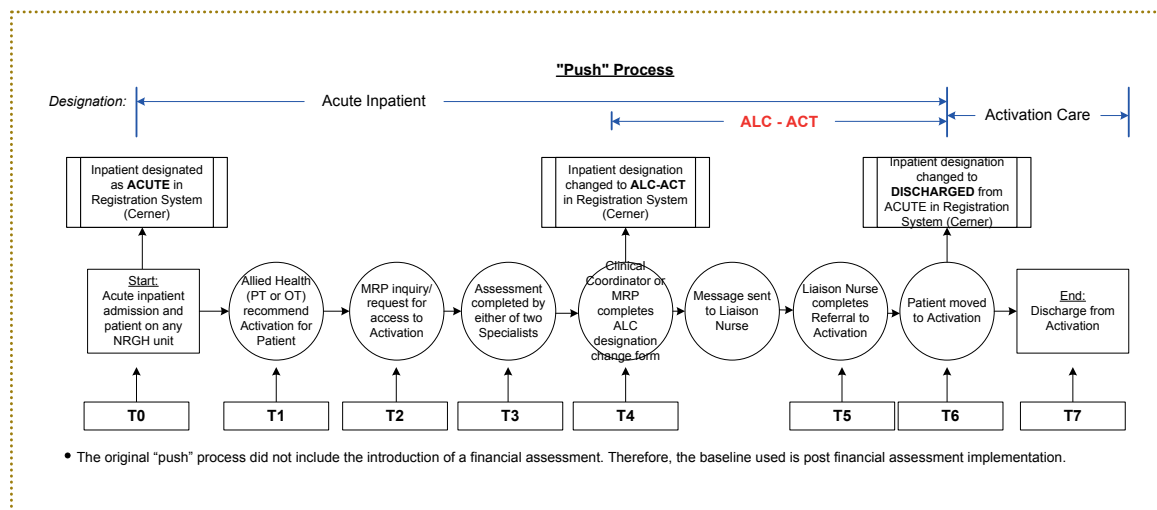
Lean methodologies were used to identify areas of improvement, reduce waste, and increase efficiency and effectiveness.

- 1 A five-day Kaizen event was conducted with acute, home care, and activation staff in June 2010, as well as a value stream mapping exercise that identified process-oriented waste and key information that would assist in expediting referral reviews.
- 2 Continuous improvement plans were developed, with new processes tested in several PDSA cycles conducted in the summer and fall of 2010. Data on referral time and review time were collected before, during and after the PDSA cycles in order to monitor progress as well as the implementation of new procedures. Changes to the new processes were made as necessary.
- 3 Key-points sheets and standard operating procedures were developed for staff in order to support the change process.

Solutions

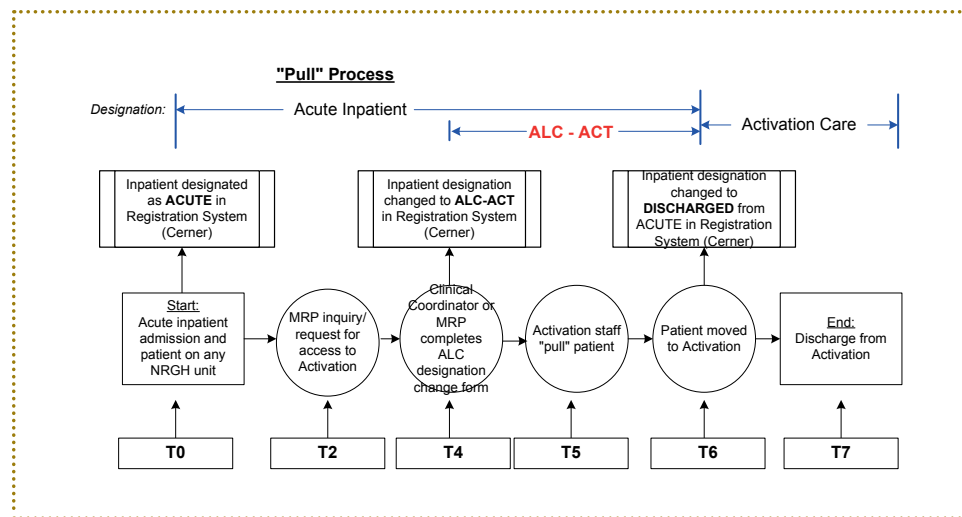
The main finding of the Lean event was that patients were being referred to the Activation Unit using the traditional “push” process, in which patients were referred to activation and found a bed when acute care staff felt the patient was ready to leave. The Lean event revealed that acute care staff did not know enough about the activation services and criteria to appropriately assess and refer clients. In addition, roles and responsibilities were not clear, as some floors did not always fill in all the information on the referral form, or inappropriately called in a geriatrician to facilitate the process. The “push” process is illustrated in Figure 17 (MRP=most responsible physician).

FIGURE 17: TRADITIONAL PUSH PROCESS



A major outcome of the Kaizen event was that patients are now “pulled” by activation staff rather than being pushed from acute care. In the pull process, acute care staff complete the activation referral form, and a switch in the electronic information system is turned to “ALC-ACT”. This trigger alerts activation staff to go to the hospital to pull a patient when a spot in the Activation Unit becomes free. Activation staff assess and select the right patient, and the patient is transitioned to activation (see Figure 18).

FIGURE 18: PULL PROCESS



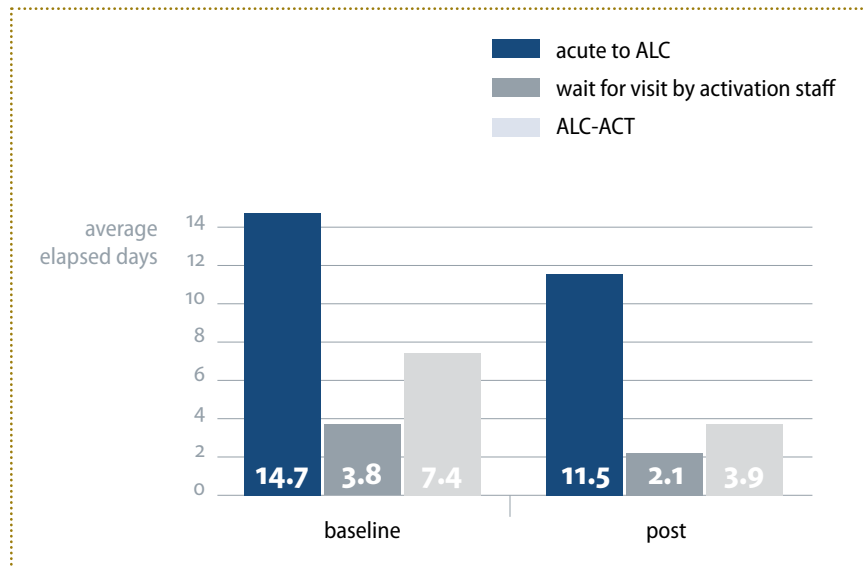
The Lean event team also simplified the activation admission guidelines and referral form, and acute care staff were educated about the new process flow. Other activities such as reporting upcoming vacancies in the activation unit, and flagging all delays to the appropriate staff, were also completed.

Results

The goals of the Lean event were met and exceeded:

- » The pull process reduced the elapsed time, from when the patient is designated ALC-ACT until discharged from acute and admitted to activation, from an average of 7.4 days to 3.9 days (Figure 19). This was a 47% reduction in acute in-patient days designated as ALC-ACT, which freed acute care bed days to service more clients.
- » The time from when the patient was admitted, to their designation as ALC, was reduced from an average of 14.7 days to 11.5 days, a 22% reduction.

FIGURE 19: AVERAGE ELAPSED DAYS FOR PATIENTS TRANSFERRING FROM ACUTE IN-PATIENT TO ACTIVATION



In addition, the Lean implementations resulted in:

- » Improved flow and safety for patients going from acute to activation services, because revisions to the acute-to-activation referral process reduced the number of discrete steps from seven to four.
- » Better and faster documentation of assessments on patient charts because of the standard operating procedures and key-points sheets.
- » Better communication and collaboration among acute care, Home and Community Care, and activation staff, resulting from updated communication tools and education about activation services and criteria. This outcome was noted by Clinical Coordinator Cheryl Rikely and Dufferin Activation Manager Laurie Chisholm as “the best thing that has come out of this initiative.”
- » Increased staff satisfaction (reported anecdotally), because acute care staff now understand how to use the activation criteria, patients referred to activation are now the most appropriate, and staff have seen that the new process works to both client and staff benefit.
- » Increased patient satisfaction, as patients have voiced (anecdotally) how nice it is to meet activation staff and see them again once the former are transferred to a new environment. Seeing the same staff member provides a sense of security for the patient as well as continuity of care.

The staff at Nanaimo Regional General Hospital and Dufferin Place will continue to monitor Alternate Level of Care — Activation rates, have ongoing monthly check-in meetings with the key stakeholders involved, and provide education on the new pull process to staff as required. There have also been early discussions about “spreading the learnings” to two other activation sites on Vancouver Island. Further evaluation needs to be completed to determine which components of this model can be used for other activation sites.

There were challenges experienced during the process redesign. Mid-way through, a new government policy was introduced that required that patients pay a daily fee for the Activation Unit and be assessed within three categories of ability to pay:

- 1 Able to pay per diem rate.
- 2 Able to pay but refused to pay.
- 3 Not able to pay, and applied for a waiver.

A liaison nurse from Home and Community Care is now required to carry out the financial assessment, and several meetings were required with the liaison, acute and activation staff to clarify roles and responsibilities. Processes were then developed for each of the three ability-to-pay categories.

A second challenge was also presented by the turnover of staff both entering and leaving the organization, and moving to different positions within the organization, as well as by staff taking summer holidays. The lack of staff continuity increased the difficulty of developing and testing continuous improvement plans, and meant that extensive training was required on the new activation processes and roles in order to make sure all staff received consistent education on the new procedures.

Lessons Learned

- » It’s important to monitor and measure progress, and name owners accountable for each process. Measurement allows slippages in implementing changes to be noticed, which can be acted upon through discussions in team meetings.
- » It’s important to plan for extensive training on new processes, especially when staff work on shifts and there is high turnover.
- » Improved care can lead to improved staff satisfaction.

Lessons Learned (continued)

- » Additional critical factors for success include sharing the common goal of providing quality patient care, leadership support, and staff engagement.
- » Ongoing communication is really important at all stages of the process to allow participants to problem solve.

Lean Event Team Members

Stakeholders from each area were involved in the Lean event: acute, Home and Community Care Liaison and activation. A Master Black Belt (external consultant) and a Green Belt candidate (Goldie Luong) provided Lean training 101 and led the Lean event, and Goldie Luong led the implementation of recommendations, monitored progress, and managed the project.

Staff Members

- » Geriatrician – Dr. Kim King
- » Clinical Coordinator – Lisa Rivington
- » Geriatric Nurse – Catrin Brodie
- » Clinical Coordinator – Cheryl Rikely
- » Home and Community Care Liaison – Carina Svenstrup
- » Home and Community Care Case Manager – Mary Ann Roff
- » Acute Care Physiotherapist – Hayley Evans
- » Residential Services Registered Nurse – Catherine Kirkbride
- » Activation Occupational Therapist – Darlene Yee
- » Activation Social Worker – Marie King
- » Dufferin Site Manager, Activation Manager – Laurie Chisholm

Northern Health

Lean was initiated in Northern Health in 2008 through a Ministry of Health Transformation Fund project to develop system performance and quality improvement capacity. Lean training was provided to Northern Health staff along with training in the Model for Improvement.¹ This initiative developed into a formal Lean program in Northern Health, which uses Lean tools and concepts to improve selected processes rather than using Lean as a system-wide management philosophy. The goal of the Lean program is to build capacity in all staff in order to further develop an organizational culture that encourages, supports, and expects the application of continuous quality improvement as a part of everyday practice.

To date, over 50 staff and executive have completed or are undergoing Lean certification training provided by external consultants. Eight staff are trained at the Black Belt level. Each Lean certification candidate has executed a Lean quality improvement project, and these have spanned a broad range of business areas in Northern Health. In 2009, 13 projects were undertaken by Lean Green Belts, and 11 projects that began in 2010 were recently completed. Some more advanced Black Belt projects are currently reaching completion, and a new cohort of trainees and projects is being launched in 2011.

The position of Regional Manager of Process Improvement, which reports to the Regional Director of Planning and Performance Improvement, was created in the winter of 2010 to lead the Lean program. Neither position is solely dedicated to Lean, nor does Northern Health have a dedicated cadre of Lean quality improvement advisors. Instead, Northern Health draws on the expertise of Lean-trained champions on an ad hoc basis.

Northern Health has allocated approximately \$240,000 to support Lean projects in the 2011–2012 fiscal year. The Lean program has developed substantially with this relatively modest dedicated investment. There has been a considerable cultural shift toward quality improvement as a result of program promotion, Lean training, execution of Lean projects, and the creation of a Quality and Process Improvement Intranet website that features Lean knowledge dissemination. A Lean community of practice has been established, and an inaugural Lean conference was held in March 2011 that showcased Lean projects and provided further education for Lean practitioners.

A five-year Lean Implementation Plan aligns future Lean projects with the Northern Health Strategic Plan 2009–2015, as well as meeting sector and regional process redesign interests. A computerized system for capturing Lean project ideas and monitoring project progress is being implemented, and measurement, return on investment, and evaluation of the Lean program will continue to be refined. Lean leaders in

¹ Developed by Associates in Process Improvement and made popular by the Institute for Healthcare Improvement (IHI, 2011).

Northern Health will continue to support the provincial Lean Network and provide leadership to working groups. Northern Health will continue to integrate and unify all quality improvement initiatives and activities so that progress can be effectively leveraged across the system.

Northern Health has selected a Lean case study in which the process for referring clients to Long Term Care Home Support Services has been improved.

CASE STUDY 6 — Referral to Home & Community Care

Northern Health's Home and Community Care supports clients who wish to remain independent and in their own homes or in residential care, and support patients and their families during end-of-life care. Its goals are to promote independence, choice and dignity in a patient's health care options. Home and Community Care's Home Support Services provides clients with assistance in managing personal health care needs such as bathing, toilet use, grooming, and medication management through two programs, Long Term Care and Short Term Care. Long Term Care was the subject of this Lean process redesign.

Impetus for Lean

There had been problems within the Home and Community Care referral process for Long Term Care Home Support Services since June, 2010 when Northern Health began using a new referral process. While the problems primarily affected the Prince George Home and Community Care office, rural offices were also affected when information processing interfaced with the Prince George site. The referral process was cumbersome, disjointed and had staff frustrated. Processing of referrals was inconsistent, parts of or entire client referral packages were lost, some billing was incorrect, entry of data into the electronic system was slow, and there were long delays before clients received services. Staff felt they were spending a great deal of time on administrative tasks such as photocopying that interfered with clinical duties, and there was miscommunication among the departments involved in delivering services to clients.

The staff at Home and Community Care were very aware of these problems and had convened many meetings in an attempt to improve the referral process. Front-line leadership had produced process maps that revealed systemic inefficiencies and pointed to the piecemeal expansion of the system, which had culminated in a tangled web of redundancy and disjointedness.

Objectives

The primary objective of this Lean project was to improve information flow during the referral process and eliminate errors so that clients would receive service in a timely manner. A second objective was to ensure that billing information would be entered into the electronic system correctly and promptly, with minimum reporting requirements provided efficiently to the Ministry of Health.

Lean Event

Home and Community Care managers contacted the Planning and Performance Improvement Department to investigate the use of Lean techniques for quality improvement. A Lean leader was identified (Stacey Gibbs) who collaborated with the departmental leaders to formulate a Lean Kaizen event. In preparation for the event, a planning session was led by Home and Community Care front-line leadership and attended by the Lean leader as well as the Northern Health internal consultant.

Pre-Kaizen interviews were conducted to further orient the Lean leader to the referral process, and a Kaizen team which represented a range of stakeholders was identified. The Lean leader created a preliminary value stream map to depict the current state of the referral process. The mapping process involved touring the building and work stations, and carrying out interviews with staff and front-line leadership.

Lean White Belt (introductory) training was provided to the team and Home and Community Care staff to kick off the five-day Kaizen event, which was held from February 28th to March 4th, 2011. During the event, the Kaizen team validated and added to the preliminary value stream map. The value stream mapping exercise was halted after 46 independent steps had been identified, which revealed that there was no standard process in place for referrals (see Figure 20). Referral files were transferred from department to department in no predictable order, and re-working of the referral was commonplace. All departments were making multiple copies of the file, and there was no way to track the status or physical location of a file. While several different departments were involved in the referral process, they did not have a working understanding of how their work was interrelated.

FIGURE 20: CURRENT STATE VALUE STREAM MAP



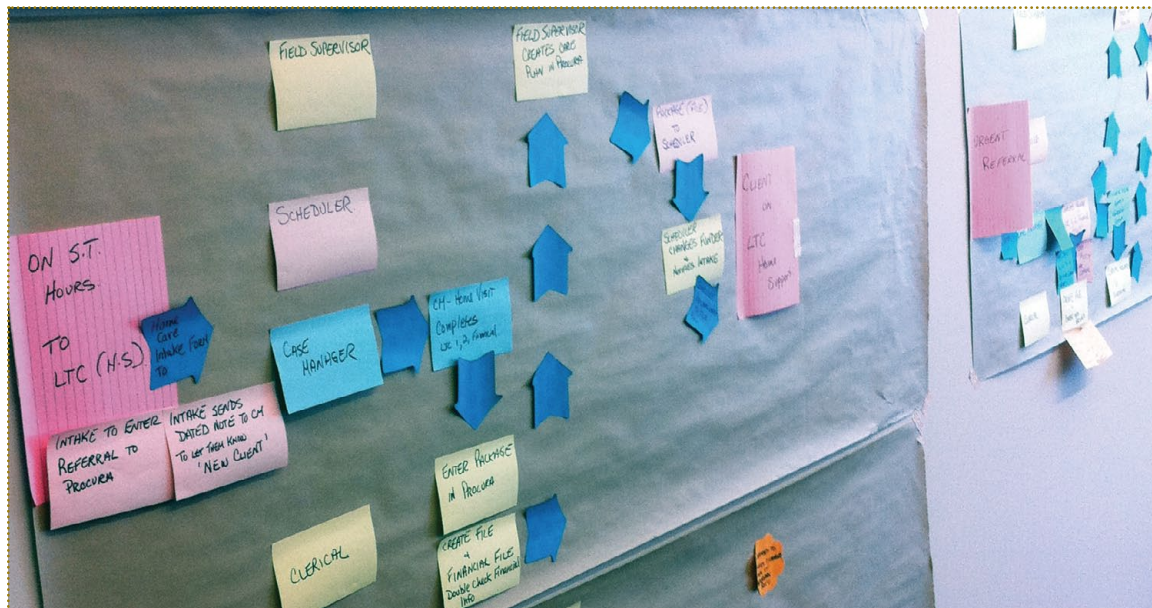
The Lean team calculated lead-time from the receipt of a referral to the start of a client's receipt of service using an electronic client tracking system which time-stamps clients at intake. The analysis showed that it took an average of 68 days for new clients to receive service, and the lead time was six to eight weeks if the referral was for an existing client requiring service modifications. There was no way to prioritize who received service, with some clients receiving service within a few weeks and others waiting up to six months.

Areas in which billing errors occurred were also identified — clients were occasionally overbilled or not billed at all. The managers discovered that billing errors occurring in the first three months of the year were valued at over \$10,000.

The root cause of these problems was identified as the lack of a plan for implementing the new referral process that was introduced in June 2010 (pre-Kaizen).

The team brainstormed solutions to problems, and developed a future (ideal) state map with various forms of waste eliminated (see Figure 21), a revised referral process, and a process for exceptional cases in which the referral could not follow the standard new value stream. Lean tools such as mistake proofing (poka-yoke), standard work, and visual management were used to eliminate errors, improve quality and efficiency, and enable any member of the Home and Community Care Team to immediately assess the status of a client's referral at a glance.

FIGURE 21: FUTURE STATE VALUE STEAM MAP



The team then attended a PDSA education session, followed by trialing the proposed changes first theoretically using PDSA principles, and then using an actual client file. Once the changes were agreed upon, a training package for implementation of the restructured process was created and trialed with staff.

The new process was implemented one week following the Kaizen event. Each time a referral made its way through the process from start to finish, a Kaizen team member conducted an audit to see if there were any areas that required further changes. Adjustments were incorporated as necessary, with the philosophy being the “pursuit of perfection” through making incremental improvements and ongoing revisions.

A Lean 5-S education session was also delivered, and staff identified areas in the work space that would benefit from formal organization.

Results

The goals of the Kaizen event were achieved. *Cycle times* have been reduced at various steps in the process, and overall lead time has been reduced: clients now receive services in 14 days following referral into the Home and Community Care rather than the 68 days it took pre-Kaizen. Overproduction and over-processing have been virtually eliminated, and information is flowing to the right person at the right time. Billing mistakes have been greatly reduced, and data are entered into the system in a timely manner.

Informal qualitative interviews with front-line leadership and other staff have revealed that the Lean Kaizen event has also contributed to workplace wellness by reducing staff frustration. One staff member commented, "Love it. It provides for accountability and better communication. I felt I was repeating many tasks that now I don't. I feel more efficient in my job."

The new process solutions are documented and are now part of the orientation of new staff. A Lean community of practice has been established at the Home and Community Care office to discuss issues that arise with the new process, as well as other areas in which they would like to improve efficiency.

Further efficiencies will be realized by having the referral forms move from paper based to electronic. A business case identifying the benefits of this change is going to be developed and presented to senior managers. Other Lean events are also planned within the same office, using the Lean tools and principles learned during this Kaizen event. For instance, the new referral process is going to be rolled out to the rural offices, and a Kaizen event is being planned to develop a referral process for the Short Term Care service. In addition, the office plans to 5S the file room, storage room, and supply room.

A key success factor was the ability of staff to be released from their day-to-day activities to participate in the Kaizen event. The project team was composed of the people involved in the actual referral process, and who were best positioned to bring forward the issues that were relevant to improving the process. Staff felt empowered by participating in the event, as they were able to develop solutions to the problems rather than having solutions imposed by an outside consultant with limited content knowledge.

A challenge, however, was that there is some redundancy in the forms used in the referral process that the Kaizen team would like to have improved. However, the forms are used region-wide and the team did not receive permission to change them without region-wide consultation, which was not possible within the time frame of the Kaizen event. The process could have been streamlined even further if the team had been granted permission to revise the referral form.

Staff learned through this process that, consistent with the literature on quality improvement, the project greatly benefitted from genuine executive-sponsor support and adequate resourcing. They also learned that successful staff engagement resulted in a burst of quality improvement energy and that Lean was an appropriate quality improvement methodology for this kind of problem.

Lessons Learned

- » Make sure the right players are at the table: front-line workers, decision makers and applicable support staff (such as Information Technology representatives)
- » Ensure that communication before, during and after the Lean event is clear, especially about goals and objectives.
- » Create a safe atmosphere in which people can speak freely in order to work through problems.
- » Genuine executive sponsor-support greatly benefits a Lean project.
- » The ability to free staff from their day-to-day responsibilities in order to participate in the Kaizen event is crucial.

Lean Event Team Members

Senior managers in Home and Community Care were very supportive of this project and released staff as needed to participate in the Kaizen event. There were representatives from each department involved in a typical referral process. Participants included administrative support, case managers, an intake nurse, schedulers, and field supervisors. Each participant explained in detail the steps for moving a referral through their department. Front-line leaders and managers were also included in the Kaizen event, along with a representative from Information Technology who provided feedback and decision support.

- | | |
|----------------------|----------------------|
| » Stacey Gibbs | » Connie Hunt |
| » Virginia Schneider | » Christel MacDonald |
| » Colleen Bowers | » Denise Pederson |
| » Vicki Rensby | » Cathy Czechmeister |
| » Samantha Jones | » Raymond Hallock |
| » Jenna Stevens | » James Chan |

Fraser Health

In Fraser Health Lean is applied independently (without central coordination) in business and clinical units wishing to review and optimize their core operational processes. Since 2005 more than 250 Fraser Health employees have taken courses in Lean taught by an external vendor or by internal Fraser Health instructors. Fraser Health plans to integrate a basic Lean course into its Management Development Pathway program to instruct managers about Lean concepts and basic techniques they can utilize to improve the performance of their units. A Lean community of practice is also planned, which will be a forum in which people trained in and practicing Lean will be able to share their improvement activities with peers, identify common needs and themes, discuss methodology, and solve problems.

Process improvement work in Fraser Health is also supported by an operations engineering team which provides advanced business analytics (e.g., root cause analysis, process mapping, and simulation modeling) to key areas in the organization. This team includes 13 senior operations engineers who are funded corporately and deployed strategically across the organization. Their focus is:

- 1 Process optimization;
- 2 Clinical capacity optimization;
- 3 Capacity planning; and,
- 4 Operational planning activities within large capital projects such as the Jim Pattison Outpatient Care and Surgery Centre and the Surrey Memorial Hospital redevelopment.

Twenty-four system or process optimization activities were identified for fiscal 2010–11 in Fraser Health, although this number is likely understated because of the distributed nature of process optimization activities throughout the clinical program areas and clinical and non-clinical support departments. Overall performance is measured across the entire organization with reporting done by clinical areas using a quality dimensions framework to ensure that a balanced set of measures is tracked, monitored, and acted upon.

For this report Fraser Health has chosen to feature a process improvement project which aimed to significantly improve time to diagnosis for women with breast cancer.

CASE STUDY 7 — Breast Health Care Optimization in Surrey

Breast Cancer is a leading cause of death among women over 50. It is well established in the medical community that early detection and diagnosis, combined with a multidisciplinary approach to treatment by specialized teams, helps reduce breast cancer morbidity and mortality rates.

The city of Surrey is the tenth largest city in Canada and the second largest in British Columbia. Approximately 10% of BC's population lives in Surrey, and close to half of the population is female.¹ The female population is projected to be 193,287 and 236,402 in 2010 and 2020 respectively. Assuming the breast cancer incidence rate remains constant, the number of Surrey women projected to develop breast cancer is 244 in 2010 and 299 in 2020. Developing services designed to detect and treat these cancers early is fundamental to the survival of these women.

This case study begins with a description of the main service components of breast cancer screening and diagnosis in Surrey.

Screening

Breast screening is currently provided on an invitation basis to BC women aged 40–79 years through the BC Cancer Agency's Screening Mammography Program. At the time that this process improvement project was initiated, the city of Surrey had one screening mammography centre located in the Guildford Town Centre mall. More than 15,000 women were screened at the centre in 2007.

Diagnosis

Referrals for diagnostic tests are made upon suspicion of breast cancer following an abnormal screen result, a physician exam, or a self exam. Breast cancer diagnostic tests are categorised into three types:

- » Imaging
- » Cytology
- » Surgical consult / physical examination

Imaging is usually provided through mammography or ultrasound. Ultrasound scans are useful in cases involving dense breast tissue or for detecting cysts containing fluid. Ultrasound is also used to guide the

¹ 2007 P.E.O.P.L.E 32 statistics

biopsy needle during core biopsy or fine needle aspiration procedures. Magnetic resonance imaging (MRI) is used occasionally but its use is limited by the availability of the service. At the time that this process improvement project was initiated, diagnostic imaging services were available at Surrey Memorial Hospital as well as at two community diagnostic centres.

Cytology tests (fine needle aspiration, core biopsy, and surgical biopsy) are performed on cell or tissue specimens. These tests are done in hospitals only, with analysis taking place in the pathology laboratory.

Physical examinations of the breast(s) are conducted by a breast surgeon as part of the clinical consultation with the patient. Further consultations are necessary in cases in which a surgical biopsy is required. The procedure takes place in the operating room and follow-up consultation takes place in a clinical setting. Some surgical biopsies are performed after the lesion is located using the insertion of fine wires under radiographic control (fine wire localization).

Table 3 below presents the estimated volume of diagnostic services carried out in 2007.

TABLE 3: DIAGNOSTIC SERVICE VOLUMES AT SURREY MEMORIAL HOSPITAL

Surrey Memorial Hospital – Utilization (2007)						
Year	Diagnostic Mammogram	Ultrasound	FNA*	Core Biopsy	Surgical Biopsy	Fine Wire Localization
2007	4,578	2,019	295	193	554	277

* FNA: Fine needle aspiration.

Sources: Surrey Memorial Hospital (SMH) Medical Imaging Booking for all data except for surgical biopsy volume, which has been estimated in consultation with SMH surgeons, based on the assumption that the surgical biopsy volume is twice that of the fine wire localization rate.

Impetus for Lean

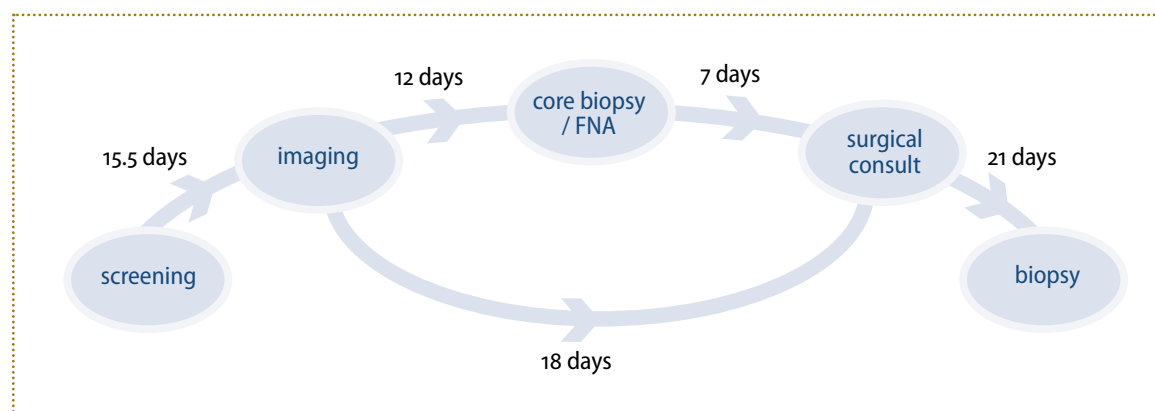
At a time when breast cancer incidence rates are climbing, and national and international communities are rallying to improve standards and implement best practices to combat the disease, the delivery model in Surrey did not align with published national and international guidelines.

More than one test is frequently required to establish a breast cancer diagnosis, and a number of medical disciplines provide services at various points in the patient's journey. Any or all of diagnostic imaging, cytology and surgical consults may be performed, and in Surrey, each test required a separate visit to the medical facility. The absence of a focused breast health centre in Surrey resulted in minimal coordination of the diagnostic tests. Breast health services were dispersed among several departments within Surrey Memorial Hospital with neither central coordination, nor protocols for the sequence of the diagnostic

investigations. Since many tests are also repeated for avoidable reasons such as prior images not being available, a patient may have needed to visit medical facilities over and over again before a diagnosis was confirmed. The lack of service protocols made it difficult for patients to navigate the system to access appropriate services and for medical staff to plan the right treatment, and led to underperformance of the service delivery system.

Figure 22 illustrates the journey from screening to biopsy for breast cancer patients requiring cytology tests (fine needle aspiration or core biopsy), showing the wait times experienced at each step by the patients in this BC Cancer Agency study.

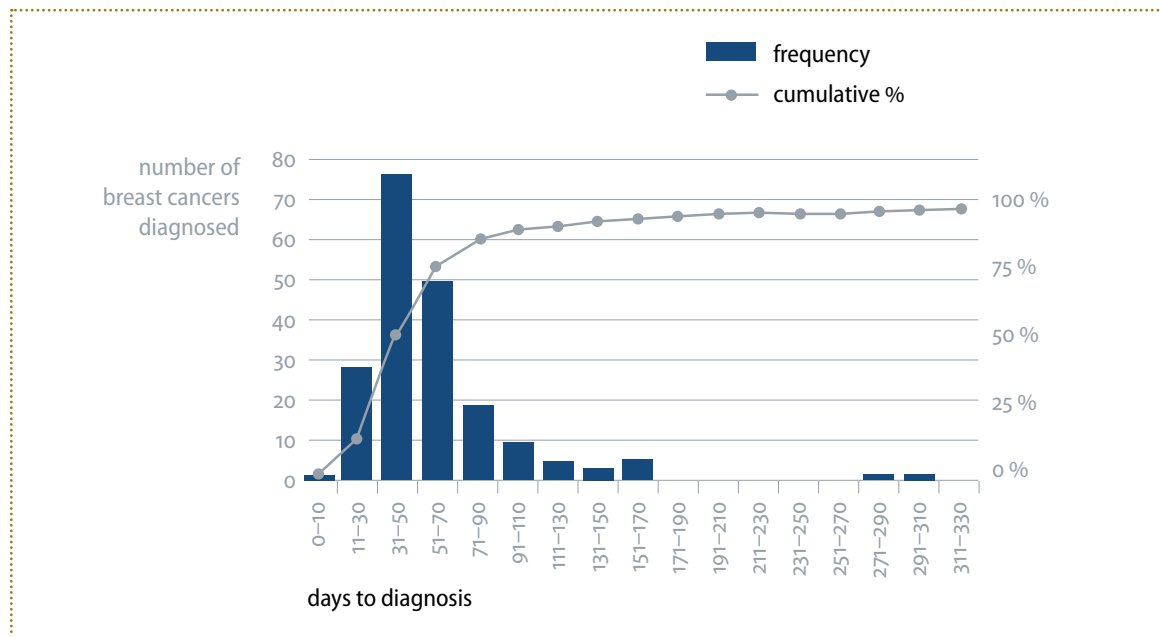
FIGURE 22: ELAPSED TIMES FOR BREAST CANCER PATIENTS' DIAGNOSTIC TESTS



Source: BC Cancer Agency, 16 breast cases reviewed by the Screening Mammography Program of BC.

Performance levels for time to diagnosis in Surrey fell far short of national and international targets. The British Association of Surgical Oncology and the European Society of Breast Cancer Specialists both specify a target for time to diagnosis. In comparison to these standards, data from the BC Cancer Agency show that in a Surrey study of 195 confirmed breast cancer cases, 90% were diagnosed within approximately three months, and fewer than 10% of women received a diagnosis within 30 days. In one case, 302 days elapsed before a diagnosis was made (see Figure 23). During the time it takes to arrive at a confirmed diagnosis, the patient and her family are exposed to anxiety and other mental hardships.

FIGURE 23: TIME TO DIAGNOSIS FOR BREAST CANCERS IN SURREY



Source: BC Cancer Agency (BCCA). Screened January 1, 2003 to June 20, 2005.

Appendix C provides a summary of these and other operational challenges presented by the breast cancer diagnosis and treatment services, identified by staff and physicians at the Surrey Memorial Hospital.

Objectives

Surrey's newly built Jim Pattison Outpatient Care and Surgery Centre (JPOCSC) provided Fraser Health with the opportunity to redesign the breast health service delivery model within a new Breast Health Clinic. The goal was to shrink time to diagnosis and improve patient outcomes.

A major requirement of the new delivery model was that breast cancer diagnostic investigations would follow the triple assessment model in which patients are offered imaging, cytology and physical examination during a single visit. For patients who have breast cancer, triple assessment has proven to detect the disease in 99% of cases.¹ A benefit of earlier diagnosis of breast cancer is that it is likely to reduce the need for more extensive management such as reconstructive surgery or in-patient chemotherapy.

A business case was developed looking at three options for the new delivery model:

¹ National Institute for Clinical Excellence, 2002.

- 1 A triple assessment clinic in a multidisciplinary setting.
- 2 A triple assessment clinic in a multidisciplinary setting, with integrated breast screening.
- 3 A triple assessment clinic in a multidisciplinary setting, with integrated breast screening, and treatment and management of breast cancer cases, including advanced stages.

Although option 1 does not include breast screening within the Breast Health Centre, it would be feasible to continue to operate breast screening off-site.

Option 2 includes breast screening and diagnosis. Although the capital costs associated with option 2 might be higher than for option 1, there is the potential to improve operational efficiencies by sharing Mammography Tech staff and on-site radiology for both breast screening and diagnostic mammogram or ultrasound, thereby reducing overall operating costs. In addition, with breast screening co-located in the Breast Health Centre, many patients who require diagnostic investigations would already be familiar with the Breast Health Centre and its staff. This option would also facilitate sharing of resources and better electronic and manual processes for exchanging information about patients.

Option 3 includes treatment management and adjuvant therapies in addition to breast screening and diagnosis; related operating costs would therefore be higher than for either option 1 or 2. Option 3 was deemed feasible in the longer term but not essential in the initial phase of development as Fraser Health prepared to move Surrey's breast health services into the new JPOCSC.

The decision was made that Option 2 was preferred, as it represented a significant step toward the goal of improved integration compared to option 1, while being pragmatic in the current circumstances.

Process Optimization

As the operational plans for the JPOCSC were being put into place the breast health planning team began the work of defining the facility requirements and developing the operational requirements for the new clinic model: a triple assessment clinic in a multidisciplinary setting with integrated breast screening. This was not achieved through a single Lean event, but rather through a sequence of planning exercises involving collaborations among the surgical program, the diagnostic imaging teams, and the operations engineering team.

A clear understanding of the current workflow was obtained through facilitated sessions with stakeholders. The future state workflow was developed within the framework of the practice and planning principles that had been agreed to for JPOCSC.

Operational engineers were key in supporting the clinical planning team in developing sound, evidence-based operational plans for the new breast health clinic. Projecting demand for services based on historical patterns so that optimized scheduling of the various resources could be modeled ahead of time was very important for generating the evidence and buy-in that was required to satisfy both decision makers and stakeholders who could be affected by scheduling decisions. To that end, a simulation tool was developed that allowed the planning team to test various scenarios by manipulating variables such as:

- » Estimated demand for each triple assessment pathway
- » Patient arrival patterns
- » Clinic days open
- » Number of scheduled slots available with start, end, and break times
- » Scheduled duration for each appointment
- » Number of rooms available

Testing scenarios that simulated patient flow provided insight into how changing a variable such as the number of rooms available would affect outcome measures such as patients' overall length of stay and wait times, waiting-area congestion, clinic overtime, and time to diagnosis targets. The simulations generated results that provided the planning team with valuable insight into projected performance before actually implementing the model. For example, Table 4 illustrates the projected performance for one scenario, in which there are three full clinic days per week, the average referral per day is 12.7 patients, the estimated annual volume of new patients is 3,171, and there are on average 21 new patients per clinic day. These inputs result in the outputs shown in the table, as days to wait for various diagnostics tests.

TABLE 4: PROJECTED PERFORMANCE SCENARIO

Patient Accessibility	Scenario (3 full day clinic per week)
Average referral per every day	12.7 patients
Estimated annual volume (new patients)	3,171 patients
Average new patients per clinic day	21 patients
Wait Days to Initial (i.e. Medical Imaging & Clinical Exam) Triple Assessment	
Time Lapse	Percent of Patients
0 day	29.04 %
1 day	34.12 %
2 days	16.87 %
3 days	14.29 %
4 days	4.16 %
5 days	1.45 %

Patient Accessibility	Scenario (3 full day clinic per week)
Same Day Biopsy	
<i>US Core / FNA</i>	<i>(Total Volume: 892)</i>
Yes	99.66 %
No – 2 days after initial visit	0.22 %
No – 3 days after initial visit	0.11 %
<i>Stereotactic Core</i>	<i>(Total Volume: 194)</i>
Yes	11.34 %
No – 1 day after initial visit	15.46 %
No – 2 days after initial visit	11.34 %
No – 3 days after initial visit	19.07 %
No – 4 days after initial visit	12.89 %
No – 5 days after initial visit	8.76 %
No – 6 days after initial visit	4.64 %
No – 7 to 12 days after initial visit	16.49 %

* All days are measured in calendar days and are relative to the time of booking (i.e. not receipt of referrals, as sometimes referrals are incomplete and more information is needed from referral source before clinic can book).

Other implementation issues that needed to be addressed for the proposed Breast Health Centre to be successful were also identified. Some of these issues, as well as strategies for mitigation, are outlined in Table 5 below:

TABLE 5: RISKS AND MITIGATIONS

Risk	Mitigation
Multi-disciplinary meetings may be stalled due to physician compensation issues. There is no payment model for multi-disciplinary team meetings within the current Medical Services Plan (MSP) framework.	Propose discussion with the Medical Services Commission (which is responsible for MSP).
The current MSP payment schedule does not cover multiple diagnostic procedures done the same day.	Propose discussions with the Medical Services Commission, and develop Fraser Health policy and protocols that govern the triple assessment model, to support such payments.
Lack of qualified staff.	Initiate recruitment strategy for required positions as soon as the business plan is approved.
Resistance to changing the existing work practices.	Implement good quality strategic and tactical change management processes.

Implementation and Monitoring

The operational planning and modelling resulted in an operational plan (including staff complements, skill levels, training, and staffing rotations; scheduling; and budgets) that should lead to the desired outcomes of coordinated breast health services, triple assessment, an improved patient experience, and a shorter time

to diagnosis. Implementation of the new breast health service model within the JPOCSC took place June 1, 2011, and a full evaluation is planned.

A key performance indicator will be time to diagnosis. Other measures of accessibility and continuity of service are contemplated within a balanced scorecard framework. For example, an improved process may contribute to increased breast cancer screening participation rates.

The new clinic should substantially increase client centeredness as the services will be more tightly integrated and optimized with patients' interests in mind. Related to this is that health care work-life / provider satisfaction should improve as this exceptional program is structured to deliver the best possible care to patients in a state of the art facility. Early indications are that this is so, as the ability to recruit imaging staff at JPOCSC was easier than anticipated.

Effectiveness measures are likely to improve. Two potential measures are the rate of false negatives, which is anticipated to be lower within the triple assessment protocol, and compliance with best practices.

Patient safety is expected to be optimized given that time to diagnosis is decreased and triple assessment mitigates positive cases going undiagnosed. Safety may also be improved by reducing exposure to radiation and avoiding invasive surgeries through early intervention. Overall mortality rates should decrease.

Process Redesign Team

Representatives on the Breast Health Clinic Core team (listed alphabetically) included:

- » Candice Chan, Operational Engineer, Strategic Transformation Team¹
- » Dr Peter Doris, Surgeon, Surrey Memorial Hospital
- » Leslie Eakin, Diagnostic Mammographer
- » Vivian Giglio, Executive Director, Clinical Programs and Operations, Fraser Health Surgery and Royal Columbian Hospital
- » Lorraine Gillespie, Director, Clinical Programs, Surgery
- » Dr Dennis Janzen, Clinical Chief Radiologist, Surrey Memorial Hospital
- » Dr Rhonda Janzen, Surgeon, Surrey Memorial Hospital
- » Linda Leveridge, Director, Clinical Programs, Surgery
- » Donna Rolph, Clinic Manager

¹ Candice Chan presented this project at INFORMS (Institute for Operations Research and the Management Sciences) Healthcare 2011 in Montreal on June 21, 2011.

- » Heather Ryan, Ultrasound Supervisor
- » Barb Ryz, Screening & Diagnostic Mammography Supervisor
- » Sharon Secord, Clinical Nurse Specialist
- » Sandra Sewell, Director Medical Imaging
- » Dr Frances Wong, Chief Physician, BC Cancer Agency, Fraser Valley and Abbotsford Centres

Appendix C

Areas	Challenges/Bottlenecks	Impacts
Process Flow	Time to reach diagnosis While each of the procedures or consults is fast, there is a lot of waiting in between steps. It takes typically 17 weeks from the time of suspicion to reach diagnosis.	» Patient safety and health outcomes are adversely affected.
Process Flow	Handoffs The current system contains multiple handoffs.	» Loss of efficiency due to multiple locations of key resources required to reach diagnosis. » Improper coordination at handoff points may risk patient cases “falling through the cracks”.
Process Flow	Access / retrieval of previous imaging exams across multiple facilities	» Continuity of care compromised.
Process Flow	Investigation reports These reports may not be forwarded to BCCA.	» May result in redundant tests.
Process Flow	“Fast Track” Fast Track system, as used within the BC Screening Mammography Program, shortens the time from abnormal screening to diagnostic imaging workup. It is not extended to automatic referral for biopsy.	» Gains experienced in the “Fast Track” system may be lost in the process if biopsy is the next step.
Referral Protocol	No consistent referral protocol for symptomatic referrals	» No consistency in clinical treatment of symptomatic patients.
GP Referral	Preparatory work incomplete. Sometimes GP simply refers patient to surgeon without any of the following: » Physical exam » Diagnostic workup » Complete imaging requisition	» Surgeon requires diagnostic reports to reach diagnosis. For patients who were referred without workup, diagnostic imaging (DI) process starts after the surgeon visit. » Booking clerk returns imaging requisition to GP’s office to complete. This delays setup of DI appt.
GP Referral	Gaps in care for orphaned patients (patients without GP)	» Abnormal findings require a referral from a GP to proceed to next step.
Diagnostic Imaging	Staff recruitment	» Future prospects for imaging technologists (especially ultrasound technologists) are not attractive.
Screening Centre	Staff recruitment Physically demanding job. Staff suffers from work related injuries to arms, hands, and back	» In short term, summer relief coverage. » In long term, staff recruitment for a new screening centre will be challenging.
Screening Centre	Storage space Insufficient room to store screening films	» Films that are 8 yrs and older (prior to year 2000) are permanently destroyed.

Areas	Challenges/Bottlenecks	Impacts
Screening Centre	Waiting list 14 week waiting list at time of site visit (Jan 2008); 11 weeks (April 2011)	» Once a woman can get an appointment, she spends less than 0.5 hr at the screening centre. However, the demand far exceeds supply, resulting in a waiting list that is a few months long.
Community Diagnostic Imaging	Suspect interpretation and quality of images obtained at community DI Patients are attracted by shorter wait lists offered at community DI. However, a faster DI appointment does not necessarily equate to a better outcome for the patient.	» Patient may be sent for repeat imaging, delaying diagnosis. » False negatives go undetected; patient safety is compromised.
SMH Diagnostic Imaging Booking	Manual booking system Booking information is handwritten on pre-made forms. Pre-registration then transcribes onto an Excel spreadsheet.	» Duplication of effort. » Inefficient information retrieval. » Risk of data entry error.
SMH Diagnostic Imaging Booking	Appointment notification Unless patients are on "Fast Track", patients receive notification on DI appointments via GP/surgeon's office.	» In the handoff process, patients may not receive notification about the appointment, or learn about it rather late. This may contribute to no-shows, wasting valuable appointment slots.
Diagnostic Procedures	Incorrect exam ordered This happens on a daily basis.	» Mammography technologist needs to seek approval from radiologist, and then get correct exam entered in Meditech via Booking before proceeding with the actual exam.
Lab Accession	Mismatch of patient identifiers 5% of all lab samples experience accession errors. Reconciliation is a resource-intensive and time-consuming process involving various avenues: patient, GP, PHN registry, etc.	» Sample cannot be processed or analyzed. This delay could be in the order of minutes to weeks.
MSP Billing	Current payment schedule No forum or payment model for multi-disciplinary team assessment of patients with breast abnormality.	» Fee for service model does not support the proposed multi-disciplinary assessment team model of operation.
MSP Billing	Current payment schedule Unless cleared with GP, multiple diagnostic procedures performed on same day are treated as 1 visit under current payment schedule.	» Future state is to combine as many consults and diagnostic procedures as possible in the same visit.
MSP Billing	Current payment schedule No forum or payment model for multi-disciplinary team assessment of cancer patients.	» Fee for service model does not support the proposed multi-disciplinary treatment team model of operation.
Mail Distribution	Pathology Report Physical printing and mail out of pathologist report	» Contributes to 1 to 2 day delay.

Conclusions

Lean has historically been applied most extensively in the private sector, and predominantly in the manufacturing industry. Over time, it has been applied in other sectors and industries, and there is a growing body of evidence that it may be successfully applied to the health care sector. Much of the evidence demonstrating that Lean can improve the quality of patient care and reduce costs has been accumulated in the privately-funded health system in the United States.

This report contributes to that body of evidence by showing that Lean also works in British Columbia's publicly-funded health care system. In the case studies featured in this report, Lean has been used to improve patients' access to services, reduce costs, implement evidence-based processes, and improve the patient experience. Briefly, the outcomes of the case studies are as follows:

- » In the Provincial Specialized Eating Disorders Program for Children and Adolescents, wait times from referral to assessment have been reduced from 66 to 8.5 days.
- » In Northern Health, the lead time from when patients are referred until they receive Long Term Care Home Support Services has been reduced from 68 days to 14 days.
- » In the Vancouver Island Health Authority, the average time from when a Nanaimo Regional General Hospital acute care patient is designated to move to activation, until they are admitted to the Dufferin Place Activation Unit, has been reduced from an average of 7.4 days to 3.9 days.
- » In Fraser Health, Surrey breast cancer patients are now offered three diagnostic tests (imaging, cytology and physical examination) during a single visit to the Jim Pattison Outpatient Care and Surgery Centre, with the intent to reduce time to diagnosis.
- » In the BC Children's Hospital, the elimination of 2,160 unnecessary blood tests is estimated to lead to cost reductions of \$32,400 per year.
- » In Vancouver Coastal Health, modifications made to the Early Intervention and Rehabilitation Program for disability management have led to a reduction in absence duration, and a reduction in long-term disability claims, which is estimated to produce savings for Vancouver Coastal Health of \$17.6 million (amortized from 2010 until 2020).
- » In the Provincial Specialized Eating Disorders Program for Children and Adolescents, two care pathways have been developed for eating disorder patients.

- » More than 60 modifications have been made to processes in the pre-surgical screening/operating room booking processes at Kelowna General Hospital in order to make the journey more patient and family centered, and more efficient.

Since the evidence suggests that Lean process redesign can be a powerful tool for implementing change, health authorities should continue to use Lean methods and tools to improve quality, productivity and efficiency.

The case studies also revealed what needs to be in place in the health authorities for Lean to be successfully implemented.

Executive support benefits Lean projects, and can be secured through involving executives as leaders and partners, and frequently communicating with them about successes, challenges and risks. Executive support can also provide the impetus for implementing Lean strategically across an organization rather than in isolation.

The engagement of frontline staff is crucial for making Lean work, beginning with making sure the right players are at the table, and ensuring that staff are temporarily released from their day-to-day responsibilities so that they can participate fully in Lean events. Involvement of stakeholders and customers is also important, and their participation can be assured with some creativity, for instance by arranging drop-in sessions or site visits.

A dedicated Lean team is able to provide the support for wide implementation of Lean, as well as for structured monitoring and evaluation of each event. Monitoring and evaluation is often a challenge, but it is necessary to assess the true impact of Lean initiatives.

The importance of making a clear link from each Lean initiative to an organization's strategic goals was identified, as was focussing on the goal of providing quality patient care. Viewing the change process through the lens of the patients and families served helps focus all team members on a common goal and shared interest.

Gathering and analyzing data that will be useful for decision-making is important, including making observations at the work site in order to determine how the work is actually carried out, for example, how supplies and equipment are actually stocked and used.

The importance of communication with participants and affected staff was frequently highlighted, including both communication and education before the Lean event, and communication and training on new processes afterwards.

Once new processes are developed, it is important to assign responsibility for measuring progress, and report on and deal with any roadblocks associated with the roll out of a changed process. It is essential to engage with staff daily to review issues and problems, and to coach them in developing the ability to solve problems as they arise.

Finally, refining improvements that have been implemented, and making further strategic improvements, puts into practice the philosophy of continuous improvement.

Next Steps for Lean in British Columbia's Health Sector

As the use of Lean evolves, the Ministry and health authorities will continue to collaborate and share knowledge and best practices through the provincial Lean Network. In the short term, the Network and its working groups are focussing on:

- » Developing a common introductory-level Lean curriculum and Lean toolkit which may be used by all the health authorities;
- » Developing a framework for improving the measurement of results and evaluation of Lean initiatives;
- » Creating a report for Leadership Council recommending how Lean can be better integrated within the capital planning process; and
- » Developing a Lean community of practice and web-based "hub" to allow health authority participants and the Ministry to connect to solve problems, share ideas, and transfer best practices.

The Lean Network will be discussing the case studies described in this report, and other compelling health authority Lean initiatives undertaken in fiscal 2010/11, to determine which may be suitable for broader adoption. Once identified, these initiatives will be monitored to ensure gains are sustained over time, and to support Network recommendations to Leadership Council about initiatives that potentially could be implemented across health authorities to reduce waste and increase value for patients.

Appendix 1

Innovation & Change Agenda

2010–2013 Key Result Areas

Ministry Vision

A sustainable health system that supports people to stay healthy, and when they are sick, provides high quality publicly funded health care services that meet their needs.

Strategic Actions

Our strategic direction, known as the Innovation and Change Agenda, was developed to achieve the Ministry's vision. This strategy is focused on making positive impacts to the quality of life for those who are facing increasing frailty, are managing chronic diseases, or dealing with mental illness, as well as continuing to contribute to a sustainable health system. For fiscal 2010/11, the agenda consists of four broad themes and project focused teams are collaborating on fifteen key result areas.

1. **Effective health promotion, prevention and self-management to improve the health and wellness of British Columbians.**
 - Key Result Area #1: Implement targeted health promotion and prevention initiatives to reduce the incidence of chronic disease
 - Key Result Area #2: Streamline core public health services to improve delivery.
2. **British Columbians have the majority of their health needs met by high quality primary and community based health care and support services.**
 - Key Result Area #3: Implement an integrated model of primary and community care to more effectively meet the needs of frail seniors and patients with chronic and mental health and substance use conditions
3. **High-quality hospital services are available when needed.**
 - Key Result Area #4: Use patient-focused funding to increase access to cost-effective elective surgeries and improve efficiencies in other hospital services
 - Key Result Area #5: Improve the quality, safety and consistency of key clinical service by implementing a guideline-driven clinical care management system for hospital care
 - Key Result Area #6: Drive LEAN across the hospital service sector
 - Key Result Area #7: Optimize the efficiency and effectiveness of the BC Ambulance Service.
 - Key Result Area #8: Achieve greater efficiency in the delivery of quality diagnostic services.
4. **Improved innovation, productivity and efficiency in the delivery of health services.**
 - Key Result Area #9: Optimize use of health human resources to improve clinical care and productivity.
 - Key Result Area #10: Improve patient safety and access to records through enhancements to the Health CareCard.
 - Key Result Area #11: Complete the implementation of eHealth.
 - Key Result Area #12: Reduce the cost of drugs, equipment and supplies.
 - Key Result Area #13: Drive savings through the consolidation of administrative services across the Lower Mainland.
 - Key Result Area #14: Redesign capital planning to optimize use of budget capacity
 - Key Result Area #15: Optimize governance, leadership and operational and change management capacity.

Appendix 2

Lean Network Members

Northern Health

- » James Chan
Regional Manager
Process Improvement

Interior Health

- » Diane Goossens
Corporate Director
Transformation, Innovation & Change

Vancouver Island Health Authority

- » Bob Clark
Executive Director
Strategic Process Improvement

Vancouver Coastal Health

- » Rena van der Wal
Executive Director
Lean Transformation Services

Fraser Health

- » Eric Demaere
Director
Strategic Transformation Team

Provincial Health Services Authority

- » Margaret Seppelt
Director of imPROVE
*BC Women's Hospital & Health Centre
and Provincial Health Services
Authority Corporate Services*

Ministry of Health

- » Kevin Samra
Director
*Stakeholder Relations
& Transformation*
- » Frances Bryan
Senior Policy Analyst
*Stakeholder Relations
& Transformation*

Appendix 3

Glossary

3P — Focuses on production, preparation and process in the design of new processes and workspaces (Institute for Healthcare Improvement [IHI], 2005).

5S — Sort, Simplify, Sweep, Standardize, Self-Discipline: a visually-oriented system for organizing the workplace to minimize the waste of time (IHI, 2005).

Batch and queue — The mass production practice of making large lots of a part, then sending the batch to wait in the queue before the next operation in the production process (IHI, 2005).

Black Belt — A level of training expertise defined by Lean Six Sigma training institutes. Green Belt and White Belt are lower levels of training expertise.

Cycle time — The time required for completing one step of a process (IHI, 2005).

Gemba — The shop floor; the worksite.

Kaizen — Continuous, incremental improvement of an activity to create more value with less waste.

Plan-Do-Study-Act (PDSA) cycle — PDSA cycles test change in real work settings (IHI, 2011). Plan-Do-Study-Act means planning the change, trying it, observing the results, and acting on what is learned.

Poka-Yoke — Mistake proofing devices, which are often built into machinery to prevent missing an operation (lean-manufacturing-junction.com [LMJ], n.d.). A poka-yoke prevents errors by halting production if an error occurs.

Rapid process improvement workshop (RPIW) — A workshop in which the kaizen approach is implemented to improved some aspect of work flow.

Single-piece flow — A situation in which products proceed, one complete product at a time, through various operations in design and production, without interruptions (IHI, 2005).

Standard work — A carefully documented and balanced work process that must be adhered to by each operator to ensure consistency (LMJ, n.d.)

Value stream — The specific activities required to design, order, and provide a specific product or service from concept launch to delivery into the hands of the customer (IHI, 2005).


Value stream mapping — Identification of all the specific activities occurring along a value stream for a product or product family (or service) (IHI, 2005).

Visual controls — Processes and measurables are set up so they can be understood at a glance (LMJ, n.d.).

Visual management — System enabling anyone to quickly spot abnormalities in the workplace, regardless of their knowledge of the process (Profitec, 2004).

Appendix 4

Lean Storyboard Template

STORY BOARD TEMPLATE		Health Authority Logo
Facility / Unit Name Contact: Event specific Date:	Event Title (include reference to service line for cataloguing purposes)	
Objective: ◇ The goal of this section is to identify the problem or issue that will be addressed through the event. ◇ Include a measurable goal and target.	Solution: ◇ What is the desired outcome (ideal state)? ◇ What will be implemented and why? ◇ How were changes made? What factors were critical to success? ◇ Were there barriers to change and how were they overcome? ◇ What lessons were learned? ◇ Event type? Lean tools used? ◇ Who was involved/represented? Was a vendor used? ◇ Before and after pictures and/or other visual aids may be useful in illustrating a change.	
Background: ◇ This section should provide general information regarding the role of the unit/facility involved in the event and the type of care/services they provide. ◇ What is the scope of the problem and why is it important to address it? Who identified it as a problem?	Results: ◇ Every event should include at least one primary measure providing information on how patient care has been impacted or how the bottom line has been improved (or both). ◇ Report baseline data in this section for events that are too recent to report final results. In these cases, the storyboard will need to be updated at a later date with post event results. ◇ Results should be specific and measurable . ◇ Improvement measures can be defined in absolute, and/or percentage terms and should be taken at multiple points in time. ◇ Before and after pictures and/or other visual aids may be useful in illustrating results. ◇ Results should fit into the following categories: accessibility, safety, work life, client-centred, continuity of services, effectiveness, and efficiency.	
Current State: ◇ How does the current process work? ◇ How does the problem impact patients, staff, and/or physicians? ◇ How has the problem been measured? ◇ Does the problem extend beyond the scope of this initiative? Please discuss limitations. ◇ Provide some analysis of the problem. For example, is it a local or historical issue? ◇ Was the root cause of the problem uncovered?	Next steps / Sustaining the Gains: ◇ Is further action required to address outstanding challenges? ◇ Are other events planned? ◇ What will be done to sustain or standardize the solution? How and when will sustainability be measured? ◇ Would this solution be applicable in another situation? Miscellaneous: ◇ Is there an important point that doesn't fit into the other sections you would like to share?	
		
<p>* Please note: Sections need not address all bullet point/questions. Use pictures and diagrams where appropriate. Reports will assist in identification of success stories, best practices and opportunities to realize gains that may be applied across health authorities.</p>		

Selected Storyboard Results

The following are randomly selected results from storyboards submitted by health authorities.

Improvements in efficiency, making the best use of resources:

- » *Sterile packaging failures at the BC Children's Hospital — in which sterile equipment could not be used — have been reduced from 19 per week to zero, with a cost savings of \$32,400 per year.*
- » *Cost savings at Kelowna General Hospital are projected to be more than \$12,700 per year as a result of changing patient identifiers on each page of a patient's chart to save clerks' time.*

- » *At the Nanaimo Regional General Hospital, average turnaround time for some Core Laboratory Assays has been reduced by 44%.*

Improvements in access to programs and services:

- » *At BC Women's Hospital, the number of Foetal Non-Stress Test patients being monitored in the assessment room has been reduced from 11 to 2 per period, so that more beds are now available for labouring women.*
- » *The capacity of PHSA's Tuberculosis Clinic has been increased from 250 to 325 patients per month.*

Improvements in patient safety:

- » *The number of patient moves within the BC Children's Hospital's Neonatal Intensive Care Unit has been reduced from 25 to 12 per week, improving patient safety and reducing staff time required for moves.*
- » *In the Pediatric Intensive Care Unit at the BC Children's Hospital, 100% of medication orders are now reviewed by the pharmacy. Previously only about 25% of medication orders were reviewed.*

Increase in evidence-informed treatments:

- » *At St. Paul's Hospital, the number of cochlear implant patients seen in a dedicated clinical space that meets best practice standards for their direct care needs has been increased by 50%.*
- » *At Sunny Hill Health Centre, the proportion of patients with a rehabilitation focus clearly documented for patient handover within the inter-professional team has increased from 0% to 100%.*

Appendix 5

List of Health Authority Storyboards 2010/11

Fraser Health	<ul style="list-style-type: none"> » Jim Pattison Outpatient Care and Surgery Centre <ul style="list-style-type: none"> » Breast Health Clinic Scheduling (One-Stop-Shop Patient Care) » Integrated Operating Room and Ambulatory Scheduling Operating Room Workflow Improvements to Increase Access to Surgery » Improving Access to Interventional Cardiology Services in Fraser Health Authority » Diagnostic Cardiology – Holter Exam Clinic Process Review » Operational Review of Surrey Memorial Hospital Sterile Processing Department » Facility Redevelopment – Flow Analysis » Key to Home: Home Health – Liaison Services Transformation » Care Delivery Model Redesign in Seven Medical Units » Surgery – Automated Preference Cards » Review of Surrey Memorial Hospital Pharmacy's Order Transmission and Management Processes » Lower Mainland Pharmacy Services <ul style="list-style-type: none"> » Drug Distribution Model Optimization » Production Centres: Service Delivery Improvements » Wardstock Optimization » Pre-Admission Clinics Redesign
Interior Health	<ul style="list-style-type: none"> » Royal Inland Hospital – Operating Room Changeover Project <ul style="list-style-type: none"> » Cleaners » Anaesthesia Supplies » Theatre Room Stock » Royal Inland Hospital – Medical Device Reprocessing <ul style="list-style-type: none"> » Steripeel Station » Operating Room Neuro Supply » ENT/Eye/ENDO Supplies » Royal Inland Hospital – Post-Anaesthetic Recovery <ul style="list-style-type: none"> » Value Stream Map of Patient Flow (Supplies) » Process Flow of Patients from Operating Room to Post-Anaesthetic Recovery through to Day Care Surgery » Vernon Jubilee Hospital, Ambulatory Care/GI Flow of the Endoscopy Patient » Vernon Jubilee Hospital, Central Sterile Department Current State Mapping » Kelowna General Hospital, Pre-Surgical Screening/Operating Room Booking » Kelowna General Hospital, Future State Process Flow Mapping » Kelowna General Hospital, Hips & Knees Service Line, Surgical Optimization Clinic » Central Okanagan Community Integration, Value Stream Mapping

Northern Health	<ul style="list-style-type: none"> » Southside Health and Wellness Center – Inventory Management » Mills Memorial Hospital (Terrace) – Cataract Surgery Reporting » Referral Process For Home Support Services » Hand Hygiene Compliance » Northern Health Board Policy Review Process » Medical Staff Reappointments » Registration of Non-Clinical Educational Events
Provincial Health Services Authority (PHSA) – BC Cancer Agency	<ul style="list-style-type: none"> » Pre-registration of new patients » Ensure the time scheduled for an appointment matches the time required for an appointment (Part B) » Enhance radiation oncology patients’ reception experience » Improving patients’ telephone experience » Improve patients’ symptom-related telephone calls » Create standard work and mistake proof physicians’ processing of orders
PHSA – BC Centre for Disease Control	<ul style="list-style-type: none"> » Standardize enhanced surveillance process » Review transitional care of patients from hospital to TB clinic » Fall prevention strategy to minimize the impact of patient falls – TB clinics » Mistake proof the use of two patient identifiers
PHSA – BC Children’s Hospital	<ul style="list-style-type: none"> » Just in time booking, Ambulatory Care, Neurology Clinic » Ensure that ICU beds are always ready for admission with zero defects » Mistake proof sterile packaging and storage of operating room instruments » Eliminate incomplete sets of consignment items in OR supplies and equipment » Improve patient preparedness for discharge and reduce lead time for booking follow-up appointments, Ambulatory Care Neurology Clinic » Nursing shift to shift handover, Critical Care » Reduce day of clinic no shows, Ambulatory Care » Improve efficiency of OR case cart supplies management and accuracy of preference cards » Eliminate defects in transcription of medication errors, Pediatric Intensive Care Unit » Reduce transcription lead time, Ambulatory Neurology Clinic » Improve process for managing preference cards for the Urology Service, OR Supplies and Equipment » Reduce lead time for post-operative communication to families, Pediatric Intensive Care Unit » Increase quality of care by the elimination of overproduction of lab specimens » Improve patient safety and quality of service by decreasing the lead time for procedures in the Surgery Day Care Unit » Creation of a standardized process for communication for continuity of patient care, Sunny Hill Health Centre
PHSA – BC Mental Health and Addiction Services	<ul style="list-style-type: none"> » Follow established care pathways in outpatient clinic, Eating Disorders Clinic » Standardize the initial shift assessment, Eating Disorders – In-patient » Standardize Care Plan, Eating Disorders – In-patient » Eliminate documentation defects, Eating Disorders – In-patient » Reduce defects within the internal patient transfer of care process » Reduce lead time for medication administration at the Forensic Psychiatric Hospital

PHSA – BC Women's Hospital and Health Centre	<ul style="list-style-type: none"> » Reduce foetal non-stress test volume in the assessment room by improving capacity in the Fetal Assessment Clinic » Increased access to and utilization of Single Room Maternity Care Units » Reduce patient prep time for urgent C-sections and assisted vaginal deliveries » Standardize nursing handover process » Eliminate defects in patient information and reduce chart preparation time » Eliminate defects during nurse to nurse handover » Eliminate defects in chart preparation » Standardize communication in discharge preparation » Reduce lead time from decision to OR arrival » Reduce the cycle time of sonographer's workflow » Standardize daily bedside information » Standardize post-partum bed status information » Reduce lead time on day of discharge by establishing and implementing standardize process for day of discharge » Reduce the unused spots due to no show and last minute cancellations by 50% » Improve the safety of oxytocin administration by revising the safety checklist and implementing standardized physicians' orders » Inpatient loose filing roll-out in Postpartum Units (Arbutus, Balsam, Cedar, Dogwood)
PHSA – Lower Mainland Pathology & Laboratory Medicine	<ul style="list-style-type: none"> » Increase the availability of H&E (Hematoxylin and Eosin) surgical slides ready for pathologist review » Create one-piece flow of confirmatory samples and HBe (Hepatitis B) tests to maximize efficiency
PHSA – PHSA Laboratories	<ul style="list-style-type: none"> » Reduce the lead time to type dictation from pathologists » Reduce lead time to report molecular results » Increase capacity of technologists & instrumentation, reduce re-work and decrease lead time » Reduce ECG lead time from time of tracing to upload in CAIS
Vancouver Coastal Health	<ul style="list-style-type: none"> » Vancouver Kidney Clinic <ul style="list-style-type: none"> » Blood Work Monitoring » Care Management Plan » Single Patient Chart » St. Paul's Hospital <ul style="list-style-type: none"> » Creating Capacity and flow in the Audiology Department » Maternity Lean Design » St. Mary's Hospital – In-Patient Unit Supplies Distribution & Storage » Lions Gate Hospital Peri-operative Services <ul style="list-style-type: none"> » Daycare Policy and Pre-Printed Orders » Operating Room Turnover Times » Vancouver General Hospital – Cardiac Catheterization Laboratory » Richmond Hospital Birth Centre Phase 1 – Unscheduled Caesarean Births » Pre-Admission Clinic (PAC) <ul style="list-style-type: none"> » PAC Clerical Workflow Changes » Pamphlets » Screening Desk Algorithm / Patient Questionnaire

Vancouver Coastal Health (continue)	<ul style="list-style-type: none"> » Mental Health and Addictions <ul style="list-style-type: none"> » Acute Regional Inter-Hospital Transfer: Acute Care » Acute Regional Patient Flow » Housing Phase 1 » North Shore Mental Health and Addictions Intake » North Shore Acute to Residential Care: Patient Flow » Vancouver Coastal Disability Management Lean Initiative » Human Resources Integrated Recruitment Processes
Vancouver Island Health Authority	<ul style="list-style-type: none"> » Nanaimo Regional General Hospital <ul style="list-style-type: none"> » Pain Program Referral Process » Acute to Activation Referral Process » Core Cell Initiatives <ul style="list-style-type: none"> » Campbell River Hospital » Cowichan District Hospital » Nanaimo Regional General Hospital » West Coast General Hospital » Human Resources, Staffing & Payroll – Change Notice Process

Appendix 6

References

- Counsell, S. R., Callahan, C. M., Buttar, A. B., Clark, D. O. and Frank, K. I. (2006). Geriatric resources for assessment and care of elders (GRACE): A new model of primary care for low-income seniors. *Journal of the American Geriatrics Society*, 54(7), 1136-1141.
- Institute for Healthcare Improvement. (2005). *Going Lean in Health Care*. IHI Innovation Series white paper. Cambridge, MA. Retrieved July 15, 2011 from <http://www.IHI.org>
- Institute for Healthcare Improvement. (2011). Science of Improvement: How to improve. Retrieved July 19, 2011 from <http://www.ihl.org/knowledge/Pages/HowtoImprove/ScienceofImprovementHowtoImprove.aspx>
- Lean-manufacturing-junction.com (n.d.). Lean Vocabulary. Retrieved July 20, 2011.
- King, C. (2006). The ACE (Acute Care of the Elderly) model of Care. Retrieved July 19, 2011 from http://www.health.nsw.gov.au/resources/nursing/pdf/moc_o6/ace.pdf
- National Institute for Clinical Excellence. (2002). Improving Outcomes in Breast Cancer. Retrieved July 19, 2011 from http://www.nice.org.uk/nicemedia/pdf/Improving_outcomes_breastcancer_manual.pdf
- Profitec.com (2004). Lean manufacturing vocabulary and terms. Retrieved July 20, 2011 from <http://www.profittec.com/vocab.htm>
- Stamatis, D.H. (2011). *Essentials for the improvement of healthcare using Lean & Six Sigma*. New York: Productivity Press.
- Vancouver Island Health Authority. (2007). RJH Patient Care Centre. Retrieved July 15, 2011 from http://www.viha.ca/NR/rdonlyres/ECE96861-A694-4816-A3EE-D3Co494EE2F9/o/rjh_site_photo_illustrations2.pdf
- Vancouver Island Health Authority. (2010). Vancouver Island Health Authority Service Plan 2010/11 – 2012/12. Retrieved July 19, 2011 from http://www.viha.ca/NR/rdonlyres/AADEEF61-FoF4-47F8-B65B-268D2F6D1FDB/o/HSP_2008_2009.pdf

