Redesigning care at the Flinders Medical Centre: clinical process redesign using "lean thinking"

David I Ben-Tovim, Jane E Bassham, Denise M Bennett, Melissa L Dougherty, Margaret A Martin, Susan J O'Neill, Jackie L Sincock and Michael G Szwarcbord

ABSTRACT

- The Flinders Medical Centre (FMC) Redesigning Care program began in November 2003; it is a hospital-wide process improvement program applying an approach called "lean thinking" (developed in the manufacturing sector) to health care.
- To date, the FMC has involved hundreds of staff from all areas of the hospital in a wide variety of process redesign activities.
- The initial focus of the program was on improving the flow of patients through the emergency department, but the program quickly spread to involve the redesign of managing medical and surgical patients throughout the hospital, and to improving major support services.
- The program has fallen into three main phases, each of which is described in this article: "getting the knowledge"; "stabilising high-volume flows"; and "standardising and sustaining".
- Results to date show that the Redesigning Care program has enabled the hospital to provide safer and more accessible care during a period of growth in demand.

MJA 2008; 188: S27–S31

In November 2003, the Flinders Medical Centre (FMC), a 500-bed teaching general hospital in the southern suburbs of Adelaide, initiated a program of clinical process redesign across the entire hospital. Redesigning Care, as the program is known, is based explicitly on applying an approach called "lean thinking",[1] which was developed in the manufacturing sector, to health care. The FMC provides the whole range of secondary and tertiary services required by its community, but its main focus is on providing time-urgent, complex care. The extensive nature of the Redesigning Care program, and its focus on a specific improvement method, may be of interest to those outside our centre. Redesigning Care can be considered in three broad phases: "getting the knowledge", "stabilising high-volume flows", and "standardising and sustaining".

Phase 1: Getting the knowledge

In 2003, the emergency department (ED) at FMC saw around 45 000 patients, 40% of whom were admitted to hospital. In that same year, the number of patients seen per day peaked at around 140 once or twice per week during the winter period.

At this time, congestion in the ED had become so severe that the recovery area of the operating theatre suite had been taken over as an extension of the ED. There was bitter conflict between staff, key senior clinicians were prepared to leave, the "blame game" was pervasive, and surgical and medical programs were proving hard to sustain. An aggregated root-cause analysis of a series of deaths in the ED and elsewhere in the hospital made it clear that, despite having implemented a range of strategies to relieve congestion,[2] the capacity to provide safe care was under threat.

As clinicians and senior managers, we were united in acknowledging that we needed to do something, but we did not yet know what or how. We were fortunate to obtain a key piece of advice from a member of the then United Kingdom National Health Service Modernisation Agency,[3] who advised that sustainable change requires as much care in developing an improvement team, as in the improvement interventions themselves. Consequently, the Redesigning Care team — comprising three experienced clinicians designated as clinical facilitators, and a part-time director who was also a member of the hospital executive — was formed.

Governance

The hospital management executive is the authorising body for all redesign activities at FMC. The Redesigning Care program itself is managed by a reference group of the most senior hospital executives, plus the redesign team. Clinical leaders from the major clinical divisions take leadership roles in their own areas, and each major work program involves an executive sponsor from outside the relevant operational division.

Why "lean thinking"?

Lean thinking[1] is an approach to the redesign of complex processes derived from methods developed in the manufacturing sector. Successful modern manufacturers, such as the Toyota Motor Corporation, are concerned with the timely, safe manufacture of a diverse range of cars or other goods, in large volume and at high quality. We also faced the challenges of volume, timeliness, diversity, and safety and quality, and after an early success with applying lean thinking, we elected to use it as the basis for our whole program of clinical process redesign. While lean thinking remains at the heart of the Redesigning Care program, over time we have borrowed from many other manufacturing philosophies.

Getting the technical knowledge

As an improvement team, we needed to "get the technical knowledge" for redesign. Team members read the existing texts on lean thinking,[1] and the team and hospital senior managers spent 2 days with a lean thinking expert from Lean Enterprise Australia. We also received generous support from the staff of the School of Management at the University of South Australia, where the team plus senior managers also participated in a Diploma in Lean Manufacturing. Through these contacts, we all came to appreciate the complexity of other service and manufacturing industries, and the seriousness with which quality control is approached outside health care.

Knowledge of lean thinking principles and practices helped us develop a new way of looking at our work, moving away from a craft-group skill base (eg, medical care, nursing) or a body system orientation (eg, cardiovascular, respiratory) towards a process view where the care is seen as the outcome of a sequential series of steps

1 Process redesign with the use of lean thinking

The basics of process improvement through lean thinking include:

- being clear about what it is that you "make" at the step or stages in which you are involved
- identifying who your customers are — who uses what you make, and what they value
- identifying activity families or patient-care families and their value streams
- improving flow
- identifying and reducing waste
- moving from "push" to "pull" processes
- acknowledging that process improvement must be continuous ◆

through a sectional and hierarchically organised institution or service (see illustration on *page S14*).[4]

Lean thinking principles need to be adapted to the specifics of health care,[5] but adaptation is necessary for every setting in which lean thinking is applied, and the basics of process improvement are as appropriate for health care as they are for other service and manufacturing industries (Box 1).

From the outset, we realised that the Redesigning Care program was a change management process. Putting lean thinking into a broader change management context provided us with our overall redesign method (Box 2).

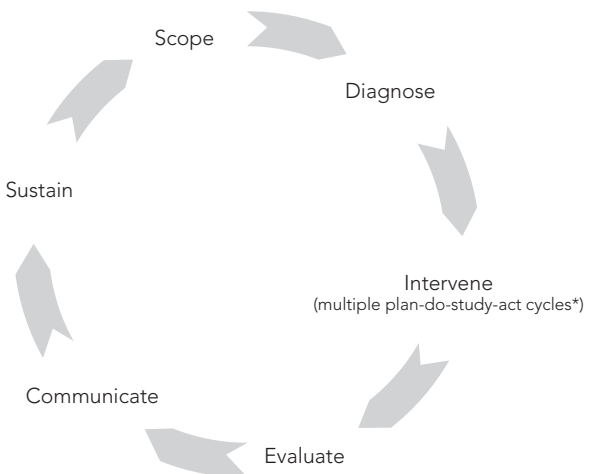
The Redesigning Care facilitators have developed substantial knowledge about process redesign. They begin a program of work by working with the senior staff involved to determine the scope of that piece of work: what is being "made" (is it a clinical service, a document, a report, or what?); where the process begins and ends; who uses what is being made overall, and at each step; and what do these "customers" value? There are two kinds of customers for a process at FMC: the patients for whom the care is provided, and the staff member or staff group next in line in the care process.

The facilitators then bring multidisciplinary groups of frontline staff together to diagnose process problems using mapping and staff "tag-alongs", documenting actual practice (*page S14*).[4] Those same groups identify opportunities for redesign and make the necessary changes by means of a series of plan-do-study-act cycles[6] (Box 2), each of which is evaluated according to relevant measures identified in the diagnostic phase. The key measurement issue is: how can we tell if what we have done has made things any better? As far as possible, the processes and outcomes measured need to be important to both the patients cared for by the institution and the practitioners. Separate measures may be required to capture these different concerns.

Progress can be made quickly in some programs of work. The initial change to the flows within our ED were planned and executed within weeks. Other programs, such as the redesign of the flows of medical inpatients admitted as emergency cases, take concerted efforts over long periods. Complex areas of work are visited and revisited in a process of continuous improvement.

The facilitators also work on developing widespread understanding of lean thinking principles and practices. They communicate them in a variety of ways, including lean thinking education days for large numbers of staff, open staff meetings, newsletters and an intranet site.

2 Redesigning care — a virtuous circle



* Testing a change by planning it, trying it, observing the results, and acting on what is discovered. ◆

Phase 2: Stabilising-high volume flows

At the outset of the Redesigning Care program, we tried to improve the flow of patients presenting as emergency cases. We undertook a series of mapping sessions, looking at the hospital services in the greatest difficulty — the ED and adult medical and surgical inpatient services. By improving the flow of patients through these services, we aimed to improve safety, reduce congestion, and restore the integrity of our surgical program. The mappings brought together large numbers of staff from each service who plotted out the end-to-end journeys taken by typical patients.

"Short" and "long" patient-care families

Patient-care families are groups of patients with a number of processing steps in common. A key lean thinking strategy is to look at the processing steps of patient-care families from end to end, to improve the sequencing of the processes involved. In lean thinking, those sequences of steps that add value or materially improve the care for patient-care families are called value streams.

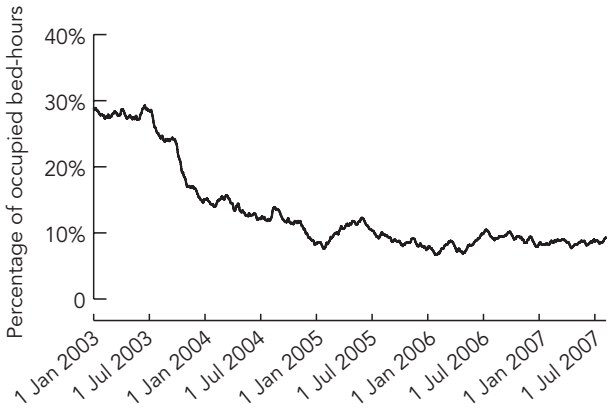
The mapping revealed both problems and similarities across services. Time and again, clinicians differentiated groups of patients whose care was relatively straightforward and likely to be completed in a limited number of processing steps, from patients with more complex problems who will require more processing steps. We started to recognise that "short" and "long" constitute a basic method for identifying patient-care families and their end-to-end value streams.

Short patient-care families

Short patient-care families are those whose care involves a limited number of processing steps, most of which will be undertaken by clerical and nursing staff. This is not to downplay the skills of clinicians, but the clerical and nursing elements in the journeys of short patient-care families are not only numerically the most frequent, but are also surprisingly similar, even when the clinical specifics differ widely.

Short care requires concentrated and focused effort to complete all the necessary processing steps related to admission, assessment, treatment and discharge in a timely manner. Our experience is that this is best managed by enabling nursing and clerical staff to focus

3 Percentage of medical and surgical inpatient bed-hours during which beds are occupied by "ward outliers",* Flinders Medical Centre, 2003–2007



* Patients admitted to an available bed in a ward that is not the designated ward for their condition. ◆

on that type of work without trying to juggle the continuing demands of patients requiring longer care.

Early interventions at FMC streamed all ED patients into either a short-care (likely to be discharged) stream, or a longer-care (likely to be admitted) stream.[7] This was followed by the development of a short-stay (less than 72 hours) medical/surgical emergency inpatient ward within the body of the hospital.[8] Patients continue to be discharged in a timely manner from that ward no matter how congested the rest of the hospital becomes, thus aiding patient flows. Indeed, at times, up to a quarter of all adult inpatient emergency admissions are managed through this one ward of 26 beds.

Long patient-care families

Hospitals such as FMC need to be able to provide for the care needs of patients with severe, complex or multidimensional problems. Rather than trying to improve the specific treatment protocols for these long patient-care families, we began with programs of work on two common elements of long processing: medical "take" and bed management. Medical take refers to the process whereby medical teams are rostered to take all emergency admissions of designated types over a "take" period, with a new team taking over at the end of the take period, be it 24 hours, 48 hours or longer. The take team then continues the care of patients who are not referred onward to specific specialty groups.

Dismantling "take", and "pull" rather than "push" bed management

An important goal of the long patient-care family teams was to minimise the time patients spend as outliers in wards other than the home ward of the treatment team. A multiyear, multigroup program balancing workloads and bed capacities between highly specialist and generalist medical teams set the scene for a major practice change — dismantling the existing medical take system (in which hospital teams are rostered to take what may be large numbers of unplanned arrivals and process those patients).

In a busy hospital, take is a source of substantial day-by-day variability in the number of patients cared for by each team. The new system involves patients either being allocated directly to a highly specialised unit, or, if a period of further clinical "sorting" is required over and above that undertaken in the ED, patients are referred to an acute medical assessment unit for the first 12 hours of their care. From there, medical emergency patients in long patient-care families are assigned to home teams at a consultant-led team meeting every morning, where allocations are balanced so as to keep numbers relatively even between teams.

These changes have gone hand-in-hand with a change to the bed management system. The change involved moving away from a central bed manager "pushing" patients into any available bed to instead functioning as a facilitator to help wards develop a structured process to "pull". Thus, ward staff pull or find those patients from settings such as the acute medical assessment unit, the ED and high-dependency areas who best fit their ward care profiles, and move them expeditiously into their wards. The overall outcomes for the amount of time patients spent as "ward outliers" is shown in Box 3.

Other interventions

A lengthy program rebalancing surgical waiting list structures, together with improved access to a small number of overnight-stay beds, enabled our surgical elective program to be restored to near full function. This strategy was aided by the enthusiastic uptake of clinical practice improvement initiatives throughout the surgical services, and this enthusiasm then spreading within the hospital. Detailed programs of redesign in important support areas such as pharmacy and central sterile supply were also undertaken during this period.

Phase 3: Standardising and sustaining

With a well conducted diagnostic phase and frontline participation, new ways to improve clinical processes readily emerge. Sustaining changes and making them "the way that is done around here" is a continual challenge. The key to this task seems to be creating standardised processes. This has always been challenging in health care where autonomy is held dear, but lean thinking is concerned with standardising processing sequences, not with changing the conduct of care itself. Once the best, most efficient and most effective way of undertaking a process has been developed and agreed on, it should become "standard work".[1] This standard work is developed and continually improved by the people who do the work. Examples from two different areas illustrate this process.

5S

Hospitals, as workplaces, are often disorganised. People spend long periods of time just looking for things. Workplace organisation is a key feature of many lean thinking practices. It is reified

4 Time spent in the emergency department for all patients, discharged patients and admitted patients, Flinders Medical Centre, 2002–2006

Financial year	Mean overall time (h)		
	All patients	Discharged patients	Admitted patients
2002–03	5.4	3.7	8.3
2003–04	5.3	3.5	8.2
2004–05	4.9	3.4	7.3
2005–06	4.8	3.4	7.0

5 Percentages of all emergency department patients whose treatment was commenced in compliance with protocols for their triage categories, Flinders Medical Centre, 2002–2006

	Triage categories				
Financial year	1	2	3	4	5
2002–03	100%	75%	63%	59%	74%
2003–04	100%	70%	58%	66%	89%
2004–05	100%	68%	59%	72%	93%
2005–06	100%	69%	63%	74%	90%

under the rubric 5S (Sort, Set in order, Shine, Standardise and Sustain),[9] which designates a set sequence of actions.

When redesigning the provision of discharge medication, it became clear how much time rotating and relieving staff spent in the ward medication storage areas just looking for medications. In response to this, a standardised medication storage and labelling process was developed by a multidisciplinary team. Teams of nurses from each ward then reviewed their medication cupboards, implemented the standard format and agreed how and by whom the improvement would be maintained. The process then became a standard part of daily ward work. Rotating and relieving staff in particular appreciate the time saved when moving from ward to ward.

Many different 5S programs are being implemented across FMC, from the ED to the operating theatres. The resulting easier working conditions are valued by all concerned.

Ward rounds and discharge summaries

Ward rounds are the key decision-making process in the medical day. A program of work has been undertaken to standardise the structure of ward rounds, especially those relevant to the care of patients with complex medical problems. The original aim was to improve the timing of decisions relating to discharge. This involved mapping out the daily processes for clinical teams, then obtaining agreement on new sequences. The new sequences involve protected time for junior staff to process and review potentially dischargeable patients before the arrival of the consultant for the morning round, allowing the round to start with the potentially dischargeable patients. A further period of protected time for the junior medical staff later in the day allows administrative processes to be completed. Serendipitously, it was found that this dramatically improved the capacity to complete discharge summaries in a timely manner, and a major program of work was developed around this opportunity. Standardising aspects of the way junior and senior medical staff organise their day across the hospital has increased the percentage of patients with complex medical problems whose discharge summaries were completed within 24 hours of discharge from around 40% to over 80%. Our goal is to raise this to at least 90% of discharge summaries by the end of this calendar year.

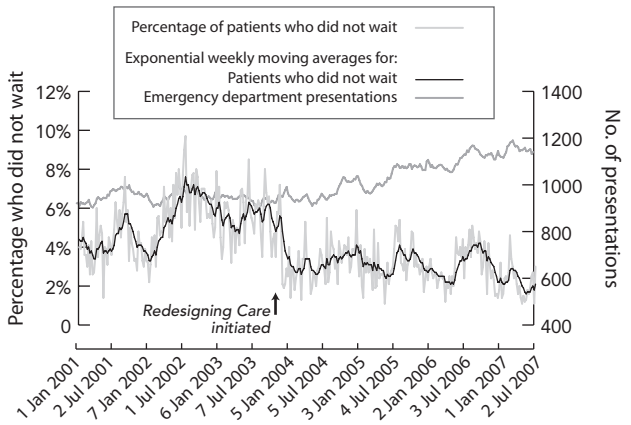
Outcomes

When the Redesigning Care program began in November 2003, the ED was struggling to cope with 140 patients arriving each day. The ED now routinely sees between 180 and 210 patients per day (an increase in demand of up to 50%) and manages them within the same physical space and with similar staff–patient ratios as previously. We have not had to resort to using the recovery area for overflow, and Box 4 and Box 5 show that overall processing outcomes have generally improved despite the increased numbers of arrivals. The small decrease in the percentage of patients in triage category 2 whose meaningful treatment was commenced within 10 minutes represents additional delays of 1 or 2 minutes, and has not been accompanied by any change in clinical outcomes.[7] The number of patients leaving the ED without waiting to be treated declined sharply after the introduction of new processing sequences and improvements in aligning staff with those sequences, and has stayed low (Box 6). This is a concrete demonstration of patient satisfaction with the services provided.

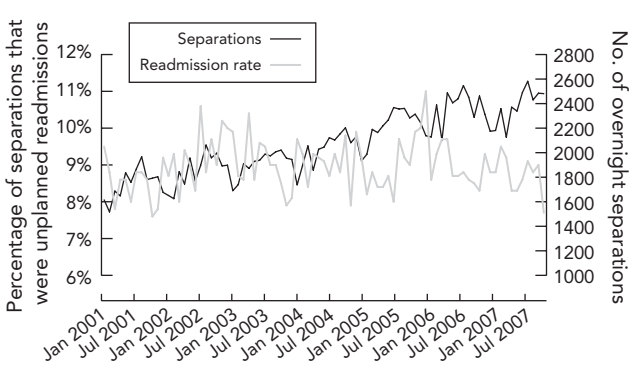
There have been other benefits. Staffing has stabilised within the ED and across nursing services throughout the hospital. Towards the end of the financial year 2005–06, the hospital reported only six nursing vacancies across a service with almost 2000 staff.

Reassuringly, the number and types of serious adverse events throughout the hospital have declined strikingly since the begin-

6 Patients who presented to and those who did not wait for treatment at Flinders Medical Centre emergency department, January 2001 to April 2007



7 Percentage of all acute separations that were unplanned readmissions,* Flinders Medical Centre, 2001–2007



* Emergency readmission within 28 days of discharge within same major diagnostic category. ◆

ning of the Redesigning Care program. In the financial year before the program began, the hospital made 91 notifications of serious medicolegal adverse events to its insurers. In the past financial year, the whole region, of which the hospital is the largest service, generated only 19 such referrals. This is despite the average overall numbers of emergency admissions increasing from 1200 per month at the onset of Redesigning Care, to over 1600 per month at present. (In Box 7, the increase in separations relates to the adult medical and surgical activity.)

Length of stay for medical patients admitted as emergency cases has fallen by about a day since the Redesigning Care program began, saving around 15 000 bed-days to date.

Reassuringly, rates of unplanned readmissions to hospital have remained stable despite increased activity and decreased length of stay (Box 7).

The FMC has seen a substantial growth in demand for care in recent years, and continued growth will mean that the imperative to improve will remain, and indeed increase.

Acknowledgements

We thank the large number of staff at FMC who have participated in Redesigning Care activities; Lean Enterprise Australia for continuing support; and Professor John Marley for editorial advice. We also acknowledge the role of Dr Deborah Lloyd in editing this article and producing this supplement.

Competing interests

None identified.

Author details

David I Ben-Tovim, PhD, MRCPsych, FRANZCP, Director, Clinical Epidemiology and Redesigning Care Units,[1] and Professor, Faculty of Health Sciences[2]
Jane E Bassham, RN, BN, Clinical Facilitator, Redesigning Care Unit[1]
Denise M Bennett, RM, BN, MBA, Deputy Director, Redesigning Care Unit[1]
Melissa L Dougherty, BA(Psych)(Hons), Clinical Facilitator, Redesigning Care Unit[1]
Margaret A Martin, RN, BN, MHSS, Deputy Director, Division of Surgery and Specialty Services[1]
Susan J O'Neill, RN, BN, MNSc, Executive Director, Nursing, Midwifery and Patient Services,[1] and Associate Professor[3]
Jackie L Sincock, RN, BN, GradCertHSM, Clinical Facilitator, Redesigning Care Unit[1]
Michael G Szwarcbord, BSc, BSocAdmin, FAIM, Executive Director,[4] and General Manager[1]
1 Flinders Medical Centre, Adelaide, SA.
2 Flinders University, Adelaide, SA.
3 Faculty of Health Sciences, University of South Australia, Adelaide, SA.
4 Acute Services, Southern Adelaide Health Service, Adelaide, SA.
Correspondence: David.Ben-Tovim@fmc.sa.gov.au

References

1 Womack J, Jones D. Lean thinking. Banish waste and create wealth in your corporation. London: Simon and Schuster, 1998.
2 Bartlett J, Cameron P, Cisera M. The Victorian emergency department collaboration. *Int J Qual Health Care* 2002; 14: 463-470.
3 UK National Health Service Modernisation Agency. Ten high impact changes for service improvement and delivery: a guide for NHS leaders. Leicester: NHS Modernisation Agency, 2004. http://www.ogc.gov.uk/documents/Health_High_Impact_Changes.pdf (accessed Jan 2008).
4 Ben-Tovim DI, Dougherty ML, O'Connell TJ, McGrath KM. Patient journeys: the process of clinical redesign. *Med J Aust* 2008; 188 (5 Suppl): S14-S17.
5 Ben-Tovim DI, Bassham JE, Bolch D, et al. Lean thinking across a hospital: redesigning care at the Flinders Medical Centre. *Aust Health Rev* 2007; 31: 10-15.
6 Berwick DM. Developing and testing changes in delivery of care. *Ann Intern Med* 1998; 128: 651-656.
7 King DL, Ben-Tovim DI, Bassham J. Redesigning emergency department patient flows: application of Lean Thinking to health care. *Emerg Med Australas* 2006; 18: 391-397.
8 Cooke, M, Higgins J, Kidd P. Use of emergency and observation wards. A systematic literature review. *Emerg Med J* 2003; 20: 138-142.
9 Chapman CD. Clean house with lean 5S. *Qual Prog* 2005; 38: 27-32.

(Received 11 Sep 2007, accepted 3 Jan 2008) ❑