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National variability in provision of health services for major long-term conditions in New Zealand (a report from the ABCC NZ study)
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Chronic disease is the leading cause of illness, mortality, and inequitable health outcomes in New Zealand. This study aimed to identify extent of long-term conditions management evidence-based practices in stroke, heart disease, stroke and chronic lung disease in New Zealand’s District Health Boards (DHBs). In 2007/08, 15 DHBs completed two questionnaires: a generic component capturing perceptions of practice; and a disease-specific component assessing actual service provision. There was considerable variability in perceptions of long-term conditions management service provision across DHBs. In many instances variability in actual service provision appeared to relate to DHB size.

Contemporary sedation practice in a large New Zealand emergency department
Martyn Harvey, Grant Cave, Chris Betham

We have audited the sedation practice in a single large Emergency Department (ED) in New Zealand. Sedation to enable performance of painful procedures was commonly used with good effect. Such a technique may result in quicker, cheaper, and more efficient performance of many simple but painful tasks within the ED rather than requiring hospital admission.

Manipulation of simple paediatric forearm fractures: a time-based comparison of emergency department sedation with theatre-based anaesthesia
Chris Betham, Martyn Harvey, Grant Cave

Manipulation of childhood forearm fractures is traditionally done in the operating theatre. We have shown setting of simple fractures may be achieved in the Emergency Department under sedation with comparable outcome, but with significant savings in time both before and after the procedure thus enabling early discharge.

Project RED—a successful methodology for improving emergency department performance
Michael W Ardagh, Angela M Pitchford, Anne Esson, Heather Manson, Brian Dolan

Emergency Department overcrowding is bad for patients and staff. Its causes are multiple and complex, and addressing it requires a comprehensive approach. The methodology of Project RED is pragmatic, innovative, comprehensive and prioritised.
It incorporates clinical leadership, management support and project facilitation and is a useful structure for addressing the large and complex problem of ED overcrowding.

**Improving acute patient flow and resolving emergency department overcrowding in New Zealand hospitals—the major challenges and the promising initiatives**  
Michael W Ardagh, Gary Tonkin, Clare Possenniskie

All New Zealand hospitals were visited to determine the main challenges and the promising initiatives in relation to achieving the Shorter Stays in the Emergency Department Health Target. Access to hospital beds, inpatient team delays and access to diagnostics are the biggest challenges.

**Emergency nurse practitioners: do they provide an effective service in managing minor injuries, compared to emergency medicine registrars?**  
Margaret Colligan, Caroline Collins, Bernard Foley, Peter Jones, Jennifer Miles, Irene Zeng

The introduction of the Emergency Nurse Practitioner (ENP) role to Auckland Hospital Emergency department has impacted on the waiting times for patients with minor injuries. Currently the ENP role focuses primarily on patients with minor injuries who normally would wait the longest to be seen. This research study found that the ENP role does reduce waiting times and length of stay for patients. ENPs appear to see minor injury patients faster than Emergency Medicine Registrars and this may account for the reduced length of stay for patients. In the current environment in New Zealand with the 6-hour target this role proves to beneficial to meeting this goal.

**Outcomes from out-of-hospital cardiac arrest in the Wellington region of New Zealand. Does use of the Fire Service make a difference?**  
Andrew H Swain, Tasmin Barry, Sarah R Hoyle, Grant Haywood, Hayley Cameron, Peter D Larsen

The survival rate from cardiac arrest (cessation of heart activity) in the Wellington region compares favourably with that reported from major cities overseas. Although the Fire Service often responds to cardiac arrest calls and arrives in advance of the Ambulance Service, no improvement in survival has been shown to result from this practice. When a cardiac arrest is witnessed, emergency services can respond more rapidly and the more likely it is that the heart will respond to treatment and the patient survive.
Unwarranted variation in healthcare organisation and practice for long-term conditions

Sue Wells, Rod Jackson

It has been estimated that people with a long-term conditions account for 50% of all appointments in general practice and 70% of the hospital beds. Therefore we should be experts at managing their health needs and providing evidence-based care that only varies according to patient preferences within a shared decision-making context. Yeah right.

In this issue of the *New Zealand Medical Journal*, Connolly and colleagues describe a stocktake of health services provided by district health boards (DHBs) for major long-term conditions in New Zealand, based on self-reports from senior DHB staff. It is unfortunate that the study was DHB-centric given that most chronic care happens in primary care, although the conclusion would probably have been similar, whoever was questioned. As in most countries, they found marked variation in self-reported accounts of evidence-based service provision for multiple components of care for patients with ischaemic heart disease, congestive heart failure, chronic obstructive pulmonary disease and stroke.

In this study, the five largest DHBs generally reported greater provision of standard care, leadership, patient self-management programmes, case management and audit activity at the patient and service level than the smaller DHBs. There were also marked differences in how interviewees rated their own DHBs in terms of community linkages, focus on inequalities, organisation of chronic care management, collaboration, knowledge transfer and delivery system design.

Professor Jack Wennberg who has pioneered research on healthcare variation in USA has observed that the frequent first response to these types of reports is to state that “the data is wrong”. The main findings presented in this publication are simply the presence or absence of key services and strategies as reported by a DHB employee in a managerial or senior clinical position.

The findings do not appear to have been validated from other sources such as primary healthcare organisations (PHO) or Māori primary care providers so they may not be accurate. However, these key informants were those deemed responsible for planning, funding or delivering these services. Furthermore there have been multiple audits of long-term condition care that have identified large evidence-practice gaps in New Zealand.

The second response is usually that “our population is different”. While it is true that some DHB populations will have higher rates of chronic diseases due to sociodemographic differences (such as older age structure or serving more disadvantaged populations), we would not expect this to account for the observed variation in the provision of standard care (such as having protocols/guidelines for CHF management).
Clearly not all variation is bad. As AJ Mulley writes: “If all variation were bad, solutions would be easy. The difficulty is in reducing bad variation, which reflects the limits of professional knowledge and failures in its application, while preserving the good variation that makes care patient centred. When we fail, we provide services to patients who don’t need or wouldn’t choose them while we withhold the same services from people who do or would.”

It is therefore unwarranted variation that is likely to impact on the equity of access to services, the health outcomes of regional populations and the efficient use of resources.

So why the problem with long-term conditions? It is widely understood that these chronic diseases are eminently preventable by addressing shared risk factors, mainly tobacco use, unhealthy diet and physical inactivity. It has been estimated that appropriate evidence-based lifestyle and medical treatment could reduce future CVD events by more than 50% in well-targeted and well-treated adult patients. However, these interventions are dependent on several key factors; accurate identification of high-risk patients; systematic offering of interventions to these patients and; long-term self-management and maintenance.

This requires a system of care that links patients through the continuum of health from initial screening, risk factor advice and monitoring, medical and surgical interventions, rehabilitation until end-of-life care. Health systems have been slow to provide this patient-centred life course approach. We have tended to see health services defined by buildings and location rather than the patient journey and co-ordination of care across these services.

The cost of the lack of co-ordination, lack of attention to the fidelity by which evidence-based processes are undertaken are huge. They result in patient harm, waste, inequity, failure to prevent the preventable and variation in outcomes. A 2004 report from the US reported that “the abyss between what physicians know should be done for patients and what is actually done accounts for more than $9 billion per year in lost productivity and nearly $2 billion per year in hospital costs.” While the magnitude will be different in New Zealand, there will be a large cost (and opportunity cost) daily accruing from the evidence-practice gaps.

A recent Kings Fund report indicated that “the first step in addressing unwarranted variations in healthcare is the systematic and routine collation and publication of data on such variation.” However, it is well known that knowledge of variation does not necessarily lead to action and there is little evidence that publication of comparative information on health services will result in improvements. Without action, the analyses of variation are pointless activities- akin to revving a car in neutral. The question remains how the ABCC study can be used to drive improvement.

Notably in the United States and United Kingdom, improvement has been driven down ‘selection’, ‘change’ and ‘reputation’ pathways. ‘Selection’ refers to patients making choices between providers and thus incentivising commercial entities to improve and so attract more patients. Clearly this doesn’t fit the New Zealand delivery system very well. The ‘change’ pathway relates to health professional
intrinsic motivation to improve their care. Here local audits of care, measured against agreed standards are important practice improvement tools.

The ABCC study reported audit activities in the five long-term conditions and while this varied by condition was notably underutilised for patient self-management programmes. The ‘reputation’ pathway is an extrinsic mechanism whereby dissemination of information on performance drives change through a desire to improve one’s reputation compared to others. The ABCC study does not name DHBs but given the huge and growing burden of long-term conditions in New Zealand—open and transparent accountability in providing standard practice would seem reasonable.

One obvious service gap that needs to be addressed following on from this study is the integration between the primary and secondary care services in New Zealand. Enabling and incentivising those on either side of the primary-secondary care divide, who are charged with the healthcare of enrolled and regional populations, to work more collectively could be a game changer.

Information technology that links across services (e.g. electronic discharge summaries, shared pharmaceutical and laboratory test data, shared decision support data, shared care plans) has a crucial role. The value of the ABCC study will only be seen if it truly stimulates health providers to explore exposed deficiencies at the local level, engage with communities of care, galvanise action to collaboratively improve regional provision of long-term condition services and remeasure to show that changes have indeed resulted in improvements.

Competing interests: None.

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Procedural sedation in the emergency department: good medicine or flirting with danger?

Benjamin van der Griend, Ross Kennedy

The alleviation of pain and suffering through sedation and anaesthesia represents one of the great advances in medicine. Sedation and anaesthesia techniques have evolved and we are seeing increasingly frequent use of these techniques outside the operating theatre. In this issue, two audits are published describing the experiences and potential benefits of procedural sedation in the Emergency Department at Waikato Hospital.1,2

In this context it is useful to define what we mean by sedation and how this differs from anaesthesia. Conscious sedation is a drug-induced depression in consciousness but patients still respond to verbal commands or light tactile stimulation. The margin of safety of this technique is very high because patients maintain their protective airway reflexes.

During deep sedation, patients respond only to painful stimuli and progression to general anaesthesia is common, certainly once any painful stimulus is removed. Determining whether patients are deeply sedated or anaesthetised is difficult to define and in reality sedation and general anaesthesia are part of a continuum. The important thing to emphasise is that deep sedation is very likely to have similar risks to general anaesthesia and requires an equivalent level of care.3

The authors of these audits have defined procedural sedation as “the administration of intravenous, intramuscular, oral, intranasal or rectal hypnotic/sedative agents alone or in combination with analgesics to facilitate performance of potentially noxious procedures whilst in the emergency department”.1 In 99% of adult cases presented, this was achieved by the administration of propofol and in 73% of cases with the addition of fentanyl.1

The mean amount of propofol and fentanyl given to patients are similar to doses required to induce general anaesthesia. Among their adult cohort, 22% required some form of airway intervention. As we don’t know their endpoint for sedation,1,2 it is therefore likely that some patients were in fact anaesthetised rather than sedated and if this is the case, was the same level of care applied compared to general anaesthesia in the operating theatre?

One area of rigorous debate is the issue of fasting prior to procedural sedation. Reports of aspiration during procedural sedation are rare in the literature.4,5 This may well be because of relatively small studies published and reliance of self-reporting of adverse events. However, the truth is that aspiration under general anaesthesia is also infrequent and when it does happen, it seldom results in mortality.6,7

The question is then, have we anaesthetists got it all wrong? Should we not bother fasting patients prior to anaesthesia? Certainly, most of the patients having procedural sedation during these audits were not fasted1,4 and forearm fractures under procedural sedation amongst a paediatric population at Waikato Hospital was associated with a
shorter delay until the reduction of the fracture and a shorter hospital stay. Could and should anaesthetists do away with fasting and also save time and potentially money?

Anaesthesia is very safe and the reason it is very safe are the high standards put into practice. The American Society of Anesthesiologist’s (ASA) have recommended minimum fasting periods prior to elective anaesthesia. Although modern recommendations with regard to clear fluids have been somewhat relaxed with patients now encouraged to drink clear fluids up to 2 hours before surgery, solid foods are still prohibited for 6 hours prior to anaesthesia.

Despite commentary in the literature stating otherwise, there is not enough evidence to suggest that the incidence of aspiration during procedural sedation is any less than during general anaesthesia. A trial to show a difference would require both rigorous methodology and very large numbers. Thus, we cannot assume that the risk of aspiration during procedural sedation (especially deep sedation) is any different to that during general anaesthesia.

What we do know is that emergent cases are at increased risk for aspiration and also those cases whereby gastric emptying is likely to be delayed. For these higher risk cases, it may be prudent to weigh up your options. For example, should the procedure be delayed, does the trachea need to be protected by intubation, what should be the sedation end point (conscious sedation versus deep sedation) and what drugs should be used? Readers should also be reminded that any intravenous anaesthetic agents must only be used by a second medical practitioner trained in their use and must not be administered by the proceduralist.

With adequate training, procedural sedation can be, and is, practiced safely by non-anaesthetists. It is clear that the Emergency Department at Waikato Hospital have instituted some very good systems and amassed a great deal of experience and expertise. However, in the interests of safety, hospitals need to be reminded that standards should be adhered to despite resourcing issues and other pressures (for example from Health Ministry targets).

The Australian and New Zealand College of Anaesthetists, together with other specialist groups including the Australasian College of Emergency Medicine, have published sedation guidelines that emphasise some of these systems that need to be in place.

We need to balance humanitarianism with the resources of the public hospital system but most important is the maxim primum non nocere (first do no harm).

Competing interests: None.

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The ‘Shorter Stays’ target is a whole health system target, not an emergency department target

Peter Jones

In this issue of the *Journal* Professor Ardagh and colleagues describe the process they used to make improvements within their emergency department (ED), in order to address a myriad of issues contributing to what they believed was less than optimal quality of care.¹

Their process was called Project RED (Rejuvenating the Emergency Department), and it is an excellent example of a framework for clinical governance, following the principles of distributed leadership, where clinical leaders are empowered by and work with the chief executive officer, other managers and non-clinical staff to improve quality of care.²

The keys to their successes were the strength of the clinical input into decisions about the provision of resources and use of those resources. As a result of Project RED, the size of their ED doubled and more senior medical and nursing staff were employed in the ED. Problem areas that impeded the quality of care and patient flow were identified and prioritised. Those with the most pressing need to be addressed, due to perceived importance, urgency and the likelihood of being able to fix the problem in a realistic time frame were dealt with first.

All staff within the ED had the opportunity to contribute to the process at some level, and the progress and successes achieved were marketed extensively both within the hospital and in local media, providing momentum to continue the process over time.

One of the major aims of Project RED was to “address the large and complex problem of Emergency Department overcrowding”.¹ There is a clear association with ED overcrowding and adverse outcomes for both inpatients and those discharged directly from the ED.³⁻⁵

The authors provide two quantitative examples of process improvements over the time of the Project RED interventions as markers of quality of care. The first of these, triage 2 compliance, represents the time taken for ED staff to see and treat patients with potentially life threatening or time urgent illness, such as acute myocardial infarction.

This marker of quality of care depends largely on the availability of resources (space and staff) within the ED, and there was an impressive relative improvement (>50%) attributed to the Project RED interventions. Unfortunately no comparative data is presented from EDs that did not utilise Project RED methodologies over the same time period. It is possible that methodologies other than those described may have lead to the same improvement, especially with a similar investment in senior clinical time and resources.

The second was the percentage of patients leaving the ED within 6 hours or less. There was a modest improvement seen over time, in the order of 5-6% (the clinical
importance and statistical significance of which is unclear). This marker of quality of care reflects both efficiencies within the ED (for patients discharged directly from ED) and efficiencies of process within the hospital; most notably the availability of inpatient hospital beds and inpatient resources, and the will of inpatient services to admit acute patients under their care when required.

Delays to admission to hospital due to hospital overcrowding are a major contributor to the adverse events associated with ED overcrowding. Although the Project RED team included “senior in-patient clinical staff”, their contribution to the process is not stated, and none of the large number of interventions described or alluded to in the current report appear to have addressed the issues of “high hospital occupancy rates, discharge practices, authority to admit acute patients, workloads and priorities of specialist registrars” identified by the authors as contributors to ED overcrowding in their hospital.

Project RED predated the current ‘Shorter Stays in Emergency Departments’ health target by two years, and the apparent successes in the Christchurch ED reported here helped drive the adoption of this target by the present government in July 2009, in an attempt to address ED overcrowding and hospital access block nationally. Six hours was chosen as it was recognised that the NHS target of four hours was unachievable and associated with unintended and counterproductive consequences.

Although the ideals behind the Shorter Stays in ED Target are laudable, the title itself is an unfortunate misnomer that may have contributed to ongoing misunderstanding of and lack of buy-in to solving the problem of timely access to hospital admission (Access Block) for acutely unwell patients, by some DHBs and in-patient clinicians.

This misunderstanding is reinforced by the media, who, perhaps unwittingly, label failure to meet the target as the fault of the ED, when the reality is that many patients who languish in the ED waiting for a hospital bed are there because the hospital is working inefficiently not the ED: “… the ED’s inability to meet a Health Ministry target that requires 95 per cent of patients to be treated then discharged or admitted within a six-hour time frame”, “…emergency departments’ combined performance on the target dipped to 91 per cent last month”.

Recent Quarter 4 2010/11 ‘Shorter Stays’ target results were encouraging, however unlikely to be maintained in Quarter 1 2011/12 due to the late arrival of winter this year, with resulting recent high hospital occupancies. In order to further improve the quality of care for acute patients requiring admission to hospital, attention and resources need to be focused on the provision of inpatient care, such as aiming for hospital occupancy ≤85%, addressing the chronic shortage of RMO and SMO workforces, developing new models of care (both nursing and medical), and improving the availability and practice of long term residential care in the community.

As an example of a change management process within a complex healthcare system, Project RED provides a blueprint for success within the ED itself, but less so for the hospital and health system. To address the fundamental whole system problems that manifest as inappropriately long waits for admission to hospital for acute patients, there needs to be engagement of inpatient and community care providers at all levels. The ED acts as a window on the function of the wider health system and ED overcrowding is not just an ED problem.
For the sickest acute patients who are most at risk of adverse outcomes from inappropriately long ED stays, the issues leading to long stays in ED often lie beyond the ED, and therefore cannot be solved by focusing solely on the ED.\textsuperscript{6,12} Re-naming the current target as the ‘Acute Care Target’ would be a simple but important step towards turning attention towards identifying and addressing these issues.

\textbf{Conflict of interest statement:} Dr Jones is a Co-Primary investigator on the Shorter Stays in Emergency Departments National Research Project (MEC 10/06/060, HRC 10-588, \url{http://www.akhdem.co.nz/ssed-research/}) which is a nationwide research project exploring the effects of implementation of the target on clinically relevant indicators of quality of care.

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National variability in provision of health services for major long-term conditions in New Zealand (a report from the ABCC NZ study)

Martin J Connolly, Timothy Kenealy, P Alan Barber, Peter Carswell, Janet Clinton, Lorna Dyall, Gerard Devlin, Robert N Doughty, Ngaire Kerse, John Kolbe, Ross Lawrenson, Allan Moffitt, Nicolette Sheridan

Abstract

Introduction Chronic illness is the leading cause of morbidity, mortality, and inequitable health outcomes in New Zealand. The ABCCNZ Stocktake aimed to identify extent of long-term conditions management evidence-based practices in stroke, cardiovascular disease, chronic obstructive pulmonary disease and congestive heart failure in New Zealand’s District Health Boards (DHBs).

Methods Eleven ‘dimensions’ of care for long-term conditions, identified by literature review and confirmed at workshops with long-term conditions professionals, formed the basis of the Stocktake of all 21 DHBs. It comprised two questionnaires: a generic component capturing perceptions of practice; and a disease-specific component assessing service provision.

Results Fifteen DHBs completed all or parts of the questionnaires. Data accrual was completed in July 2008. Although most DHBs had developed long-term conditions management strategies to a moderate degree, there was considerable variability of practice between DHBs. DHBs thought their PHOs had developed strategies in some areas to a low to moderate level, though cardiovascular disease provision rated more highly. Regarding disease-specific services, larger DHBs had greater long-term conditions management provision not only of tertiary services, but of standard care, leadership, self-management, case-management, and audit.

Conclusions There is considerable variability in perceptions of long-term conditions management service provision across DHBs. In many instances variability in actual disease-specific service provision appears to relate to DHB size.

Chronic illness (particularly stroke, cardiovascular disease [CVD], chronic obstructive pulmonary disease [COPD] and congestive heart failure [CHF]) is the leading cause of morbidity and mortality, and inequitable health outcomes in New Zealand, causing over 80% of deaths, and a large healthcare burden.

Ten percent of New Zealand adults are diagnosed with cardiac disease and more than 5% with COPD, with perhaps as many again undiagnosed. Prevalence rises exponentially with age, and as the percentage of New Zealanders aged 75+ will quadruple by 2025, this burden will continue to increase.

Māori, Pacific peoples and those with lower socioeconomic status (SES) experience much higher levels of chronic disease, earlier in life, with resultant higher morbidity and lower life expectancy.
However, current service orientation, in both primary and secondary care is still weighted towards acute care despite a number of initiatives in recent years. This is not suitable for current and future population needs. Management requires a shift from reactive, (often) secondary care to longer-term managed care, in a social, cultural and economic context, and emphases on prevention, early intervention, self-management and integration within primary health care, consistent with the principles expressed by the National Health Committee and with the Primary Healthcare Strategy, the Health of Older People Strategy, and the Principles and Action Areas of the Australian National Chronic Disease Strategy.

Internationally and within New Zealand, integrating evidence into care models has reduced morbidity, improved quality of life and yielded financial savings. Several models recognise the importance of systems approaches to healthcare services. The Chronic Care Model (CCM) identifies the elements of healthcare systems encouraging high-quality chronic care and can be applied to many chronic illnesses, settings and populations, and results in healthier patients, satisfied providers and cost savings. Although other models have been developed to expand on components of CCM, or to emphasise, for example, a population health or community perspective, and no subsequent model has removed elements from the original CCM. The original CCM has been the most widely used in New Zealand.

Despite growing evidence on effective long-term conditions (LTC) management and frameworks for conceptualising care, we need to more fully use evidence and close "knowledge-action gaps"—essential to two core functions of New Zealand’s District Health Boards (DHBs): improving health and reducing health inequalities. Despite evidence and cost-effectiveness, patients do not always receive evidenced-based care.

Uptake of recommendations on processes of care is lower than for pharmaceutical interventions. Reasons for this are complex but may include: lack of evidence in digestible formats to DHBs/clinicians; poor access to New Zealand-based evidence of success; lack of clarity by DHBs about largest potential gains and how to reach them; DHBs/clinicians lack ‘ownership’ of evidence/guidelines, the most important determinant of successful implementation. Several New Zealand studies have highlighted inadequacies in application of disease-specific guidelines in the management of chronic conditions.

The ABCCNZ study addressed these issues for four index chronic conditions (stroke, CVD, COPD and CHF) in several ways: a literature review; a ‘Stocktake’ of CCM provision (for our index conditions) in New Zealand’s DHBs; and the development of a workbook for (and with) DHBs to facilitate implementation of new initiatives. This paper summarises the results of our Stocktake, the purpose of which was to identify the extent to which CCM evidence-based practices are applied across New Zealand’s DHBs.

The literature review was tasked with identifying key, evidence-based practices, whose presence therefore would justify a claim for an evidence based service, and whose absence would indicate a likely shortfall from ideal service provision. Examples include stroke units and pulmonary rehabilitation. We acknowledge that the mere presence of such elements does not guarantee that the service is optimally provided, nor that it reaches the appropriate population.
Dimensions were those considered important to address in a New Zealand context. None of the original Wagner components were dropped, but the judgement of the team and workshops was that some warranted their own dimensions to ensure they were specifically attended to. A typical example would be evidence-based efficiency.

It is important to recognise that the present paper is not a report of the totality of the ABCCNZ project, and represents a synthesis from this which tells a story on national variability of provision.

**Method**

The study received Ethical Committee approval (MEC/07/21 EXP).

The CCM ‘dimensions’ below, identified in the first component of the ABCCNZ study, the literature review, 38 formed the basis of the Stocktake. We interviewed approximately 30 New Zealand-based experts in LTC management—our ‘movers and shakers group,’ 42 and, as a further component of the study not reported here, held five Standard Setting workshops involving LTC management professionals across New Zealand (to be reported later). These validated our choice of dimensions. The Stocktake, which is the emphasis of the current paper, comprised two questionnaires: a generic component capturing overall practice; and a disease-specific component, sent only to respondents in the initial survey who confirmed existence of programmes in each disease area.

The dimensions are:

- Conceptual understanding of LTC management
- Appropriate levels of collaboration
- Engagement of leadership
- Development of sustainable community links
- Focus on health inequalities
- Decision support systems in place
- Delivery design system
- Knowledge transfer – organised/appropriate
- Attention to efficiency/cost/output
- Attention to effectiveness/outcomes
- Adherence to clinical guidelines

The Stocktake development team comprised a senior clinician from each subject area, and representation from epidemiology, statistics, nursing, primary health care, Māori health, Pacific health, IT and expertise in participatory action research methodology. The Ministry of Health (MOH) and District Health Boards New Zealand (DHBNZ) provided information from DHBs’ District Annual Plans (2007/08). The tool was piloted (July 2007) in two DHBs (Counties Manukau and Nelson Marlborough), producing refinement of the questionnaires subsequently sent in two phases.

In the first phase a generic questionnaire and a ‘foundation’ disease-specific questionnaire phase asking basic information on existence of evidence-based services. The second phase was a tailored ‘comprehensive’ questionnaire which asked detailed questions about disease-specific service provision by DHBs on the basis of their answers (from the foundation questionnaire) to their provision of such services.

The study was funded and supported by District Health Boards New Zealand and the Chief Executives of all DHBs gave their backing to this project. As part of this process the Chief Executive nominated an individual (most commonly the Chief of Funding and Planning for that DHB) to be the contact person for our study team. Thus the questionnaire was sent initially to that contact person who was encouraged to consult as widely as possible. Questionnaires were sent to all 21 DHBs and were completed by DHB personnel: senior clinicians; service heads (clinical/managerial); Māori general managers/ liaison workers; Pacific and Asian general managers; senior funders and planners.

The focus of enquiry was DHB perceptions rather than those of PHOs, consumers or other parties. Although questionnaires were sent to all PHOs and Māori providers, due to constraints on the project’s
resources there was relatively little interaction with these sectors (from whom the response rate was low—data not reported here).

DHBs were asked to comment on our LTC management dimensions, each collectively represented by a set of variables and statements. DHBs were asked to rate each statement by Likert scale (0–11), higher values indicating that the statement was more fully implemented and thus that the DHB gave the statement greater support. A rating of zero indicated that the action in the statement was not implemented—i.e. nil support for the statement. A similar questionnaire asked DHBs to describe level of LTC management service within their primary health care providers.

Subsections related to provision for CVD, CHF, COPD and stroke, and general primary health care provision. The dimension of ‘collaboration’ is necessarily defined at a high level, as a prerequisite for the existence of the other dimensions. The generic questionnaires provided verbal vignettes of what specific levels of collaboration might look like and ask the respondent to match their service to the closest vignette.

The disease-specific stocktake asked DHBs to comment on details of service provision in our index conditions. DHBs were categorised as small, medium or large, based on their population-based funding.

Within the generic stocktake we also asked several questions around the area of health inequalities. These will be reported in a separate paper.

Descriptive statistics was performed, and frequencies, percentages and means/medians/modes calculated using SPSS v15.0 software. DHBs were allocated an anonymous alphabetical code. National results were communicated to each DHB for benchmarking, with code identification for that DHB only.

**Results**

Fifteen of 21 DHBs completed all or parts of the questionnaires. Many responses were incomplete (Table 1), or delayed. Data accrual was completed in July 2008.

<table>
<thead>
<tr>
<th>DHB generic</th>
<th>DHB perceptions of primary care</th>
<th>Disease-specific questionnaires about DHB services</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTC management inventory</td>
<td>Health Inequalities</td>
<td>General</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>12</td>
</tr>
</tbody>
</table>

**Generic stocktake – CCM implementation within DHBs**—Figures 1 and 2 summarise DHBs’ perceptions. Important findings are:

- DHBs rating themselves poorly/highly tended to consistently do so.
- Median scores indicated that DHBs collectively had developed strategies around chronic conditions to a moderate level.
- There was considerable variability between DHBs in range of practice.
- Dimensions relating to change management (knowledge transfer, delivery system design), were rated considerably lower than others.
- Strategies placing patients at the centre of the system (e.g. self-management) were underdeveloped relative to those placing health providers at the centre (e.g. leadership, collaboration, organisation).

Figure 1. Summary of DHBs’ responses in relation to their perception of LTC management for leadership, community linkages, inequalities and organisation of health care delivery

<table>
<thead>
<tr>
<th>Leadership</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational leadership for chronic care</td>
<td>M</td>
<td>M</td>
<td>MS</td>
<td>L</td>
</tr>
<tr>
<td>Programme leadership for chronic care</td>
<td>L</td>
<td>L</td>
<td>MS</td>
<td>M</td>
</tr>
<tr>
<td>Clinical leadership for chronic care</td>
<td>M</td>
<td>M</td>
<td>MS</td>
<td>M</td>
</tr>
<tr>
<td>Senior leadership for chronic care</td>
<td>L</td>
<td>L</td>
<td>MS</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community linkages</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linking patients to outside resources</td>
<td>LL</td>
<td>M</td>
<td>L</td>
<td>MM</td>
</tr>
<tr>
<td>Partnership with community organisations</td>
<td>L</td>
<td>L</td>
<td>MM</td>
<td>L</td>
</tr>
<tr>
<td>Links with complementary alternative medicine</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Degree of Maori perspective in organisations</td>
<td>M</td>
<td>S</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>Partnerships with consumers</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inequalities</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A strategic focus to reduce inequalities</td>
<td>L</td>
<td>S</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>A commitment to Maori and developing cultural safety</td>
<td>L</td>
<td>S</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>A commitment to cultural safety for all</td>
<td>S</td>
<td>M</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td>Equitable access to health care</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>S</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organisation</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
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</thead>
<tbody>
<tr>
<td>Organisational goals for chronic care</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Improvement strategies for chronic care management</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Strategies for securing adequate financial resources</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Strategies for securing appropriate workforce</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Team based approach to care</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Incentives for chronic care management</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Regulations for chronic care management</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

KEY: ★ = median score  = range S= Small DHB  M= Medium DHB  L= Large DHB
Figure 2. Summary of DHBs’ responses in relation to their perception of LTC management for collaboration, knowledge transfer, self-management, decision support and delivery system design

<table>
<thead>
<tr>
<th>Collaboration</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategies for meeting with CCM related organisations</td>
<td>M, L</td>
<td>L, M</td>
<td>M, LL</td>
<td>SM, S, M, L</td>
</tr>
<tr>
<td>Strategies for organisation wide collaborative CCM decision making</td>
<td>M, L</td>
<td>L, M</td>
<td>MM, M</td>
<td>L, M</td>
</tr>
<tr>
<td>Cross organisational CCM network</td>
<td>L, M</td>
<td>M, LL</td>
<td>M, MM</td>
<td>M, L</td>
</tr>
<tr>
<td>Belief that those working in CCM program will do what they say</td>
<td>L, M</td>
<td>M, LL</td>
<td>S, M, M</td>
<td>M, L</td>
</tr>
<tr>
<td>Levels of perceived honesty between individuals in the CCM programme</td>
<td>M, LL</td>
<td>M, MM</td>
<td>SM, M</td>
<td>M, L</td>
</tr>
<tr>
<td>Levels of perceived trust between individuals in the CCM programme</td>
<td>L, M</td>
<td>L, LL</td>
<td>MM, ML</td>
<td>M, M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge Transfer</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical IT capability</td>
<td>M, MM</td>
<td>L, MM</td>
<td>S, S</td>
<td>M, M</td>
</tr>
<tr>
<td>Strategies for creating, sharing &amp; transferring CCM knowledge</td>
<td>M, L</td>
<td>L, LL</td>
<td>SS, M</td>
<td>M, L</td>
</tr>
<tr>
<td>Systems for CCM programme performance feedback</td>
<td>M, L</td>
<td>L, M</td>
<td>MM, S</td>
<td>M, L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self Management</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategies for assessing and documenting self management needs</td>
<td>M, L</td>
<td>M, L</td>
<td>S, M</td>
<td>M, L</td>
</tr>
<tr>
<td>Resources to support self management</td>
<td>L, LM</td>
<td>L, MM</td>
<td>MM, MM</td>
<td>M, M</td>
</tr>
<tr>
<td>Systems for addressing concerns of patients and families</td>
<td>L, M</td>
<td>M, LL</td>
<td>MM, M</td>
<td>M, L</td>
</tr>
<tr>
<td>Strategies for behaviour change intervention and peer support</td>
<td>L, M</td>
<td>M, LL</td>
<td>MM, MM</td>
<td>L, L, SM</td>
</tr>
<tr>
<td>Overall level of patient engagement with the CCM programme</td>
<td>M, LL</td>
<td>AML</td>
<td>SM, M</td>
<td>M, L</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Decision Support</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of evidence based guidelines</td>
<td>SM, L</td>
<td>SM, MM</td>
<td>M, M, M</td>
<td>L</td>
</tr>
<tr>
<td>Strategies to involve medical specialists in improving primary care</td>
<td>L, SM</td>
<td>M, LL</td>
<td>M, MM</td>
<td>L</td>
</tr>
<tr>
<td>Strategies for provider education in chronic care</td>
<td>L, LL</td>
<td>LL, MM</td>
<td>MM, M</td>
<td>L</td>
</tr>
<tr>
<td>Systems for informing patients about guidelines</td>
<td>SL, M</td>
<td>SM, MM</td>
<td>MMM</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Delivery System Design</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategies for functioning as a team</td>
<td>L, LL</td>
<td>SM, M</td>
<td>MM, M</td>
<td>L</td>
</tr>
<tr>
<td>Appointment system to facilitate customisation</td>
<td>L, SM</td>
<td>LL, L</td>
<td>SM</td>
<td>MM, L</td>
</tr>
<tr>
<td>Strategies to assure successful follow-up</td>
<td>L, SL</td>
<td>L, LL</td>
<td>M, L</td>
<td>M</td>
</tr>
<tr>
<td>Strategies to ensure continuity of care between providers</td>
<td>MM, M</td>
<td>MM, M</td>
<td>SL, L</td>
<td>S, L</td>
</tr>
</tbody>
</table>

KEY: ★ = median score  ●●● = range  S= Small DHB  M= Medium DHB  L= Large DHB
Generic stocktake – DHB perceptions of primary health care—Twelve DHBs responded (Figures 3–5).

Figure 3. Summary of DHBs’ responses in relation to their perception of primary health care provision of LTC management services for CVD and CHF

<table>
<thead>
<tr>
<th>CHF</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmes to care for Patient with CHF</td>
<td>L M</td>
<td>L M</td>
<td>L</td>
<td>S M</td>
</tr>
<tr>
<td>Education and consultation for patients and family</td>
<td>M L</td>
<td>M M</td>
<td>L</td>
<td>S L</td>
</tr>
<tr>
<td>Outreach programme</td>
<td>M L</td>
<td>S M</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>Shared records for CHF</td>
<td>M L</td>
<td>L M</td>
<td>L</td>
<td>S M</td>
</tr>
<tr>
<td>Ethnic/culture specific programmes for CHF</td>
<td>M L M</td>
<td>L L L</td>
<td>L</td>
<td>S M</td>
</tr>
<tr>
<td>Nurse-led clinics for CHF</td>
<td>L M</td>
<td>L M</td>
<td>L</td>
<td>S M</td>
</tr>
<tr>
<td>Case/Care management for CHF</td>
<td>M L</td>
<td>M L</td>
<td>L</td>
<td>S M</td>
</tr>
<tr>
<td>Community health worker for CHF</td>
<td>M M M</td>
<td>L</td>
<td>S L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CVD</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute risk assessment for CVD</td>
<td>M L</td>
<td>M L</td>
<td>M L</td>
<td>S M</td>
</tr>
<tr>
<td>Programmes to care for Patient with CVD</td>
<td>L M</td>
<td>M L</td>
<td>L</td>
<td>S L</td>
</tr>
<tr>
<td>Education and consultation for patients and family</td>
<td>M M</td>
<td>M M</td>
<td>L</td>
<td>S M</td>
</tr>
<tr>
<td>Outreach programme</td>
<td>M L</td>
<td>M L</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Shared records for CVD</td>
<td>L M</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Ethnic/culture specific programmes for CVD</td>
<td>L</td>
<td>S M</td>
<td>M</td>
<td>S M</td>
</tr>
<tr>
<td>Nurse-led clinics for CVD</td>
<td>L M</td>
<td>M</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td>Case/Care management for CVD</td>
<td>L M</td>
<td>M</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td>Community health worker for CVD</td>
<td>L M</td>
<td>L L</td>
<td>L</td>
<td>S L</td>
</tr>
</tbody>
</table>

KEY: ★ = median score ● = range S= Small DHB M= Medium DHB L= Large DHB
Figure 4. Summary of DHBs’ responses in relation to their perception of primary health care provision of LTC management services for COPD and stroke

<table>
<thead>
<tr>
<th>COPD</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prog. for Patient with COPD</td>
<td>MM</td>
<td>L</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Education consultation for patients and family</td>
<td>MM</td>
<td>LS</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>Outreach programme</td>
<td>S</td>
<td>ML</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Shared records for COPD</td>
<td>MM</td>
<td>LM</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>Ethnic/culture specific programmes for COPD</td>
<td>M</td>
<td>M</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td>Nurse-led clinics for COPD</td>
<td>MM</td>
<td>LL</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>Case/Care management for COPD</td>
<td>L</td>
<td>M</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td>Community health worker for COPD</td>
<td>MM</td>
<td>LL</td>
<td>L</td>
<td>S</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stroke</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prog. for Patient with Stroke</td>
<td>MM</td>
<td>L</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Education consultation for patients and family</td>
<td>ML</td>
<td>MS</td>
<td>ML</td>
<td>L</td>
</tr>
<tr>
<td>Outreach programme</td>
<td>M</td>
<td>MM</td>
<td>S</td>
<td>L</td>
</tr>
<tr>
<td>Shared records for Stroke</td>
<td>M</td>
<td>ML</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Ethnic/culture specific programmes for Stroke</td>
<td>L</td>
<td>LL</td>
<td>S</td>
<td>M</td>
</tr>
<tr>
<td>Nurse-led clinics for Stroke</td>
<td>ML</td>
<td>MM</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>Case/Care management for Stroke</td>
<td>MM</td>
<td>LL</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>Community health worker for Stroke</td>
<td>LL</td>
<td>MM</td>
<td>S</td>
<td>L</td>
</tr>
</tbody>
</table>

KEY: ★ = median score  ● = range  S= Small DHB  M= Medium DHB  L= Large DHB

The most important findings regarding index conditions (Figures 3 and 4) were:

- DHBs rating themselves poorly/highly tended to consistently do so.
- DHBs collectively thought that their PHOs had developed strategies in some areas to a low or moderate level only.
• Provision for CVD was rated better than that for other conditions.
• Outreach, community workers and cultural initiatives seemed less well developed.

The most important findings regarding DHBs’ perception of primary health care LTC management provision (Figure 5) were:

• There was considerable variability of perceived provision in all variables, largely dictated, however, by a few outliers perceiving poor or unavailable provision.
• Median scores suggest that DHBs collectively had developed strategies to a moderate/high level.

Figure 5. Summary of DHBs’ responses in relation to their perception of general LTC management service provision in primary health care

<table>
<thead>
<tr>
<th>General Primary care provision</th>
<th>NIL (0-2)</th>
<th>BASIC (3-5)</th>
<th>GOOD (6-8)</th>
<th>FULL (9-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processes to reduce “avoidable hospital” admissions</td>
<td>M M M L</td>
<td>S M L M</td>
<td>M L L S</td>
<td>S L L M</td>
</tr>
<tr>
<td>Evidence Based Practice</td>
<td>M S M M L</td>
<td>L M L M</td>
<td>L L S M</td>
<td>L S M M</td>
</tr>
<tr>
<td>Equity of Health Inputs</td>
<td>M M L M L</td>
<td>M M M L</td>
<td>L L S L M</td>
<td>L S L M</td>
</tr>
<tr>
<td>Continuing education for doctors, nurses and other primary care providers</td>
<td>M M L M L</td>
<td>M L L S L</td>
<td>L L S L M</td>
<td>L S L M</td>
</tr>
<tr>
<td>Referral processes</td>
<td>L M M S M M</td>
<td>S M M M L</td>
<td>L L L M</td>
<td>L S L M</td>
</tr>
</tbody>
</table>

KEY: ★ = median score  ●● = range  S= Small DHB  M= Medium DHB  L= Large DHB

Disease-specific stocktake—Between 14 and 15 DHBs (depending on condition) completed all/part of each questionnaire. Tables 2-5 summarise provision.
### Table 2. Summary of evidence-based CVD service provision by DHB size

<table>
<thead>
<tr>
<th>Variables</th>
<th>Small DHBs positive response N=3</th>
<th>Medium DHBs positive response N=6</th>
<th>Large DHBs positive response N=6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Leadership in Cardiology</td>
<td>0/3</td>
<td>4/5</td>
<td>6/6</td>
</tr>
<tr>
<td>Protocols/guidelines for ACS management</td>
<td>1/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>2/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Coronary Angiography</td>
<td>0/3</td>
<td>2/5</td>
<td>4/5</td>
</tr>
<tr>
<td>Percutaneous coronary intervention</td>
<td>0/3</td>
<td>0/6</td>
<td>4/5</td>
</tr>
<tr>
<td>Coronary Artery bypass grafting</td>
<td>0/3</td>
<td>0/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Hospital or community-based cardiac rehab</td>
<td>3/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Post-rehab exercise programme</td>
<td>0/3</td>
<td>2/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Ongoing (post-rehab) support</td>
<td>3/3</td>
<td>4/6</td>
<td>4/5</td>
</tr>
<tr>
<td>Cardiac rehab audit or quality improvement programme</td>
<td>3/3</td>
<td>3/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Smoking cessation service</td>
<td>2/3</td>
<td>6/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Smoking cessation audit or quality improvement programme</td>
<td>0/3</td>
<td>0/6</td>
<td>0/0</td>
</tr>
<tr>
<td>Dietician service for cardiac patients</td>
<td>3/3</td>
<td>6/6</td>
<td>4/5</td>
</tr>
<tr>
<td>Dietician service audit or quality improvement programme</td>
<td>0/3</td>
<td>0/6</td>
<td>2/6</td>
</tr>
<tr>
<td>Cardiac patient self-management and education programme</td>
<td>2/3</td>
<td>4/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Self management programme audit or quality improvement programme</td>
<td>0/3</td>
<td>3/6</td>
<td>0/0</td>
</tr>
<tr>
<td>CVD Case management</td>
<td>1/3</td>
<td>3/5</td>
<td>2/5</td>
</tr>
<tr>
<td>Case management audit or quality improvement programme</td>
<td>0/3</td>
<td>3/6</td>
<td>6/6</td>
</tr>
</tbody>
</table>

**Note:** Results are positive responses/total responses.

### Table 3. Responses confirming presence of specific evidence-based components of CHF service provision by DHB size

<table>
<thead>
<tr>
<th>Variables</th>
<th>Small DHBs positive response N=3</th>
<th>Medium DHBs positive response N=5</th>
<th>Large DHBs positive response N=6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit/Quality Improvement for Patients admitted with CHF</td>
<td>0/3</td>
<td>3/5</td>
<td>3/6</td>
</tr>
<tr>
<td>Leadership in CHF</td>
<td>0/3</td>
<td>2/5</td>
<td>2/6</td>
</tr>
<tr>
<td>Protocols/guidelines for CHF management</td>
<td>1/2</td>
<td>3/5</td>
<td>3/6</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>2/3</td>
<td>5/5</td>
<td>6/6</td>
</tr>
<tr>
<td>Hospital at home teams for acute CHF exacerbations</td>
<td>1/3</td>
<td>2/5</td>
<td>0/6</td>
</tr>
<tr>
<td>Discharge planning for CHF patients</td>
<td>1/3</td>
<td>2/5</td>
<td>5/6</td>
</tr>
<tr>
<td>Audit/quality improvement programme for discharge planning</td>
<td>0/0</td>
<td>0/0</td>
<td>1/5</td>
</tr>
<tr>
<td>Outpatient-based CHF management service</td>
<td>1/3</td>
<td>5/5</td>
<td>6/6</td>
</tr>
<tr>
<td>Audit/quality improvement programme for outpatient CHF service</td>
<td>0/0</td>
<td>0/5</td>
<td>2/5</td>
</tr>
<tr>
<td>CHF self-management education programme</td>
<td>1/2</td>
<td>3/5</td>
<td>5/6</td>
</tr>
<tr>
<td>Audit/quality improvement programme for CHF self management</td>
<td>0/0</td>
<td>0/5</td>
<td>1/4</td>
</tr>
<tr>
<td>CHF Case management</td>
<td>1/2</td>
<td>4/5</td>
<td>3/6</td>
</tr>
<tr>
<td>Audit/quality improvement programme for CHF case management</td>
<td>0/0</td>
<td>0/0</td>
<td>2/2</td>
</tr>
<tr>
<td>Palliative care for CHF patients</td>
<td>1/2</td>
<td>5/5</td>
<td>5/6</td>
</tr>
</tbody>
</table>

**Note:** Results are positive responses/total responses.
Table 4. Summary of evidence-based COPD service provision by DHB size.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Small DHBs positive response N=3</th>
<th>Medium DHBs positive response N=6</th>
<th>Large DHBs positive response N=6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit/ Quality Improvement for COPD admissions</td>
<td>0/3</td>
<td>2/6</td>
<td>3/6</td>
</tr>
<tr>
<td>Overall Leadership in COPD</td>
<td>1/3</td>
<td>3/6</td>
<td>4/6</td>
</tr>
<tr>
<td>Protocols/guidelines for COPD management</td>
<td>1/3</td>
<td>5/6</td>
<td>3/6</td>
</tr>
<tr>
<td>Spirometry</td>
<td>3/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Spirometry audit/quality improvement programme</td>
<td>1/2</td>
<td>2/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Pulmonary Rehabilitation (PR)</td>
<td>3/3</td>
<td>5/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Ongoing home-based exercise programme</td>
<td>0/3</td>
<td>2/6</td>
<td>3/5</td>
</tr>
<tr>
<td>Ongoing (post-rehab) support</td>
<td>3/3</td>
<td>6/6</td>
<td>2/5</td>
</tr>
<tr>
<td>Other rehab community-based service</td>
<td>0/3</td>
<td>6/6</td>
<td>2/5</td>
</tr>
<tr>
<td>PR audit or quality Improvement Programme</td>
<td>1/2</td>
<td>4/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Long-term oxygen therapy (LTOT) Service</td>
<td>3/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Service lead for LTOT (large ‘nil response’ rate)</td>
<td>1/2</td>
<td>3/4</td>
<td>3/6</td>
</tr>
<tr>
<td>Written guidelines for LTOT</td>
<td>3/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>LTOT Audit / quality improvement programme (large ‘nil response’ rate)</td>
<td>1/2</td>
<td>0/6</td>
<td>3/4</td>
</tr>
<tr>
<td>Non-invasive ventilation (NIV) for stable COPD (large ‘nil response’ rate)</td>
<td>0/3</td>
<td>0/6</td>
<td>3/5</td>
</tr>
<tr>
<td>NIV for COPD exacerbation (NB. large ‘nil response’ rate)</td>
<td>1/2</td>
<td>3/4</td>
<td>4/5</td>
</tr>
<tr>
<td>Hospital at home teams for COPD exacerbation</td>
<td>0/3</td>
<td>1/6</td>
<td>0/6</td>
</tr>
<tr>
<td>Smoking Cessation</td>
<td>3/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
<tr>
<td>Audit or quality Improvement Programme for smoking cessation (NB. large ‘nil response’ rate)</td>
<td>1/2</td>
<td>0/6</td>
<td>0/6</td>
</tr>
<tr>
<td>COPD Self management / education programme</td>
<td>2/3</td>
<td>4/6</td>
<td>3/6</td>
</tr>
<tr>
<td>Audit / quality improvement programme for COPD self management (poor response rate)</td>
<td>0/3</td>
<td>0/6</td>
<td>1/1</td>
</tr>
<tr>
<td>COPD Case management</td>
<td>1/3</td>
<td>4/6</td>
<td>3/6</td>
</tr>
<tr>
<td>Audit / quality improvement programme for COPD case management (NB. large ‘nil response’ rate)</td>
<td>0/3</td>
<td>6/6</td>
<td>6/6</td>
</tr>
</tbody>
</table>

Note: Results are positive responses / total responses.

Table 5. Summary of evidence-based stroke service provision by DHB size.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Small DHBs positive response N=3</th>
<th>Medium DHBs positive response N=6</th>
<th>Large DHBs positive response N=5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit Process/Quality Improvement for acute stroke</td>
<td>1/3</td>
<td>4/6</td>
<td>4/5</td>
</tr>
<tr>
<td>Overall Leadership in Stroke</td>
<td>2/3</td>
<td>6/6</td>
<td>4/5</td>
</tr>
<tr>
<td>TIA Clinic</td>
<td>0/3</td>
<td>4/6</td>
<td>3/5</td>
</tr>
<tr>
<td>IV thrombolysis for stroke</td>
<td>0/3</td>
<td>3/6</td>
<td>5/5</td>
</tr>
<tr>
<td>Acute inpatient (IP) Stroke Unit</td>
<td>0/3</td>
<td>3/6</td>
<td>3/5</td>
</tr>
<tr>
<td>IP Stroke rehab facility for patients &lt;65yrs</td>
<td>1/3</td>
<td>0/6</td>
<td>3/4</td>
</tr>
<tr>
<td>IP Stroke rehab facility for patients ≥65yrs</td>
<td>0/3</td>
<td>1/6</td>
<td>3/4</td>
</tr>
<tr>
<td>Stroke-specific MDT for rehab patients</td>
<td>1/3</td>
<td>3/6</td>
<td>3/4</td>
</tr>
<tr>
<td>Stroke-specific early discharge programme</td>
<td>1/3</td>
<td>1/6</td>
<td>2/5</td>
</tr>
<tr>
<td>Day Hospital rehab</td>
<td>1/2</td>
<td>1/6</td>
<td>2/5</td>
</tr>
<tr>
<td>Outpatient (clinic) rehab</td>
<td>1/3</td>
<td>3/6</td>
<td>4/5</td>
</tr>
<tr>
<td>Community or home-based rehab</td>
<td>2/3</td>
<td>4/6</td>
<td>5/5</td>
</tr>
<tr>
<td>Routine audit: patient level</td>
<td>2/3</td>
<td>1/6</td>
<td>5/5</td>
</tr>
<tr>
<td>Routine audit: service level</td>
<td>1/3</td>
<td>1/6</td>
<td>5/5</td>
</tr>
<tr>
<td>Use of guidelines</td>
<td>2/3</td>
<td>5/6</td>
<td>5/5</td>
</tr>
<tr>
<td>Routine follow up of all patients post discharge</td>
<td>2/3</td>
<td>2/6</td>
<td>2/5</td>
</tr>
</tbody>
</table>

Note: Results are positive responses / total responses.
Discussion

The purpose of this paper was to describe application of evidence-based LTC management practice in New Zealand. Our most striking finding is the wide variability in perception of provision, processes etc between DHBs.

Given our concerns (below), over the variability in DHB awareness of primary care provision, we must question whether the apparent regional inequalities reflect reality. In many cases, even if perceptions of provision underestimated actuality by a factor of three, variability would remain marked. Of greater concern, in many instances variability in actual disease-specific provision relates to DHB size, larger DHBs reporting greater provision not only of tertiary services, but of standard care, leadership, self-management, case-management, and audit. Regional variability in health provision is not unique to New Zealand.43

Decentralising decision making may mean services are more locally relevant, uniformity less desirable,44,45 and some variability unavoidable.46-48 However, the degree of variation we report is cause for concern. New Zealand is unusual in the degree of structural change experienced in the last 20 years49 and settling of a population-based health strategy50 into 20 DHBs of varying size and structure51 may have compromised uniform provision of comprehensive services.

The perception of only limited LTC management development was particularly evident in delivery system design, self-management support, knowledge transfer and aspects of decision support. Two of these (knowledge transfer; system design), relate particularly to change management, suggesting a difficulty accepting need for change; as strategies focussing on patients as the centre of the system (decision support; system design) were underdeveloped. That DHBs perceive most of their systems for promoting self-management as being at basic level is of concern as this is fundamental to LTC management.42

Decision support and knowledge transfer relate to IT provision, an area also highlighted as needing improvements in other aspects of our project.42 The inability of many DHBs to provide data in other stocktake areas, and lack of processes to improve patient access to evidenced-based programmes may also reflect IT inadequacies. Other areas of change have been reported positively by DHB management,52,53 and it is unclear whether the lower levels of engagement suggested here are specific to LTC management or more widespread.

Provision of evidence-based guidelines was reported as good—but with little support by provider education/reminders. The low scores for aspects of delivery system design (e.g. appointment system; follow-up), and very low scores for knowledge transfer (IT-dependent) were noted, despite a relatively minor investment needed to produce responsive, patient-integrated systems, vital for patient fidelity to programmes.

The lowest score in the leadership dimension was for championship, suggesting New Zealand faces challenges in facilitating clinical leaders to become champions. This aligns with the opinions of our ‘movers and shakers’.42 A minority of physicians have
had specific training in clinical leadership—a deficiency currently being addressed by the Professional Qualities Curriculum and trainee workshops of the RACP.

‘Community linkage’ dimension scores were reassuring (particularly in small DHBs). In the ‘collaboration’ dimension it was gratifying that trust between individuals was a perceived strength. In ‘organisation of the health care delivery system’, scores were moderate. However ‘moderate’ ratings were accompanied by verbatim comments: ‘discussions dominated by lead clinicians’; ‘no encouragement for self-management’; ‘need to fight to retain resources’ - which do not suggest sustainability. Workforce issues are of major relevance for the New Zealand health sector.

This study had limited ability to represent activities in primary health care, due to a low response from that sector. DHBs reported low levels of provision by and/or within primary care of LTC management service. Best provision seems to be in CVD. However, even here perception is of very limited provision of patient education, community workers, and nurse-led clinics. DHBs believe that primary health care is performing better in risk assessment and in LTC management programs for CVD, record sharing, and single-disease case management.

Provision for LTC management for CHF and COPD are believed to be poor. Though DHBs acknowledge LTC management programs exist in primary care, those completing the surveys may not have comprehensive knowledge of primary care as the Primary Health Care Strategy has led to strengthening and relative independence of PHO development. The ratings provided for many aspects were reported as low, and case management was regarded as having single-disease foci, rather than an integrated approach cognisant of co-morbidity and patient centeredness. It is, however difficult to estimate true level of LTC management provision in primary care.

Ratings for provision of LTC management in primary health care COPD programs indicate perception of low levels of provision. A survey by the New Zealand Branch of the Thoracic Society of Australia and New Zealand, similarly found that only 10 DHBs had implemented any aspects of LTC management strategy in COPD, and only 12 reported primary-secondary care cooperation in any COPD provision.

As with DHB perception of LTC management overall, perceptions of diseases-specific LTC management services within primary care, if accurate, again suggest regional inequalities. However, perceptions of primary care processes to reduce avoidable admission, evidence-based practice, referral, equity of health inputs, and professional education were reassuring, and variability influenced by a few DHBs perceiving very low provision.

Several issues emerged from the disease-specific stocktake, many of which reinforce the findings of other recent surveys of New Zealand service provision. There was good level of clinical leadership in CVD and stroke, but not in CHF or COPD - results according well with opinions of our ‘movers and shakers’. DHBs’ own impressions (generic stocktake) suggest that clinical leadership is reasonably provided (probably true for CVD/stroke but demonstrably less true in CHF/COPD) but championship less so. For all index conditions there was greater leadership provision in larger DHBs.

The situation regarding audit and quality improvement is a cause for concern and was again (generally) worse in smaller DHBs. Some responses suggested that concepts of
quality improvement and of clinical indicators were not understood, and thus that local service redesign may not be evidence based. Thus, the MOH may be unable to rely on DHB reports as markers of service quality. Half of respondent DHBs had no local management guidelines for CHF exacerbation, and 40% had none for COPD exacerbation. The situation was better for acute coronary syndrome and acute stroke.

The disparity between COPD/CHF, on one hand, and CVD/stroke on the other may reflect the differences in clinical leadership in these areas. Guidelines are not a panacea, but are useful routes towards quality improvement. They need to be accessible/usable, and the perceived absence we report further emphasises need for improvement in availability and quality of (particularly IT-based) decision support.

The evidence-base around self-management/education within LTC management programmes is strong. As stroke/TIA is generally an exception to this we did not ask about stroke self-management. In contrast with other areas, it appeared that community-linkages were rated are better by small DHBs, perhaps indicating a ‘trade off’ of small size (and thus loss of economy of scale) with the advantages of small size and local responsiveness.

Similarly, self-management was more widely incorporated into patient care in small and medium-sized than in larger DHBs, perhaps because they may have better knowledge of primary care activities where self management is best promoted. Nonetheless, staffing levels were, with few exceptions, low.

Case management provision was limited, again with low staffing, though commitment to this in primary care may not have been captured in our sampling. We know from personal experience that these services are expanding across New Zealand (reinforced by DHB comments around development plans). This is consistent with findings by Finlayson et al who contend nurses’ roles have expanded, leading to an increase in service access. This has resulted from specific funding of programs such as Care Plus, RICF (Reducing Inequalities Contingency Funding), and SIA (Services to Improve Access), and there is evidence of successful intersectoral case management models.

The ABCCNZ study had limitations. Some of our interpretations depend on accuracy of DHB perceptions of LTC management in primary care. Questionnaires were completed by Funders and Planners in cooperation with lead clinicians. A systematic approach to adequately survey primary care organisations was beyond the project’s scope. We did send questionnaires to all PHOs and Māori Health Providers, but received only 18 replies from the over 80 such providers then in existence. We recognise that we did not ask patients or families but to do this comprehensively was beyond our resources.

If DHB perceptions are inaccurate we may have overestimated, or (more likely) underestimated primary care provision. This would however, suggest a systemic intersectoral ignorance militating against effective LTC management as much as would the limited levels of provision highlighted in the report, assuming their accuracy. This is particularly true at the primary-secondary interface, especially around acute hospital admission. Intersectoral awareness is crucial. If DHB perceptions are accurate there is much to be done; if inaccurate the same is true.
There is general agreement that LTC management should largely take place within a primary health care context. We endorse this view. However, getting things right in primary health care is no excuse for poor secondary care provision:

- The evidence-base producing the view that LTC management is largely a primary health care concern was gathered in healthcare systems with reasonably comprehensive secondary provision.
- Evidence of need for effective primary/secondary interfaces is strong.\(^{38}\)
- The remaining evidence-base and guidelines are largely in secondary care and our study was looking for initiatives based on evidence.
- Secondary care events are crucial, life changing, and expensive, and index events on which to base further contacts.
- In New Zealand, many patients pay for primary health care and not for secondary care. Thus, failure to improve secondary care LTC provision will at the very least perpetuate inequality of LTC management access.

The main purpose of the disease-specific stocktake was thus to evaluate secondary-care LTC management provision and its links with primary and community care.

The DHB response rate is concerning: not because incomplete response may mean the data is not fully representative (though we acknowledge this possibility), but because, particularly for a DHBNZ-commissioned study, lack of engagement of some DHBs calls into question the priority they give to LTC management. We acknowledge that some questions required demographic, continuous, numerical data, and these aspects produced lower responses.

We also acknowledge ‘survey fatigue’ and are aware of examples where our survey actually or almost coincided with other surveys asking similar questions. An alternative (equally important) explanation for paucity of data provision is the problems with IT, data management, knowledge transfer and decision support seen in the generic stocktake; the scarcity of data provided in some areas by some DHBs may also speak to this.

In summary, we feel the most important results of this study are the considerable variability in perceptions of long-term conditions management service provision across DHBs, and that in many instances variability in actual disease-specific service provision appears to relate to DHB size.

**Competing interests:** None.

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Contemporary sedation practice in a large New Zealand emergency department

Martyn Harvey, Grant Cave, Chris Betham

Abstract

Aim Procedural sedation is commonly employed in the emergency department to assist in performance of noxious or invasive procedures. Numerous studies exist purporting the safety and efficacy of procedural sedation in North America and Australia, however, little data on sedation practice within New Zealand has been reported. We present one-year experience of all procedural sedations performed at Waikato Hospital.

Method A prospective audit of all procedural sedations performed at the emergency department of Waikato hospital during the 2009 calendar year was conducted. Data abstraction included: indication for sedation, procedure duration, emergency department length of stay, required personnel, and procedural success, in addition to sedative agents employed and associated adverse events.

Results 589 (276 paediatric, 313 adult) episodes of procedural sedation were available for analysis. Successful procedure performance was reported in 98% of paediatric cases and 88% of adult cases. Ketamine was the most commonly employed agent in the paediatric population (83.6%), with propofol the most frequently used in adults (99%). Procedural duration and emergency department length of stay was median 15 (IQR 10–25) minutes, and 122 (IQR 85–164) minutes respectively for the paediatric group, and median 15 (IQR 10–20) minutes and 124 (81–192) minutes for adult patients. Discharge rates for paediatric and adult patients were 87% and 52% respectively. Complication rates of procedural sedation for both groups was low.

Conclusion Procedural sedation appears both safe and effective in performance of time-limited noxious manipulations in a ‘real-life’ emergency department setting in New Zealand.

Procedural sedation is defined as a method “to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function independently and continuously”. In the previous two decades procedural sedation has evolved from something performed solely by the anaesthetist, to become a core skill of the practicing emergency physician.

The use of procedural sedation has been embraced by physicians and patients alike for enabling short turn-around noxious procedures to be performed entirely within the emergency department (ED)—in many cases curtailing the need for hospital admission. Numerous literature reviews have been published describing accepted methodology and limitations of procedural sedation, suitable pharmacologic agents, evidence of safety and increased patient satisfaction, in addition to the evidence behind fasting status recommendations.
Procedural sedation has become widespread within Australasian emergency departments with the Australasian College for Emergency Medicine one of the signatory colleges to a joint policy in the area.  

Few data exist, however, describing the ‘whole of system’ advantages of procedural sedation in avoidance of hospital admission, and the inherent utilisation of hospital bed-space and theatre time for conditions traditionally requiring formal anaesthesia in an operating theatre setting.

It seems intuitively obvious that reduction in demand for acute theatre time created through performance of minor procedures under procedural sedation would benefit both the individual patient, and the entire hospital though secondary effects on bed occupancy and competition for theatre bookings. Such benefits become all the more important in healthcare systems increasingly characterised by scarce resources, and governed by target driven delivery of service.

The goal of the present study was twofold. We determined to document contemporary procedural sedation practice in a large New Zealand emergency department through a prospective one-year audit of all episodes of procedural sedation performed at our institution. We additionally sought to highlight both the potential advantages, and the necessary resources, required for such as service in the context of recently adopted health ministry targets governing emergency department length of stay.

**Method**

Waikato Hospital is a large, University affiliated, teaching hospital situated in the city of Hamilton, New Zealand. The hospital provides tertiary level care inclusive all specialties to a local population of 200,000 and regional catchment of 650,000. Annual census for the 2009 calendar year was 54,250 of which 35% were paediatric (age less than or equal to 14 years).

Admission rate was 38%. The department is staffed by 11 Australasian College for Emergency Medicine-qualified Emergency Physicians, 19 registrar level Emergency doctors in training (PGY [postgraduate training year] level 3–10), and 5 resident level Emergency doctors (PGY level 2).

Procedural sedation is commonly performed at Waikato Hospital with the Emergency Department faculty amassing significant experience in performance. Procedural sedation is governed by department specific guidelines outlining minimum standards for performance including: seditionist seniority and experience (prerequisite Advanced cardiac life support/Advanced paediatric life support course attendance, and significant experience in airway and cardiovascular supportive therapies), minimum personnel numbers, monitoring requirements, and location of performance (all sedations are performed within a fully equipped resuscitation cubicle). Documentation in the form of a sedation record (in many facets similar to an anaesthetic record), and written informed consent from either patient or caregiver is mandatory.

This study was undertaken during the 2009 calendar year (1/1/2009–31/12/2009 inclusive). Ethical approval for the study was sought and a waiver granted from the Northern Y committee of the New Zealand Health and Disability Ethics Committees. All episodes of procedural sedation conducted within the Emergency Department were prospectively audited with data abstraction to standardised data collection template (Appendix 1).

Procedural sedation was defined as administration of intravenous, intramuscular, oral, intranasal, or rectal hypnotic/sedative agents alone or in combination with analgesics to facilitate performance of potentially noxious procedures whilst in the Emergency Department. Utilisation of inhalational agents alone (at the time of study performance, the sole available agent at our institution was 50% nitrous oxide [Entonox ™]) was specifically excluded.

In addition to patient demographic details, data was collated including: indication and procedure performed, location of procedure performance, pharmaceutical agents employed, qualification/seniority of performing clinicians, duration of procedure, procedural success, adverse sequelae and any reversal
agents employed, and patient duration of stay in the Emergency Department. All data were entered by the treating clinician at the time of procedure/sedation performance. Capture of all episodes was cross-referenced with the hospital’s central coding and data collation system.

Statistical evaluation of all variables was undertaken with GraphPad Prism software (Version 5.0; GraphPad Software Inc, La Jolla, USA). Comparison of continuous variables was conducted using two tailed students t testing or the Mann Whitney test as appropriate. Comparison of rate was assessed using Chi-squared testing. A p value of 0.05 was retained as statistically significant.

Results

595 episodes of procedural sedation were recorded between 1/1/2009 and 31/12/2009 (average 1.6/day). Incomplete registration occurred in 6 leaving 589 records complete for interrogation. Patient demographic details, ASA (American Society of Anesthetists) functional status, and fasting status for both liquids and solids prior to performance are presented in Table 1.

Table 1. Patient demographics, ASA and fasting status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Paediatric (n=276)</th>
<th>Adult (n=313)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>7 (1–14)</td>
<td>47 (15–94)</td>
</tr>
<tr>
<td>Gender (M:F)</td>
<td>176:98</td>
<td>165:148</td>
</tr>
<tr>
<td>ASA status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASA 1</td>
<td>265 (96%)</td>
<td>188 (60%)</td>
</tr>
<tr>
<td>ASA 2</td>
<td>11 (4%)</td>
<td>101 (32%)</td>
</tr>
<tr>
<td>ASA 3</td>
<td>0</td>
<td>24 (8%)</td>
</tr>
<tr>
<td>ASA 4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ASA 5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fasting status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 hrs</td>
<td>33 (12%)</td>
<td>27 (9%)</td>
</tr>
<tr>
<td>2–4 hrs</td>
<td>118 (43%)</td>
<td>96 (31%)</td>
</tr>
<tr>
<td>4–6 hrs</td>
<td>76 (28%)</td>
<td>90 (29%)</td>
</tr>
<tr>
<td>&gt;6 hrs</td>
<td>49 (18%)</td>
<td>99 (32%)</td>
</tr>
</tbody>
</table>

Age: median (range); ASA & Fasting Status number (%).

All procedures were performed in a fully equipped resuscitation cubicle with continuous monitoring of ECG, oxygen saturation, and non-invasive blood pressure utilised in all patients according to institutional guidelines. End tidal CO₂ monitoring was further used in nine patients.

Details of paediatric and adult procedures including procedural success, duration of procedure, emergency department length of stay and discharge rates are presented in Tables 2 and 3 respectively.
Table 2. Paediatric procedures, procedural duration, ED length of stay and discharge rate

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number n (%)</th>
<th>Successful n (%)</th>
<th>Duration procedure (min)</th>
<th>ED length of stay (min)</th>
<th>Discharged n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound repair</td>
<td>108 (39%)</td>
<td>108 (100%)</td>
<td>20 (15–30)</td>
<td>102 (62–144)</td>
<td>108 (100%)</td>
</tr>
<tr>
<td>MUS forearm #</td>
<td>73 (26%)</td>
<td>71 (97%)</td>
<td>15 (10–21)</td>
<td>121 (88.5–175)</td>
<td>64 (88%)</td>
</tr>
<tr>
<td>MUS wrist #</td>
<td>33 (12%)</td>
<td>32 (97%)</td>
<td>15 (10–21.5)</td>
<td>126 (91–155)</td>
<td>32 (98%)</td>
</tr>
<tr>
<td>I&amp;D abscess</td>
<td>11 (4.0%)</td>
<td>11 (100%)</td>
<td>13 (5–20)</td>
<td>96 (87–156)</td>
<td>10 (91%)</td>
</tr>
<tr>
<td>Lumbar puncture</td>
<td>9 (3.3%)</td>
<td>9 (100%)</td>
<td>15 (9–17.5)</td>
<td>186 (144–261)</td>
<td>2 (22%)</td>
</tr>
<tr>
<td>Reduction elbow dislocation</td>
<td>8 (2.9%)</td>
<td>8 (100%)</td>
<td>17.5 (10–25)</td>
<td>140 (111–188)</td>
<td>6 (75%)</td>
</tr>
<tr>
<td>MUS ankle #</td>
<td>7 (2.5%)</td>
<td>7 (100%)</td>
<td>11 (10–30)</td>
<td>99 (90–197)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>MUS tub/fib #</td>
<td>7 (2.5%)</td>
<td>7 (100%)</td>
<td>15 (12–25)</td>
<td>124 (101–232)</td>
<td>4 (57%)</td>
</tr>
<tr>
<td>MUS other #</td>
<td>5 (1.6%)</td>
<td>4 (100%)</td>
<td>11 (5–35)</td>
<td>174 (120–290)</td>
<td>4 (80%)</td>
</tr>
<tr>
<td>Reduction joint other</td>
<td>4 (1.5%)</td>
<td>3 (100%)</td>
<td>3 (1–10)</td>
<td>160 (150–242)</td>
<td>3 (75%)</td>
</tr>
<tr>
<td>MUS supracondylar # humerus</td>
<td>1 (0.4%)</td>
<td>1 (100%)</td>
<td>15</td>
<td>180</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Dental extraction</td>
<td>1 (0.4%)</td>
<td>1 (100%)</td>
<td>3</td>
<td>120</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Other</td>
<td>9 (3%)</td>
<td>9 (100%)</td>
<td>15 (8.5–19.5)</td>
<td>115 (51–134)</td>
<td>9 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>276</strong></td>
<td><strong>271 (98%)</strong></td>
<td><strong>15 (10–25)</strong></td>
<td><strong>122 (85–164)</strong></td>
<td><strong>240 (87%)</strong></td>
</tr>
</tbody>
</table>

Duration presented as median (interquartile range); # = fracture; MUS = manipulation under sedation; I&D = incision and drainage.

Multiple procedures were performed in six paediatric patients: two underwent bilateral wrist fracture manipulation and casting, and two combined wrist and supracondylar humeral fracture manipulation. One paediatric patient underwent combined wrist fracture manipulation and incision and drainage of abscess, and one combined manipulation of wrist fracture and distant wound repair.

Table 3. Adult procedures, procedural duration, ED length of stay, and discharge rate

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number n (%)</th>
<th>Successful n (%)</th>
<th>Duration procedure (min)</th>
<th>ED length of stay (min)</th>
<th>Discharged n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction dislocated THJR</td>
<td>50 (16.0%)</td>
<td>43 (86%)</td>
<td>15 (10–20)</td>
<td>160 (86.5–224)</td>
<td>29 (58%)</td>
</tr>
<tr>
<td>MUS ankle #</td>
<td>45 (14.4%)</td>
<td>44 (98%)</td>
<td>11 (10–16.5)</td>
<td>154 (103–265)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Reduction dislocated shoulder</td>
<td>35 (11.2%)</td>
<td>31 (89%)</td>
<td>10.7 (5.5–15)</td>
<td>112 (67–229)</td>
<td>28 (80%)</td>
</tr>
<tr>
<td>MUS wrist #</td>
<td>30 (9.6%)</td>
<td>29 (97%)</td>
<td>15 (10–20)</td>
<td>119 (96–156)</td>
<td>22 (73%)</td>
</tr>
<tr>
<td>I&amp;D Abscess</td>
<td>28 (8.9%)</td>
<td>28 (100%)</td>
<td>15 (10–20)</td>
<td>81 (60–110)</td>
<td>28 (100%)</td>
</tr>
<tr>
<td>Cardioversion AF</td>
<td>23 (7.3%)</td>
<td>23 (100%)</td>
<td>10 (6–15)</td>
<td>120 (70–230)</td>
<td>20 (87%)</td>
</tr>
<tr>
<td>MUS tub/fib #</td>
<td>22 (7.0%)</td>
<td>22 (100%)</td>
<td>15 (13–20)</td>
<td>111 (97–163)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Reduction dislocated elbow</td>
<td>19 (6.1%)</td>
<td>17 (89%)</td>
<td>14.5 (10–20)</td>
<td>114.5 (73.5–191)</td>
<td>15 (79%)</td>
</tr>
<tr>
<td>Reduction joint other</td>
<td>13 (4.2%)</td>
<td>11 (85%)</td>
<td>10 (7–25)</td>
<td>128 (72–373)</td>
<td>4 (31%)</td>
</tr>
<tr>
<td>Cardioversion SVT</td>
<td>8 (2.6%)</td>
<td>8 (100%)</td>
<td>9 (7–20)</td>
<td>134 (88–235)</td>
<td>8 (100%)</td>
</tr>
<tr>
<td>MUS other #</td>
<td>5 (1.6%)</td>
<td>4 (80%)</td>
<td>20 (9–25)</td>
<td>41 (27.5–49)</td>
<td>1 (20%)</td>
</tr>
<tr>
<td>Lumbar puncture</td>
<td>5 (1.6%)</td>
<td>5 (100%)</td>
<td>15 (13.5–25)</td>
<td>156 (110–215)</td>
<td>3 (60%)</td>
</tr>
<tr>
<td>Cardioversion WCT</td>
<td>4 (1.3%)</td>
<td>4 (100%)</td>
<td>17 (15–20)</td>
<td>94 (66–319)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>MUS forearm #</td>
<td>3 (0.9%)</td>
<td>3 (100%)</td>
<td>20 (10–20)</td>
<td>141 (69–153)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>MUS elbow #</td>
<td>3 (0.9%)</td>
<td>2 (67%)</td>
<td>10 (10–45)</td>
<td>171 (72–175)</td>
<td>1 (33%)</td>
</tr>
<tr>
<td>Cardioversion A fl</td>
<td>1 (0.3%)</td>
<td>1 (100%)</td>
<td>24 (18–30)</td>
<td>196.5 (195–198)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (0.6%)</td>
<td>2 (100%)</td>
<td>27.5 (20–35)</td>
<td>224.5 (65–384)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>313</strong></td>
<td><strong>277 (88%)</strong></td>
<td><strong>15 (10–20)</strong></td>
<td><strong>124 (81–192)</strong></td>
<td><strong>163 (52%)</strong></td>
</tr>
</tbody>
</table>

Duration presented as median (interquartile range); THJR = total hip joint replacement; MUS = manipulation under sedation; I&D = incision and drainage; SVT= supraventricular tachycardia; WCT = wide complex tachycardia; AF = atrial fibrillation; A fl = atrial flutter.
Multiple procedures were performed in seven adult patients. Three underwent bilateral manipulation of wrist fractures. One underwent combined manipulation of wrist and contralateral forearm fracture, one manipulation of bilateral ankle fractures, one manipulation of wrist fracture and distant wound repair, and one multiple incision and drainage of abscess.

Personnel utilised in procedural sedation and procedure performance are documented in Table 4. All sedations were performed by Emergency Medicine faculty. 492 (84%) of actual procedures were performed by Emergency Medicine doctors, and 97 (16% [65 orthopaedic, 13 plastic surgery, 19 misch]) by doctors from another specialty.

Table 4. All personnel involved in sedation/procedure performance

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Paediatric sedations</th>
<th>Adult sedations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>FACEM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>16 (5%)</td>
</tr>
<tr>
<td>1</td>
<td>218 (79%)</td>
<td>236 (75%)</td>
</tr>
<tr>
<td>2</td>
<td>43 (16%)</td>
<td>61 (20%)</td>
</tr>
<tr>
<td>Registrar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>75 (27%)</td>
<td>75 (24%)</td>
</tr>
<tr>
<td>PGY year 3–20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>90 (33%)</td>
<td>131 (42%)</td>
</tr>
<tr>
<td>2</td>
<td>111 (40%)</td>
<td>107 (34%)</td>
</tr>
<tr>
<td>Nurse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>58 (21%)</td>
<td>61 (20%)</td>
</tr>
<tr>
<td>1</td>
<td>204 (74%)</td>
<td>217 (69%)</td>
</tr>
<tr>
<td>2</td>
<td>12 (4%)</td>
<td>32 (10%)</td>
</tr>
<tr>
<td>3</td>
<td>2 (0.6%)</td>
<td></td>
</tr>
</tbody>
</table>

FACEM: Fellow of the Australasian College for Emergency Medicine; PGY: postgraduate year.

231 (83.6%) paediatric patients received ketamine as primary sedative agent with initial dosing of 1.69 (SD 0.72) mg/kg administered intravenously. Twenty-nine (12.6%) received a second ketamine dose at 0.54 (SD 0.04) mg/kg, and 5 patients a third ketamine dose. No patient received intramuscular ketamine. Midazolam was administered concurrently with ketamine in 7 (3%) patients. No paediatric patient received ketamine intramuscularly. Similarly no patient was administered atropine.

Forty-four (15.9%) paediatric patients received propofol as primary sedative agent at total dose 3.1 (SD0.8) mg/kg. Thirty-two (72.7%) paediatric patients receiving propofol additionally received fentanyl at 1.2 (0.2) mcg/kg as adjuvant periprocedural analgesia. Two patients received the propofol/ketamine combination ‘Ketofol’.

Paediatric patients administered propofol were more likely older (mean age ketamine recipients 6.0 (SD 0.2) years vs. mean age propofol recipients 12.1 (SD 0.27) years; p<0.0001). Adverse sequelae of paediatric sedation procedures/medications are presented in Table 5. ‘Other’ adverse sequelae included hypersalivation in 29, myoclonic activity in 8, and dysphoria in 4.
### Table 5. Adverse sequelae of paediatric sedation

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airway complication requiring:</strong></td>
<td></td>
</tr>
<tr>
<td>Jaw lift</td>
<td>8 (2.9%)</td>
</tr>
<tr>
<td>Oropharyngeal airway</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>Nasopharyngeal airway</td>
<td>2 (0.8%)</td>
</tr>
<tr>
<td>LMA</td>
<td>0</td>
</tr>
<tr>
<td>ETT</td>
<td>0</td>
</tr>
<tr>
<td>Laryngospasm</td>
<td>0</td>
</tr>
<tr>
<td><strong>Breathing</strong></td>
<td></td>
</tr>
<tr>
<td>Desaturation (O₂ sat &lt;92%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>Hypopnoea (&lt;5 bpm)</td>
<td>0</td>
</tr>
<tr>
<td>Apnoea</td>
<td>0</td>
</tr>
<tr>
<td>Requiring PPV</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td><strong>Circulation/Hypotension</strong></td>
<td></td>
</tr>
<tr>
<td>Spontaneously resolving</td>
<td>0</td>
</tr>
<tr>
<td>Responds fluid bolus</td>
<td>0</td>
</tr>
<tr>
<td>Requiring vasopressors</td>
<td>0</td>
</tr>
<tr>
<td>Requiring inotropes</td>
<td>0</td>
</tr>
<tr>
<td>Immunologic/Rash</td>
<td>4 (1.4%)</td>
</tr>
<tr>
<td>Emesis</td>
<td>5 (1.8%)</td>
</tr>
<tr>
<td>Emergence phenomenon</td>
<td>6 (2.1%)</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>41 (14.9%)</td>
</tr>
</tbody>
</table>

LMA = laryngeal mask airway; ETT = Endotracheal tube; PPV = positive pressure ventilation.

### Table 6. Adverse sequelae of adult sedation

<table>
<thead>
<tr>
<th>Complication</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airway complication requiring:</strong></td>
<td></td>
</tr>
<tr>
<td>Jaw lift</td>
<td>46 (15%)</td>
</tr>
<tr>
<td>Oropharyngeal airway</td>
<td>9 (2.9%)</td>
</tr>
<tr>
<td>Nasopharyngeal airway</td>
<td>11 (3.5%)</td>
</tr>
<tr>
<td>LMA</td>
<td>0</td>
</tr>
<tr>
<td>ETT</td>
<td>2 (0.6%)</td>
</tr>
<tr>
<td>Laryngospasm</td>
<td>0</td>
</tr>
<tr>
<td><strong>Breathing</strong></td>
<td></td>
</tr>
<tr>
<td>Desaturation (O₂ sat &lt;92%)</td>
<td>26 (8.3%)</td>
</tr>
<tr>
<td>Hypopnoea (&lt;5 bpm)</td>
<td>5 (1.6%)</td>
</tr>
<tr>
<td>Apnoea</td>
<td>5 (1.6%)</td>
</tr>
<tr>
<td>Requiring BMV</td>
<td>22 (7.0%)</td>
</tr>
<tr>
<td><strong>Circulation/Hypotension</strong></td>
<td></td>
</tr>
<tr>
<td>Spontaneously resolving</td>
<td>40 (12.8%)</td>
</tr>
<tr>
<td>Responds fluid bolus</td>
<td>24 (7.7%)</td>
</tr>
<tr>
<td>Requiring vasopressors</td>
<td>0</td>
</tr>
<tr>
<td>Requiring inotropes</td>
<td>0</td>
</tr>
<tr>
<td>Immunologic/Rash</td>
<td>2 (0.6%)</td>
</tr>
<tr>
<td>Emesis</td>
<td>5 (1.6%)</td>
</tr>
<tr>
<td>Emergence phenomenon</td>
<td>0</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>12 (3.8%)</td>
</tr>
</tbody>
</table>

LMA = Laryngeal mask airway; ETT = Endotracheal tube; BMV = Bag mask ventilation.
311 (99%) adult patients were administered propofol as primary sedating agent at
Total dose 143 (SD 4.1) mg. Two (0.6%) adult patients received ketamine as primary
sedative agent (16 and 24 years of age; both at 0.5 mg/kg), and one patient etomidate.
Despite availability, benzodiazepines were not utilised as initial sedative agents for
any patient.

Adjuvant agents administered included: fentanyl in 221 (70.6%) at total dose 57.4
(SD42.3) mcg; Alfentanly in 9 (2.9%) at total dose 0.86 (SD 0.22) mg; ketamine in 3
(0.96%) at total dose 80 (SD 20) mg; and midazolam in 2 (0.6%) at total dose 2.5 (SD
0.5) mg/kg. Adverse sequelae adult procedures/medications are presented in Table
6. ‘Other’ adverse sequelae included injection site pain 11, and agitation in 1.

The two adult patients requiring endotracheal intubation received a brief period of
mechanical ventilation before recovery and extubation within the emergency
department. No paediatric or adult patient received the reversal agents naloxone or
flumazenil. A family member remained present during 173 (62.7%) of the paediatric
procedures, and 68 (21.7%) of the adult procedures. Admission rate for the paediatric
population was 9.1% and for the adult population 37.1%.

Discussion
In this observational study we determined to prospectively examine clinical outcomes
following procedural sedation performed on both adult and paediatric patients in a
large New Zealand emergency department.

Our results suggest safe and effective sedation practice across a broad patient
demographic and a diverse range of performed procedures. It is furthermore likely
that utilisation of procedural sedation resulted in expediated access to restorative care,
and in many cases definitive care, across a wide range of treated conditions.

While such data is not unique amongst literature reports of institutional procedural
sedation from the Americas,\textsuperscript{10,11} we believe this to be the largest prospectively
conducted audit of procedural sedation from within Australasia from a single
institution.

Analysis of outcome measures across such a breadth of treated conditions is not
without limitation. Nevertheless our rates of success in procedural performance are
consistent with those of published series.\textsuperscript{12–15}

Our rate of successful THJR reduction (86%) compares favourably with reports from
similar institutions with 62% and 68% recorded in two UK based studies.\textsuperscript{16,17}
Similarly high rates success in glenohumeral joint relocation (89%) approximate those
of similar reports.

Successful reduction of displaced ankle and wrist fractures (98 and 97 percent
respectively) also demonstrate the adequacy of procedure performance within the
obvious confines of the significant heterogenicity afforded by such groupings. The
four most frequently performed paediatric procedures included soft tissue
manipulation (wound repair and incision and drainage of abscess) both afforded 100% success, in addition to similar rates of hospital discharge from the emergency
department. Success in manipulation of wrist and forearm fractures in children was
again high and is explored further in the companion article in the same issue of the NZMJ.

The significant adverse event rate recorded in this series was low. Fewer than 5% of paediatric patients required any form of airway intervention with one only developing sub-clinical respiratory depression requiring positive pressure ventilation. No paediatric patient developed hypotension during sedation.

Rates of emesis and emergence phenomenon were in line with similar reports.18,19 ‘Other’ adverse effects reported (predominately hypersalivation, and myoclonic activity) were minor.

Among the adult patients undergoing sedation approximately 22% required some form of airway intervention, with the vast majoring needing simple jaw lift, or minimally invasive airway adjuncts (oro or nasopharyngeal airways).

Two patients required endotracheal intubation and a brief period of positive pressure ventilation following sustained apnoea. This is in line with the Australasian guideline, where deep sedation is noted to have an association with both the need to support the airway and progression to general anaesthesia.

Anecdotally the need for any form of airway support was most frequently associated with both deeper sedation, and abrupt cessation of painful stimulus following joint reduction in patients receiving propofol as sedative agent. Transient hypotension occurred in 22% and resolved spontaneously in two-thirds, and following volume challenge in the remainder. No patient was administered vasopressors.

While the low rate of observed adverse events in this series is pleasing and likely reflects both rigorous patient selection and the familiarity of treating clinicians, the potential for significant unwanted outcomes during sedation performance clearly exists.20,21 For this reason clinicians’ performing sedation must be fully versed in age appropriate airway and cardiovascular supportive measures, and the procedure must be performed in a cubicle enabling immediate access to ACLS/APLS resuscitation equipment. Expertise to deal with any such eventuality is furthermore prerequisite for the physician performing sedation.22

The advantages of sedation performance may extend beyond those afforded to individual patients who variously receive: more rapid access to manipulations, thereby effecting increased analgesia (e.g. fracture reduction, joint relocation), and in many cases definitive care permitting more rapid hospital discharge (e.g. incision and drainage of abscess).

Successful performance within the emergency department of manipulations traditionally managed in the operating theatre setting may furthermore serve to curtail hospital admission, with the adherent requirement for bed occupation and theatre time allocation.

Relocation of displaced fractures may additionally turn an emergent theatre case into an urgent procedure able to be scheduled, thus creating less disruption to pressured theatre bookings. Such resource considerations, however, need to be balanced against
the workload of emergency staff and the demands of increased emergency presentations and time-based criterion for delivery of care.

Despite the availability of a wide range of sedative agents at our institution, ketamine was clearly the preferred agent for sedation in the paediatric population, and propofol similarly the most utilised in adult patients. In this series ketamine was invariably administered as monotherapy, and propofol more often than not co-administered with fentanyl (as in the work of Bawden et al).15

While not the subject of further investigation in this study selection of agent was anecdotally linked to both physician familiarity with the agents in question, and knowledge of the respective side effect profile. Such practice is furthermore in line with the recommendations of Meredith et al4 who suggested practitioners of procedural sedation become expert with few agents, rather than attempting to gain experience with the entire range of available hypnosedative medications.

This study is subject to a number of limitations. As an observational study it is constrained both by and within the methodologic constraints of such datasets. Specifically, conclusions drawn from the presented data are reliant on the accuracy of initial data input, in the present case from un-blinded clinicians subject to potential reporting bias.

All metrics were however collated prospectively to standardised data collection template. Furthermore, any assumptions drawn from this data regarding the efficiency of procedures performed under procedural sedation remain untested as no comparison was made with similar groups undergoing identical manipulations in an acute theatre setting. The presented results nevertheless are suggestive of significant time gains.

**Conclusion**

In this 12-month prospective audit of procedural sedation events at Waikato Hospital we have demonstrated both the safety and efficiency of sedation practice across a broad range of treated conditions in a large New Zealand emergency department. Adoption of procedural sedation may contribute significantly to timely access to restorative, and definitive, manipulations at institutions adopting procedural sedation.

**Competing interests:** None.

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**References:**

Manipulation of simple paediatric forearm fractures: a time-based comparison of emergency department sedation with theatre-based anaesthesia

Chris Betham, Martyn Harvey, Grant Cave

Abstract

Aim Procedural sedation has become widespread in emergency departments (ED) worldwide due to the ability to perform short turnaround noxious procedures beyond the confines of the operating theatre. We report one institution's experience with paediatric forearm fracture reduction and compare key time-based metrics for ED manipulation under procedural sedation (MUS), with traditional theatre-based manipulation under anaesthesia (MUA).

Method All simple paediatric forearm fractures requiring manipulation before casting at Waikato hospital during the 2009 calendar year were studied. Time from presentation to fracture manipulation, procedure room occupancy, and hospital length of stay were recorded. Requirement for repeated intervention was additionally collated.

Results Of 385 patients presenting with forearm fracture 108 underwent MUS and 66 MUA. Time to manipulation was shorter in the MUS group (58 ± 38 minutes MUS vs. 558 ± 368 minutes MUA; p<0.0001), as was hospital length of stay (139 ± 70 minutes MUS vs 1452 ± 544 minutes MUA; p<0.0001). No difference was observed in requirement for repeated intervention between groups (15% MUS vs 21% MUA; p=0.305).

Conclusion Manipulation of simple closed paediatric forearm fractures under procedural sedation was associated with lesser delay to reduction, and shorter hospital length of stay, compared with traditional manipulation under anaesthesia in the operating theatre.

Conventional management of children presenting with single or both-bone forearm fractures requiring manipulation prior to casting involves hospital admission for manipulation under general anaesthetic (MUA). Inherent in this process are potential delays both while awaiting theatre availability, and awaiting discharge subsequent to reduction.

While these metrics are subject to significant within and between institution variability, median waiting times to general anaesthesia and subsequent discharge have been reported as greater than 8 hours, and greater than 21 hours respectively, in one recent report.\(^1\) Given the assumption that both children and their caregivers wish to spend as little time as necessary in hospital, investigation of alternative means for achieving fracture reduction seems justified.

The increase in emergency physicians skilled in delivery of procedural sedation has seen numerous conditions previously exclusively managed in the operating theatre...
setting now performed within the emergency department under sedation.\textsuperscript{2,3} This rationale has seen reduction of simple closed forearm fractures in children successfully provided by emergency physicians,\textsuperscript{4–6} trainees,\textsuperscript{7} and clinical nurse practitioners\textsuperscript{8} utilising such techniques. One retrospective report furthermore identified significant cost savings associated with manipulations performed exclusively by emergency department personnel.\textsuperscript{6}

In this observational study (conducted in concert with the former work examining procedural sedation practice in a large New Zealand emergency department, we sought to compare key time-based metrics of emergency department MUS with conventional theatre-based MUA, for simple paediatric forearm fractures requiring manipulation prior to casting at Waikato Hospital. The specific intervals of time from patient presentation to fracture manipulation, procedure room occupancy, and total hospital length of stay were examined as primary outcome variables.

**Method**

This study was conducted at Waikato Hospital, a large university affiliated teaching hospital located in the city of Hamilton, New Zealand. The study content represents in part data collated during performance of the former reported work entitled “Contemporary Sedation Practice in a Large New Zealand Emergency Department”. Ethical approval for the project was obtained from the Northern Y division of the New Zealand Health and Disability Ethics Committees.

As a component of a wider study examining sedation practice in the emergency department all cases of paediatric (age 0-14 years inclusive) forearm fracture presenting to the emergency department during the 12 month period of the 2009 calendar year were studied. For the purposes of the study ‘forearm fractures’ were considered any fracture to the radius and/or ulnar bone with or without associated dislocation. Fractures of the distal humerus, and fractures of the carpus were specifically excluded.

All studied patients presenting with forearm fractures received routine care in accord with institutional standards including analgesia, diagnostic radiography, and arranged reduction per treating physician directives. At our institution manipulation of simple closed forearm fractures are performed by both emergency department and/or orthopaedic doctors under procedural sedation within the emergency department, and via orthopaedic doctors in the operating theatre. All MUS procedures are performed in a fully equipped resuscitation cubicle within the ED. Complicated fractures, open fractures, or those deemed to require greater levels of intervention are universally performed in the operating theatre by orthopaedic personnel. The decision to perform ED-based MUS is collaborative and based on perceived complexity of the fracture, and the availability of suitably expert personnel on shift.

Index cases of forearm fracture undergoing emergency department MUS were prospectively identified by emergency department personnel at presentation. Cases of paediatric forearm fracture undergoing MUA in the operating theatre were retrospectively identified using the hospitals computerised data collection and coding and collation (Isoft). Data was available for all (100%) of identified cases. Given the goals of the study to compare efficiency of MUS in the emergency department with theatre-based MUA for uncomplicated forearm fractures, any admitted patient with a fracture requiring more than simple closed reduction (open reduction, K-wire insertion, internal fixation, or invasive external fixation) were specifically excluded from group comparisons.

A standardised data collection template was utilised to prospectively collate details of procedural sedation for all patients undergoing emergency department MUS (see appendix 1 of the prior paper). For the purposes of this study specific interest was given to the collated time points of: time of emergency department arrival, time of fracture reduction, and time of discharge from hospital. Procedure room (resuscitation cubicle) occupancy was specified as time from entry to the resuscitation cubicle to time to leaving the cubicle following MUS. Furthermore, in addition to data abstracted as per the prior paper, note was made of fracture location and type, and the specialty doctor performing fracture reduction. All data was recorded by the treating clinician, who remained un-blinded to the contents of the study.
Data from eligible patients undergoing MUA in the operating theatre was obtained via retrospective chart review by an un-blinded investigator. This involved interrogation of the computerised hospital coding system, and the hard copy in-patient record, to determine key time metrics of admission including: time of emergency department arrival, time of fracture reduction, and time of discharge from hospital.

Procedure room (operating theatre) occupancy was specified as time of entry to the operating theatre to time of discharge to the recovery room as routinely recorded on our hospital computerised data collection and management system. All patients additionally underwent chart review at 6 months following initial MUS/MUA to determine the requirement for repeated early fracture manipulation, and/or the requirement for delayed non-operative or operative intervention.

Statistical analysis of all study metrics was undertaken using GraphPad Prism software (Version 5.0; GraphPad Software Inc, La Jolla, USA). Two-tailed student's t testing were utilised to compare differences in continuous variables following evaluation for normality with the Shapiro-Wilk statistic. Fisher's exact testing was used to evaluate dichotomous outcomes. A p value of <0.05 was retained as statistically significant.

Results

Annual census for the 2009 year was 54,250 of which 35% were children (age 0–14 years). 385 paediatric patients presented with forearm fractures as defined by inclusion criteria during this period. Of these, 108 patients subsequently underwent fracture manipulation under sedation (MUS) in the emergency department, and sixty-six patients manipulation under anaesthesia (MUA) in the operating theatre (Figure 1). Patient demographic details and fracture type are presented in Table 1.

Figure 1. Consort diagram of studied patients
Table 1. Patient demographic details and fracture type according to group

<table>
<thead>
<tr>
<th>Variables</th>
<th>Emergency MUS (n=108)</th>
<th>Theatre MUA (n=66)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>7.0 (2.7)</td>
<td>8.6 (2.9)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Gender (M:F)</td>
<td>67:41</td>
<td>35:31</td>
<td>0.269</td>
</tr>
<tr>
<td>FRACTURE TYPE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distal Radius ± Ulnar involving growth plate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salter Harris 1</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td>0.382</td>
</tr>
<tr>
<td>2</td>
<td>32 (27%)</td>
<td>9 (14%)</td>
<td>0.017</td>
</tr>
<tr>
<td>3</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>NA</td>
</tr>
<tr>
<td>Radius ± Ulnar shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distal</td>
<td>55 (51%)</td>
<td>36 (55%)</td>
<td>0.755</td>
</tr>
<tr>
<td>Mid</td>
<td>15 (14%)</td>
<td>14 (21%)</td>
<td>0.216</td>
</tr>
<tr>
<td>Proximal</td>
<td>3 (3%)</td>
<td>2 (3%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Radial head/neck</td>
<td>1 (1%)</td>
<td>4 (6%)</td>
<td>0.069</td>
</tr>
<tr>
<td>Monteggia #/dislocation</td>
<td>1 (1%)</td>
<td>1 (2%)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Age presented as mean (SD); Fracture type presented as number (%).

Fifty-seven (53%) patients undergoing emergency department MUS arrived during the hours of 0800–1700, versus 46 (70%) patients undergoing theatre-based MUA arriving during standard working hours; (P=0.038). Thirty-six (33%) of patients undergoing emergency department MUS, and 32 (48%) of patients undergoing theatre MUA respectively had their procedure performed during these hours (P=0.055).

Numbers of medical staff (sedationist/anaesthetist, proceduralist, nursing personnel) present during procedure performance are presented in Table 2. Eighteen (17%) of ED-based patients undergoing MUS were reduced by orthopaedic doctors, the remainder by emergency personnel. All theatre MUA’s were performed by orthopaedic doctors. Given the mode of data extraction obtaining accurate numbers of nursing personnel present during theatre-based MUA of fractures proved impossible and has therefore been reported as indeterminate (ID).

Table 2. Personnel present during fracture manipulation

<table>
<thead>
<tr>
<th>Personnel (number)</th>
<th>Emergency MUS (n=108)</th>
<th>Theatre MUA (n=66)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaesthetist/Sedationist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0*</td>
<td>15 (14%)</td>
<td>0 (0%)</td>
<td>0.0006</td>
</tr>
<tr>
<td>1</td>
<td>93 (89%)</td>
<td>51 (77%)</td>
<td>0.514</td>
</tr>
<tr>
<td>2</td>
<td>0 (0%)</td>
<td>15 (23%)</td>
<td>0.082</td>
</tr>
<tr>
<td>Proceduralist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>96 (89%)</td>
<td>52 (79%)</td>
<td>0.082</td>
</tr>
<tr>
<td>2</td>
<td>12 (11%)</td>
<td>14 (21%)</td>
<td>0.082</td>
</tr>
<tr>
<td>Nurse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>14 (13%)</td>
<td>ID</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>89 (82%)</td>
<td>ID</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5 (5%)</td>
<td>ID</td>
<td></td>
</tr>
</tbody>
</table>

Data presented as number (%);* seditionist additionally assisted with manipulation.
A family member was present during procedure performance in 65 (60%) of emergency MUS of forearm fractures, and zero (0%) of theatre-based MUA (p<0.0001). Thirteen (12%) of emergency MUS patients were admitted to the ward following the procedure versus 66 (100%) of theatre-based MUA patients (p<0.0001). Time from patient presentation to fracture reduction, procedure room occupancy, and total hospital length of stay are presented in Table 3.

Table 3. Time to procedure, procedure duration, and hospital length of stay according to group

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Emergency MUS (n=108)</th>
<th>Theatre MUA (n=66)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED arrival to procedure (min)</td>
<td>58 (38)</td>
<td>558 (368)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Procedure room occupancy (min)</td>
<td>38 (11)</td>
<td>45 (20)</td>
<td>0.003</td>
</tr>
<tr>
<td>Hospital LOS (min)</td>
<td>139 (70)</td>
<td>1452 (544)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

LOS – length of stay; data presented as mean (SD).

Four (4%) emergency MUS patients required hospital admission for repeated manipulation in theatre following unsuccessful attempted manipulation in the emergency department (3 distal radius/ulnar fractures with 100% displacement, 1 Salter-Harris II distal radial fracture). No patient from either group developed compartment syndrome. Sixteen (15%) of emergency MUS patients required repeated elective manipulation following developing unsatisfactory fracture position at fracture clinic follow-up compared with 14 (21%) of theatre-based MUA, (P=0.305).

Discussion

In this observational study of simple paediatric forearm fractures requiring manipulation prior to casting, reduction under procedural sedation in the emergency department was associated with a 10-fold decrease in both time to definitive care and duration of hospital stay when compared with theatre-based manipulation under anaesthesia.

No difference in the requirement for repeated manipulation during routine clinical follow-up was observed between groupings suggesting comparable efficacy of reduction for both techniques.

Our findings are consistent with a growing body of literature purporting the efficacy and efficiency of emergency department-based procedural sedation in performance of a wide variety of brief-duration noxious procedures traditionally managed in the operating theatre.2,9

Evidence to date supports emergency department procedural sedation for reduction of both native and prosthetic joint dislocation,10,11 fracture manipulation,4–6 wound repair,12–14 abscess incision and drainage,15 and foreign body extraction.16

Numerous potential advantages may ensue from such an approach. For individual patients and relatives, performance of these manipulations within the emergency
department shortens lead time to definitive care thereby reducing distress and analgesic requirement associated with delayed theatre availability. Furthermore, in many instances discharge is possible directly from the emergency department - intrinsically advantageous for the patient, relatives and caregivers.

The secondary benefits to health care systems may prove equally significant. Performance of uncomplicated procedures within the emergency department under procedural sedation may serve to reduce demand for already pressured theatre lists. Additionally, patient discharge directly from the emergency department curtails the requirement for hospital admission and thereby unnecessary acute bed occupancy.

Some insight into the mechanisms for such savings are suggested in our data. While proportionally more MUS patients presented after 1700 hours, there was a significant trend toward increased MUS performance in the evening. Conversely more MUA cases were performed during daytime hours, with the inherent requirement for prior overnight admission and starving, before booked theatre listing. While not calculated in the present study, the cost of accommodating all 108 patients undergoing MUS for one night alone, should they have been admitted for MUA, would likely have exceeded NZ$50,000. Such savings are significant in health care systems increasingly characterised by scarce resources, and time-based criterion for quality.

Also significant in the context of the health ministry targets for 95% of emergency patients to be discharged or admitted within 6 hours,17 is the finding that 95% of patients undergoing MUS in the present study were discharged from hospital within 280 minutes.

Clinical outcomes reported and the requirement for repeated manipulation following initial reduction was comparable between groups suggesting similar efficacy of fracture reduction irrespective of elected methodology of sedation/anaesthesia. While such data is informative we have nevertheless failed to include any objective measure of the adequacy of fracture reduction (e.g. post reduction correction of angular deformity), or eventual functional recovery.

The present study furthermore has not sought measures of patient/carer satisfaction with either sedation, or anaesthesia, nor have we sought to determine the psychological or social costs associated with failed MUS and the adherent requirement for hospital admission and MUA. Formal assessment of these will require further study.

This study is subject to a number of additional limitations. The study is by nature observational with data entered prospectively by investigators un-blinded to study contents in the case of MUS cases, and retrospectively obtained from hospital records by an un-blinded investigator in the case of MUA cases. As such potential exists for observer or information bias in collection of key study metrics. Furthermore, as in all such investigations of this type, the accuracy of drawn conclusions is heavily reliant upon the quality of original data entry.

More significantly, there is some evidence from the presented data suggesting studied groups may not have been equivalent in terms of fracture complexity, with selection bias likely in group allocation. Firstly, the mode of selection of patients for ED MUS implies more complex (and therefore more difficult and potentially more time consuming) patients were admitted for MUA. This assumption is furthermore...
supported with both younger patients and Salter Harris II fractures (inherently easier to reduce) being over-represented in the ED MUS group.

Conversely, procedure room occupancy was greater in the theatre MUA group suggesting more prolonged and complex manipulation. Nevertheless, while it could be contended that such differences may have impacted on the duration of procedure, it seems unlikely that these discrepancies would account for the entirety of the pre and post manipulation time differentials observed between groups.

Furthermore, even if such bias is real, this fails to discount the principal finding of the presented data: that a significant number of paediatric forearm fractures may be managed expeditiously and safely utilising procedural sedation in the emergency department.

Conclusion

In this observational study reduction of simple closed paediatric forearm fractures under procedural sedation in the emergency department was associated with a ten-fold reduction in time to manipulation and hospital length of stay compared with similar reductions performed in the operating theatre. Emergency department procedural sedation may be considered one strategy for reducing time delays inherent in formal hospital admission in such cases.

Competing interests: None.

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References:

Project RED—a successful methodology for improving emergency department performance

Michael W Ardagh, Angela M Pitchford, Anne Esson, Heather Manson, Brian Dolan

Abstract

Aim To describe Project RED (Rejuvenating the Emergency Department), an innovative and comprehensive methodology to address Emergency Department (ED) overcrowding, and its effect on ED performance.

Methods The RED Team was established, consisting of clinicians and management with an appropriate mix of authority and expertise. The project was led by three senior ED clinicians, and supported by a project manager and facilitator. The RED Action Plan was constructed, allowing all of the many potential actions to be listed in one document. Each action was categorised under the headings of ‘People’, ‘Processes’, or ‘Plant’, and then graded according to considerations of urgency, importance, and time it would take for the action to be completed.

Results A number of actions were completed under each of the areas of people, processes and plant. The percentage of triage 2 patients who were seen in less than 10 minutes of presentation improved from 46.6% in June 2007 to 77% in May 2009. The percentage of patients leaving the ED within 6 hours of presentation increased from 85.2% in May 2007 to 90.5% in April 2009, despite increased ED presentations.

Conclusions The methodology of Project RED is pragmatic, innovative, comprehensive and prioritised. It incorporates clinical leadership, management support and project facilitation and is a useful structure for addressing the large and complex problem of ED overcrowding.

The Emergency Department (ED) at Christchurch Hospital is the sole Emergency Department in Christchurch and acts as the acute access point for all secondary and tertiary care in the region. It receives in excess of 72,000 attendances yearly, making it one of the busiest in Australasia. Acute General Practice services are well developed in Christchurch, and tend to manage less unwell patients who might have otherwise come to the ED. Consequently the ED sees a patient case mix with a high level of acuity and complexity. This is reflected in the high percentage of patients who attend the ED who are subsequently admitted to hospital (approximately 47%).

At the start of Project RED, (Rejuvenating the ED), the Emergency Department facility was small and the design did not support good processes. It had 23 acute cubicles and some observation beds. Australasian College of Emergency Medicine recommendations suggest Christchurch ED needed 65 cubicles.1

In addition, Christchurch Hospital increasingly found itself in ‘gridlock’—no available inpatient beds. The consequences for the ED were delayed transfer of patients to hospital wards, meaning patients had to stay in the ED for prolonged periods of time and, as patients continued to arrive, many would overflow into the
corridors of the department. The relatively high admission rate made hospital gridlock particularly significant.

These influences placed the department under extreme pressure, leading to severe ED overcrowding, which is associated with significant morbidity and mortality; inconvenience, discomfort, patient delays, longer hospital length of stay (LOS), poorer clinical outcomes, and an increased risk of death. In 2004 the District Health Board-wide ‘Improving the Patient Journey’ Programme (IPJ) was implemented, including an ‘ED operations’ stream, which considered matters of relevance to the ED. However, despite good intentions, the IPJ was not relieving ED overcrowding. The reasons for lack of progress were multiple, but included being overwhelmed by the multiple and complex contributions to ED crowding, such as the number and complexity of patients presenting for care, the ability of the ED to manage this demand (including physical resources, appropriate people, and the right processes) and the ease with which patients can be moved on to the next phase of care (often an inpatient bed).

In each of these three general areas there were many contributors. For example, in relation to moving patients on to the next phase of care, contributors were from high hospital bed occupancy rates, discharge practices, authority to admit acute patients, workloads and priorities of specialist registrars, and so on. The consequences of this were poor prioritisation of actions, difficulty influencing change among non-ED staff, and disillusionment due to lack of tangible progress.

A new approach was needed. The objective of this paper is to describe a unique methodology (Project RED) which successfully addressed many of these problems.

**Methods**

In May 2007 three senior ED clinicians conceived and implemented Project RED. The three clinicians had experience of many EDs internationally, (either as employees or as reviewers for external bodies), and had published on ED overcrowding. The three senior clinicians (the RED leaders), the RED manager and RED facilitator had training in processes such as Lean Thinking, Theory of Constraint and Six Sigma. Throughout the project the Team explored precedents from within New Zealand and overseas.

The overarching principles of the methodology were that the project was; patient focussed, clinician led, management supported, action orientated, prioritised, transparent and accountable.

The methodology categorised the project into people (staff), plant (space and other physical resources) and processes (ways of doing things).

The three senior clinicians established themselves as the RED leaders, and defined terms of reference which encouraged a collaborative decision making process, but explicitly stated the authority of the RED leaders in determining agenda items and as final arbiters of decisions.

The RED Team was established, consisting of the RED leaders, the Chief Executive Officer, the Chief Medical Officer, the Executive Director of Nursing, the General Manager of the Hospital, senior ED clinical and non-clinical staff, senior inpatient clinical staff (medical and nursing), a RED project manager, and a project facilitator. The RED Team met weekly, with meetings chaired by the RED Leaders.

The agenda of the meetings focused on the RED Action Plan, which was divided into the three areas; people, plant and processes. The RED Team populated the plan under these three headings with problems needing to be addressed. ED staff were involved in many of the RED activities (including various working groups), and were canvassed in meetings and surveys to determine what they thought were the problems most needing attention and their perceptions of the likely solutions. Each of the specific problems/actions was graded according to 2 dimensions; urgency (U) (based on assessment of
degree of risk already present because of the problem) and; importance (I) (based on the contribution resolving the problem would make to resolving the risk, and achieving the objectives of the project). Under these two headings (Urgency and Importance) each specific action was graded as either high (H), moderate (M), or low (L) level of urgency or importance.

Specific actions were further graded under the heading of Time (T), according to whether the intended solution was a ‘Quick Fix’ (Q), because of an urgent need for solutions, or whether it would take longer to see results - slower to achieve (S) (or somewhere in between – Q/S).

Some problems were addressed by more than one action with one addressing an urgent need and the other addressing the longer term need, and proceeding in parallel.

The following Action Plan template (Table 1), gives examples (illustrative only) under each major heading.

**Table 1. RED Action Plan example**

<table>
<thead>
<tr>
<th>Work Area</th>
<th>Specific Project</th>
<th>Dimension</th>
<th>What needs to be done?</th>
<th>Who is doing it?</th>
<th>When does it need to be done by?</th>
<th>Progress to date (and other comments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>1. Medical staff urgent recruitment project</td>
<td>H I Q</td>
<td>Advertising for all levels of medical staff</td>
<td>LO</td>
<td>June 8</td>
<td></td>
</tr>
<tr>
<td>Processes</td>
<td>1. Triage 2 waiting time improvement project</td>
<td>H I Q</td>
<td>Triage 2 patients to be registered at bedside, and call to be made over tannoy.</td>
<td>AE</td>
<td>June 15</td>
<td></td>
</tr>
<tr>
<td>Plant</td>
<td>1. Waiting room to be reconfigured to allow better flow to triage, and greater observation of waiting patients</td>
<td>M H Q/S</td>
<td>Move triage desk to south east corner, with clear ‘track’ and signage.</td>
<td>RO</td>
<td>Sept 12</td>
<td></td>
</tr>
</tbody>
</table>

**Key:** U=urgency, I=importance, T=time, H=high, M=medium, L=low, Q=quick, S=slow, LO, AE, RO etc are illustrative examples of individual’s initials.

The first Action Plan was large, consisting of many pages of concentrated actions. Initially, with so many things needing to be done, the project concentrated almost exclusively on the ‘HHQs’ (High Urgency, High Importance, and Quick to achieve). Once tangible achievements ensued, work was able to begin on some of the ‘HHS’ actions, particularly major developments in relation to Plant and People. The RED Leaders needed to ensure other worthy, but less important actions according to the prioritisation methodology, did not distract efforts from the ‘high importance’, ‘high urgency’ actions.

For reasons of transparency and accountability, the RED methodology included a comprehensive communication process. The RED Action Plan, updated weekly, was posted on ED notice-boards. Verbal RED reports were given to ED Senior Doctor and Senior Nurse meetings and the RED leaders held monthly ED all-staff forums. Project RED updates became standing items for reporting at weekly Christchurch Hospital Management Group Meetings and monthly summary reports went to the Hospital Advisory Committee (HAC). The HAC papers were publicly accessible and were commonly reported in local newspapers. In addition, occasional (approximately 3 monthly) reports were published, in purchased space, in the two main local newspapers.

The regular, two way communication with all ED staff was essential to receive their useful input, but also to maintain their confidence that the things they considered important were being taken seriously.
The public airing of progress was important for two reasons. First, it enhanced public confidence in hospital services. However, the main reason for regular, detailed publication of progress was to maintain leverage within the institution. Although management and clinical colleagues soon supported both the intent and the methodology of Project RED, the RED Leaders considered they might have had less initial traction without this scrutiny.

In addition to weekly meetings of the RED Team, the RED leaders, the RED Manager and Facilitator met weekly to ensure the implementation and currency of the Action Plan. Furthermore, a team of ED staff called the ‘Lean Team’, met weekly to progress improvements in processes within the ED using Lean Thinking, and similar, principles.

Pre-existing process improvement activities in the ED were linked to, or incorporated in, the greater Project RED methodology.

The actions achieved were collated and two key process measures were defined prospectively, based on a perception that these were important, that the ED needed to improve them, that they were easy to measure, and that the data was reliable. These were; waiting time for triage 2 (T2) patients to see a doctor and; percentage of patients being admitted to a ward or discharged home (leaving the ED) within 6 hours of presentation to the ED (6hr%).

The ED uses the Australasian Triage Scale, which categorises patients into 5 urgency categories, with triage category 1 the most urgent, and triage category 5 the least urgent. Waiting times for category 1 patients were considered to be good (there are relatively few category 1 patients and they tend to be seen immediately), but T2 waiting times were an issue of concern.

ED LOS is the time from first contact with an ED staff member (usually a triage nurse) to time of departure from the ED. It is considered a useful measure because it reflects the ability of the hospital to accommodate ED patients, in addition to efficiency within the ED.

This paper reports high level data recorded as part of quality improvement process, with no identifiable nor new data collected for the purpose of the paper. Consequently, the authors considered it met the criteria for exemption from formal review by a regional ethics committee.

Results

People—Under the heading of ‘People’ projects included; staff task mapping, new staff types/roles, increased seniority and education of nurses, team nursing with designated team leaders on each shift, team rostering and greater seniority of medical workforce. Specific outcomes from these projects included redefined roles for all staff, more specialist medical staff, more nursing staff, a Nurse Educator, additional Hospital Aides (Clinical Support), additional administrative (Clerical Support) and a Pathways Facilitator.

The staff task mapping project mapped all the tasks required in the ED, attributed them to existing staff groups and then identified which ones could be done by other staff types. From this came a new workforce model which saw the development of two new staff groups in the ED; clinical support staff (to undertake tasks with patients, such as preparing patients for assessment and moving them about, previously undertaken by nursing staff), and clerical support staff (to perform paper, computer and telephone work previously done by nurses and doctors).

The medical roster was changed to ‘team rosters,’ and nursing team leaders were assigned to each area of the ED, ensuring appropriate seniority, greater teamwork and camaraderie.

The medical workforce model included a more senior workforce with more Medical Officers and Specialists to enhance patient safety and efficiency. A Pathways Coordinator was appointed to develop and implement clinical pathways in the ED, to reduce variation in practice and facilitate patient flow.
Processes—‘Process’ work included projects on: ED models of care, shift management standards, ED ‘overload planning’, a variety of lean thinking activities, rapid assessment and treatment processes, consultant ‘front loaded decision making’, clinical pathways development and implementation, and enhanced communication and professionalism.

The ‘models of care’ of the department define where patients go in the ED after presentation and triage (known as ‘streaming’), what happens in those areas, what staff are there to see them and how long it should take before the patient can go home or be transferred to a ward. The Shift Management Standards gave succinct and practical guidance to staff, so that the Models of Care were manifest in daily practice.

The ED Overload Plan (EDOD Plan) was a contingency plan which defined the response to circumstances when the ED was becoming overwhelmed. The plan included capacity plans for the two main areas of the ED, pre-emptive responses to increasing workload, and a scoring template for the status of the ED, giving points to various contributors to crowding/overload.

Staff were trained in Lean Thinking and similar methodologies and the ‘Lean Team’ met regularly to implement process improvement projects in the ED, including establishing working groups involving a large proportion of the staff, who contributed with enthusiasm.

Nurse initiated interventions included many more assessments, treatments such as analgesia and asthma medications, and complete care of some patient groups (for example, those with minor wounds). A variety of innovations to treat patients in a more timely manner had been trialled in the ED. One of these is the use of a ‘Rapid Assessment and Treatment’ (RAT) process. This process formed part of the ED ‘Models of Care’, streaming patients from triage to a ‘Rapid Assessment and Treatment’ pathway. There is local evidence that such a process not only improves timeliness of treatment for these patients but for all patients in the ED who are no longer sharing a queue with these patients10.

To encourage senior medical input early in patient care a process of ‘Consultant Front Loaded Decision Making’ encouraged an initial assessment by an SMO to outline a plan for further assessment and management.

Variation in practice contributes to delays and inefficiencies as ‘obvious’ steps in the patient’s care wait for the decisions of individual clinicians. Clinical Pathways standardise care (in keeping with principles of Six Sigma) and bring efficiencies by enabling prompt movement to the next phase of care. In addition, they enhance the quality of care by ensuring key steps are considered and appropriate clinical guidance is given (including the appropriate and efficient use of investigations, such as blood tests, x-rays and scans). The new Pathways Facilitator implemented six pathways, and a further 13 were under development according to a process for pathways development.

Plant—Projects under the heading ‘plant’ included; reconfiguration of the waiting room to enhance flow and observation of waiting patients and expansion of the ED to improve functionality and capacity. An early ‘plant’ success was a simple reconfiguration of the Waiting Room, improving intuitive access to the Triage Nurse.
and improving observation of waiting patients. A ‘quick’ plant action converted observation beds to ED cubicles, increasing the number of cubicles.

A more significant ‘plant’ project was to enhance the physical capacity of the ED. Within less than a year plans were developed, the business case was presented and approved, and building was commenced and completed. The plans for the ED enhancements were limited by the constraints of the current building and designed to allow the best application of the ‘Models of Care’, (function defines form). The outcome was a department with a total of 45 cubicles, and 10 observation cubicles.

Triage 2 waiting times and 6-hour length of stay outcomes. Improvements in T2 waiting times are presented in Figure 1, and 6h% in Figure 2. Triage 2 patients are the second most urgent category of patients attending the ED, and the target performance measure is that 80% should be seen by a doctor within 10 minutes of arrival. Prior to the start of Project RED, less than 50% were seen within 10 minutes. By May 2009, 77% were seen within 10 minutes.

Figure 1. Percentage of Triage 2 patients seen within 10 minutes
Length of stay in the ED (from time of arrival to time of discharge home, admission to a ward, or transfer to another department) is an important measure, as it reflects the total time taken to complete the ED phase of patient care. It is a better measure of ‘whole of system’ efficiency than triage waiting times, as it is strongly influenced by hospital gridlock (when beds are not available for patients to be admitted they wait in the ED). Very long stays in the ED (over 12 hours) happen particularly when the hospital is in ‘gridlock’, and especially in winter. The number of patients who spent over 12 hours in the ED reduced from about 60 per week in the winter of 2007 to about 25 per week in the winter of 2009.

While the length of stay performance shows less improvement than T2 times, maintenance of performance is impressive against increasing demand and persisting hospital gridlock. At the start of Project RED the ED was seeing an average of 200 patients per day. In June 2009 the average daily attendance had climbed to 224.

Discussion

The vision of Project RED was to develop and implement an innovative and comprehensive methodology able to address the multiple and complex contributors to ED overcrowding.

The novel structure of Project RED, based around the RED Team and the RED Action Plan, was key to its success. The methodology has been copied locally and has influenced the methodology of other hospitals.

Because of the many and varied contributions to ED overcrowding there are many actions possible in response. Isolated, misguided, or poorly conceived actions, albeit with the best of intentions, often will not bring about the hoped for outcomes. Instead, fruitless efforts of this type will frustrate and disillusion. It is essential to have a clear
understanding of where the problems sit among the other contributors, and to place solutions in the context of a master plan. Work towards resolving the complexity of the problems, across all parts of the patient journey (including those parts outside the ED) requires good collaboration of clinicians and management, and ‘buy in’ from all staff.

We believe the Project RED structure achieved meaningful clinical leadership, with ownership and authority, ‘buy in’ by all clinical staff because of this leadership, genuine collaboration between clinicians and management towards achieving agreed, common goals, healthy and constructive debate, transparency and accountability.

The RED Action Plan is comprehensive, with all the required actions listed in one document, so that the extent of the issues is explicit and there is limited opportunity for ‘new’ concerns to surprise, ‘hijack’ a meeting, or distract from other priorities. Categorisation into the three areas of People, Plant and Processes, established the relationships between areas of work, helped prioritise the actions, and helped identify further actions not previously considered.

Grading each action in Urgency, Importance and Time categories clearly established priorities within, and between the work areas, so that the right things were done at the right time. Recording progress of each action on the action plan, against a projected timeline, ensured actions did not get ignored or falter, and recording of the people responsible for each action encouraged accountability and ensured actions did not ‘fall between the stools’.

The ultimate objective of Project RED was to improve the performance of Christchurch Hospital Emergency Department, by encouraging high standards of clinical care, improving patient flow, reducing waiting times and resolving overcrowding. The ED’s improvements in performance in waiting times and length of stay suggest progress towards this objective.

However, it is conceded that the process measures reported are surrogates for real success, and improved patient experience and clinical outcomes are the real goals. However, good, reliable and comparable data from prior to Project RED was not available for this purpose, and would be influenced by confounders in a non-randomised, uncontrolled study of this sort. While difficult to measure and report, there is a tangible improvement in staff morale subsequent to Project RED. The authors believe patients are better off, because they are seen earlier (as demonstrated by the improvements in waiting times), are cared for in new, well equipped cubicles (not in corridors) and get to their definitive destination (home or ward) more quickly. The medical and nursing input into their care is more senior and care, in general, is more consistent due to the influence of clinical pathways, the models of care and the shift management guidelines. However, this belief cannot be proven with good experience or outcome data, as this data was not collected in a form allowing a useful comparison.

As part of Project RED, the ‘time’ measures are being broken down for different patient groups (for example, admitted versus discharged) and for different parts of the patient journey (for example, time waiting for a test result, time waiting to be transferred to a bed etc). These analyses will allow targeted projects to improve timeliness.
A significant threat to success is persisting hospital ‘gridlock’. While the performance measure ‘waiting time by triage category’ is largely controlled by the ED, the measure ‘length of stay in the ED’ is heavily influenced (for the nearly half of our patients who are admitted) by the availability of hospital beds – something the ED does not control. It is apparent that the improvement in waiting time for triage 2 patients has been more impressive than the 6 hour length of stay figures, because hospital gridlock is less influenced by Project RED. However, it is important to note that maintaining the length of stay figures at this high level, despite more patients coming in, higher acuity of patients, and increasing frequency and degree of hospital gridlock, is an impressive result.

The three elements of clinical leadership, management support and project facilitation were essential for success of Project RED.

The Project RED methodology explicitly prioritised actions. However, effort was required to ensure ‘good ideas’ or opportunistic ‘tags on’, although often worthy in their own right, did not distract from the highest priorities.

Progress often demands a linear process of demonstration of need, presentation of the case for need (including a detailed business case) and then investment to meet the need. The Project RED methodology encouraged parallel processes, and the support of senior management was essential to progress some matters on the basis of ‘good faith’.

Although Project RED considered important issues beyond the ED it was less able to influence change there, and this is a deficiency of the methodology for resolving ED overcrowding. Since the influence of Project RED, explicit work in relation to acute demand and hospital capacity has occurred. In July 2009 New Zealand adopted a new national health target; Shorter Stays in the Emergency Department, defined as; 95% of patients will be admitted, discharged or transferred from the ED within 6 hours of presentation. The New Zealand Ministry of Health has provided to District Health Boards a recommended approach to pursuit of the target strongly influenced by the Project RED methodology, but including prioritised actions in the areas of the patient journey pre and post ED, as well as in the ED itself.12

Competing interests: None.

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10. Ardagh M. Hart S, Lyons R, Cooper K. Effect of a rapid assessment clinic on the waiting time to be seen by a doctor and the time spent in the department, for patients presenting to an urban emergency department: a controlled prospective trial. NZ Med J 2002;115 (1157): U28
Improving acute patient flow and resolving emergency department overcrowding in New Zealand hospitals—the major challenges and the promising initiatives

Mike Ardagh, Gary Tonkin, Clare Possenniskie

Abstract

Aim To determine the most common challenges to improving acute patient flow and resolving emergency department (ED) overcrowding in New Zealand hospitals, and to share some of the promising initiatives that have been implemented in response to them.

Methods To facilitate progress towards achievement of the Shorter Stays in Emergency Departments Health Target (the Target), the authors visited every District Health Board (DHB) in New Zealand. These visits followed a standardised visit format and subsequent to each visit a report was produced that noted the observed challenges, initiatives and successes in relation to the DHB’s pursuit of the Target. Using these reports, the significant challenges and the promising initiatives across all of the DHBs were collated.

Results Access to hospital beds, access to diagnostic tests and inpatient team delays were the most common challenges, followed by increased demand for ED services, ED facility deficiencies, ED staff deficiencies, delay to discharge of inpatients, difficulty engaging hospital clinical staff in changes, difficulty accessing aged care beds, and problems at nights and weekends. Promising initiatives were noted in relation to each of these.

Conclusions To improve acute care, resolve ED overcrowding and achieve the Target we need a comprehensive, whole of system approach and some significant changes to the way we use our physical and human resources. To address common challenges we need to share our experiences and expertise.

When hospitals fail to cope with demands for acute care one manifestation is overcrowding of the emergency department (ED). ED overcrowding is associated with a number of adverse consequences, including patient deaths.1–6

In response to concerns about ED overcrowding7 and pressure for more focus on acute care (including the recommendations of the Working Group for Achieving Quality in Emergency Departments8), on 1 July 2009 ‘Shorter Stays in Emergency Departments’ (the Target) became one of six national Health Targets in New Zealand. The Target is defined as ‘95% of patients will be admitted, discharged or transferred from an emergency department within 6 hours’.

At the time of this study New Zealand had 21 District Health Boards (DHBs) which plan, manage, provide and purchase health services for the population of their district.9 Administered by these DHBs are 28 hospitals with EDs of appropriate role delineation (level three and above)10 to be subject to the Target.
A small team was formed in the Ministry (the three authors) to facilitate and lead progress towards the Target. As part of this, a priority activity for the team during the first year was to visit each DHB to gain an understanding of their specific challenges and successes in relation to the Target. In addition, the team reviewed documentation from each DHB including a ‘Delivery Plan for achieving Shorter Stays in ED’. The delivery plans were intended to be comprehensive, prioritised, ‘whole of system’ plans detailing the DHB’s challenges and how they intended to overcome them.11

The visits and associated information from DHBs provided a unique national overview of the challenges facing DHBs in their pursuit of better acute care, the resolution of ED overcrowding, and consequent achievement of the Target. The aim of this study was to collate the 10 most common challenges and discuss how DHBs are addressing them.

Methods
All DHBs were visited between 1 July 2009 and 1 July 2010. The visits were attended by the National Clinical Director of ED Services (MA) and one or both of the two other members of the Shorter Stays in ED team (GT and/or CP). The visits took a standardised format which included an initial meeting with senior clinicians and managers to discuss the purpose of the visit and general issues related to the Target. This was followed by meetings with ED staff (doctors, nurses and others), staff responsible for hospital bed management and patient flow clinical staff from in-patient specialities and primary care representatives in some instances, to discuss their perspectives of the challenges and the successful initiatives.

Tours of the ED and in-patient facilities enhanced understanding of local issues, and the visit concluded with a final meeting with senior clinicians and managers to discuss the visitors’ impressions and to verify their accuracy. Following the visit a standardised report was constructed with sections describing general conclusions, structure and leadership, specific project components, (for example, ‘pre-load’, ‘contractility’ and ‘after-load’11), specific initiatives at the DHB (for example, Medical Assessment and Planning Unit, acute care pathways, and so on), and finishing with recommendations and agreed actions. These sections recorded both the challenges to achieve the Target and the promising initiatives.

The reports were sent to the DHBs for review and feedback prior to finalising.

The reports of the 21 DHB visits were reviewed by the National Clinical Director of ED Services (MA) and challenges were recorded as present for a DHB whenever they were noted in the report as being significant.

The data was recorded for all DHBs and subcategorised by the seven smallest, seven medium sized, and seven largest DHBs. The size of the DHB was determined by the number of ED presentations in quarter four of 2009/10 (1 April–30 June 2010).

A general list of promising initiatives was constructed based on initiatives already demonstrating success, or initiatives promising to be successful because of experience of similar initiatives elsewhere, and/or initiatives focused on good analysis of the causes and contributors to the challenges (i.e. good ‘diagnostics’, particularly including ‘lean thinking’ methodologies).

Results
The top 10 challenges are presented in Table 1.
Table 1. The top 10 challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>All DHBs (21)</th>
<th>Small DHBs (7)</th>
<th>Medium DHBs (7)</th>
<th>Large DHBs (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1= Access to hospital beds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No bed</td>
<td>15</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>No bed and delays in bed ordering/transfer</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1= Access to diagnostic tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT scanning</td>
<td>15</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1= Inpatient team delays</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay to registrar attending ED to see patient</td>
<td>15</td>
<td>3</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Delay to registrar attending ED and delay to</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>registrar decision-making</td>
<td>8</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Increased demand for ED services</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Increased ‘minor’ patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5= ED facility deficiencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too small</td>
<td>12</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Poor layout</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Both too small and poor layout</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5= ED staff deficiencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMOs</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>RMOS</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Both SMOs and RMOS</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nurses</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7= Delays to discharge of inpatients</td>
<td>11</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10 Nights and weekends</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Of the 15 DHBs which noted access to hospital beds as a barrier, all 15 recorded delays because there was ‘no available bed’ and four DHBs also noted delays getting the patient into a bed even when available. Occasionally ‘no available bed’ meant ‘no suitable bed available’, for example if the patient needed isolation in a single room because of an infectious illness.

Lower in the table is ‘delay to discharge of inpatients’ noted by 11 DHBs, and ‘difficulty accessing aged care beds’ noted by seven DHBs. Both of these might be considered related to ‘access to hospital bed’. If considered together this grouping is alone in first place as the greatest challenge for DHBs.

Access to diagnostic tests were mostly due to delayed access to computed tomography (CT) scanning (nine DHBs) with six DHBs noting delays to other tests, mostly ultrasound scanning. Access to plain radiology and blood and other laboratory tests were not considered significant in causing delays.

Inpatient team delays were noted by 15 DHBs, all of which noted a delay to the registrar coming to the ED and eight also noted a delay to registrar decision-making once there.

Close behind the top three challenges was increased demand for ED services, noted by 14 DHBs, with eight of these noting an increase in ‘minor’ patients.
ED facility deficiencies (too small and/or poor layout) and ED staff deficiencies (particularly medical staff deficiencies) were next on the list of barriers, with difficulty engaging hospital clinical staff in changes, and problems at night and weekends completing the top 10. The nature of recording the challenges and the small numbers in the subgroups precludes an analysis of statistical significance, but some challenges showed a trend of relationship to DHB size. While no challenge was peculiar to DHBs of a particular size, access to hospital beds, inpatient team delays, ED facility deficiencies, delay to discharge of inpatients, difficulty engaging hospital clinical staff in changes, and problems at night and weekends seemed to be more common the larger the DHB.

Table 2 presents generalised descriptions of the more promising initiatives witnessed during the DHB visits. These are discussed further in the discussion section below.

Table 2. Promising initiatives

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special beds</td>
<td>Creation of ED observation units and inpatient assessment units so that patients with a particular need, for example further observation or treatment by ED staff to achieve discharge or ‘work up’ by inpatient teams, have that need fulfilled in a space well suited to that purpose.</td>
</tr>
<tr>
<td>Hospital Operations Planning</td>
<td>Dedicated and sophisticated daily hospital operations planning to enhance the use of the human and physical resource, and to improve patient flow between the ED and inpatient wards.</td>
</tr>
<tr>
<td>Discharge planning</td>
<td>Good discharge planning, beginning early with multidisciplinary input and as a particular focus of daily activities to reduce unnecessary patient waits and free hospital capacity.</td>
</tr>
<tr>
<td>Access to imaging</td>
<td>Guidelines and pathways for accessing imaging and a responsive service for the provision of both images and expert interpretation.</td>
</tr>
<tr>
<td>Responsive acute secondary services</td>
<td>Separation of acute and elective medical roster conflicts so that the availability of inpatient specialties is adequate to enable the hospital to provide a responsive acute service.</td>
</tr>
<tr>
<td>Pathways for acute patients</td>
<td>Pathways or agreements so that patients with common and relatively straightforward presentations, for example fractured neck of femur, can be transferred to the ward without having to wait in the ED for an inpatient registrar assessment.</td>
</tr>
<tr>
<td>Acute demand mitigation</td>
<td>Analysis of the drivers of increased demand for acute services and interventions to mitigate this demand.</td>
</tr>
<tr>
<td>Enhanced ED layout</td>
<td>Layout of EDs to enhance function, including ‘streaming’ of patients and good ‘command and control’.</td>
</tr>
<tr>
<td>Enhanced ED senior staffing</td>
<td>A greater senior staff presence to enhance decision-making and overview of department activities.</td>
</tr>
<tr>
<td>Engagement of staff</td>
<td>Engagement of all staff by ‘marketing’ changes with an appropriate whole of system and patient focused emphasis.</td>
</tr>
</tbody>
</table>

Discussion

This study is unique, providing a comprehensive national overview of the challenges facing our hospitals in the pursuit of improved acute care. However, the nature of the methodology can mean the findings are indicative only. They were the insightful opinions of those spoken to during the DHB visits, although these were usually based
on significant analysis of patient flow and performance. Most DHBs shared charts, graphs and documents supporting the opinions expressed, although the evidence base for them cannot be assured.

Those spoken to during the visits were broadly representative of the acute care system but indisputably with a bias towards staff associated with the ED. Management staff and those responsible for bed management were well represented, and ward based nursing staff generally had good input. Inpatient medical staff, general practitioners and resident medical officers were usually under-represented.

In addition, the challenges presented were ranked according to how many DHBs saw them as being important and not how relatively large an issue they were. Hence, a challenge ranked lower by this methodology might be more significant because of the number of patients it affects or the extent of the delay it causes.

The results are a stimulus for discussion and in particular, for exploration of appropriate ways to address these challenges. To this end, the remainder of this discussion will briefly recount the authors’ experience of initiatives seen during the visits. More detail and further opportunity for sharing are to be found on the Health Improvement and Innovation Resource Centre (HIIRC) website which has a section on the Target.12

Of particular note is that most of the top 10 challenges, including the top three, relate to issues in the patient journey outside the control of the ED, reinforcing the understanding that improving acute care, resolving ED overcrowding and achieving the Target requires effort across the whole of the patient pathway. This finding reinforces the need for a whole of system structure, with clear leadership and responsibilities, and with a comprehensive (so important things are not missed out), and prioritised (so the most important things are addressed first), plan for progressing improvements in acute care.11

Access to hospital beds, particularly when combined with delay to discharge of inpatients and the related subset barrier of difficulty accessing aged care beds, is the biggest challenge nationally. Discussion in relation to this issue included consideration of an optimal occupancy of hospitals. There is some evidence that hospital occupancy of around 85% allows optimal flow.13 Debate about measuring occupancy, (which beds should be counted, whether beds without a nurse are counted, at what time of the day should occupancy be measured, and so on), and concerns that extra capacity, if acquired, would soon be filled, have distracted from the key understanding—that there needs to be some spare capacity, existing or readily mobilised, so that patients can move to the right bed when ready to go.

DHBs have created capacity by investing in additional capacity or by freeing up existing capacity, or a combination of the two. A number of DHBs have examined their bed stock and have redistributed beds among speciality groups and/or have increased capacity. Many have invested in beds with a specific function, for example inpatient assessment and planning or ED observation, thereby enhancing bed stock but also (ideally) enhancing the efficiency of use of the beds. Guidance on the use of ED observation and inpatient assessment units is available.14

Hospital bed management in New Zealand is variable. Many DHBs are using predictive demand tools and attempting to match capacity to demand as a
consequence. A number of DHBs have ‘overcapacity’ or ‘gridlock’ plans intended to mobilise capacity or minimise the risk to patients when the hospital is over occupied. Most DHBs have enhanced daily operational bed management through holding daily meetings, while some are developing sophisticated operations facilities based on precedents in other industries, such as airlines, with promising early anecdotal results.

Many DHBs have introduced programmes such as ‘Releasing Time to Care: The Productive Ward’, which include modules enhancing discharge planning including the use of ‘journey boards’ and multidisciplinary team meetings. Some DHBs are advancing criteria based discharge, some have dedicated a nursing resource to discharging patients, and some are using regular ‘rapid rounds’ with a focus on enhancing decision-making. DHBs reported mixed results from the use of discharge/transit lounges.

Good discharge planning that begins early with multidisciplinary input and as a particular focus of daily activities was considered important to reduce unnecessary patient delays and free hospital capacity.

Difficult access to aged care beds prevents the discharge of some patients. Capacity shortages in aged care facilities, and a lack of cohesion between the hospital and aged care facilities, were two common contributors noted. Some DHBs also described behaviours, such as a reluctance to receive patients in aged care facilities at any time other than early on a weekday, as also being contributory. Good access to aged care facilities was considered to be an important component of a ‘whole of system’ response.

Access to diagnostic tests, and particularly CT scanning, is next on the list. Some DHBs are constructing mutually agreed guidelines which describe when CT scans and other tests are warranted for particular patient groups. The Australasian College for Emergency Medicine and the Royal Australian and New Zealand College of Radiologists are soon to publish agreed guidelines for imaging in acute care. These guidelines should be very influential for practice in New Zealand. In addition, some DHBs have embarked on significant process improvement initiatives within their Radiology Departments to enhance access to acute imaging and the rapid provision of expert reports on images.

Guidelines and pathways for accessing imaging, and a responsive service for the provision of both images and expert interpretation, were considered to be important initiatives for removing unnecessary delays in this part of the patient journey.

‘Inpatient team delays’ was one of the top three barriers and mostly referred to a delay in the inpatient registrar attending the ED. In the majority of DHBs, with most patient groups, a patient could not be transferred to a bed, or have a bed organised in anticipation, until the inpatient registrar had given approval to do so. This practice persisted even if a senior ED doctor had determined that admission was required and the registrar giving approval to admit was considerably more junior. Frequently an additional step of ‘clerking’ the patient by the inpatient house officer was interposed between the ED referral to the inpatient team and the registrar approval to admit.

Some commentators thought these steps were unnecessary and caused long and uncomfortable waits for patients, ED overcrowding, and conflict when busy inpatient registrars were ‘hassled’ by ED staff to see their patients. Many thought the additional
assessment in the ED seldom added value to patient care. However, others were of the view that the practice needs to continue for reasons of safety (an incompletely ‘packaged’ patient might deteriorate on the wards where there are neither the doctors nor the facilities required to rescue them), convenience (it is usually harder to assess a patient and get diagnostic tests performed on a general ward), and appropriateness (the patient might end up under the wrong team).

While the traditional practice of inpatient registrar assessment in the ED is causing delays, some were concerned the Target could encourage a swing to the other extreme—all patients will be transferred to the ward without inpatient registrar assessment in the ED when the clock ticks past a certain time.

A ‘middle ground’ was generally thought to be best for patients. For a large proportion of patients, although not all, if the right things are done in the ED by the right people they can be safely, conveniently and appropriately transferred to the ward without an assessment in the ED by the inpatient team. There they can wait in relative comfort and quiet, with dedicated nursing oversight, and without contributing to ED overcrowding and all the harms that ensue. However, other patients who will benefit from staying in the ED for reasons of clinical safety, or because that is the best place for them to have further diagnostic workup, should stay in the ED until these needs are met, regardless of their length of stay.

For General Medical patients, the use of Medical Assessment and Planning Units (MAPUs) allows a space for the registrar assessment of the patient which is well suited to this purpose (much more so than an ED corridor, or a general ward in the middle of the night), and which is equipped to address issues of safety and convenience.

It was noted that delays for inpatient registrar attendance in the ED were common among the surgical specialities, mostly because the registrars were busy elsewhere. Registrars were sometimes engaged in elective theatre lists or outpatient clinics while also being rostered to attend ED if required. Many DHBs are responding to this by separating acute and elective commitments, either with dedicated elective surgery centres or by separating acute and elective rosters, thereby enhancing the provision of a responsive service for acute surgery and its subspecialties.

Pathways for patients with fractured neck of femur are almost ubiquitous in our DHBs, allowing movement of the patient to the ward without orthopaedic registrar review in the ED once an agreed set of interventions has occurred. Some DHBs have produced pathways with similar objectives for other patient groups. It was considered that there is great potential for pathways of this type to apply to a large number of patient groups, from finger flexor tendon lacerations to pneumonia with a particular severity score.

The production of pathways has the additional benefits of standardising diagnostic test ordering (as discussed above), enhancing decision-making particularly among junior medical staff, providing clinical information based on evidence and accepted practice, and reducing conflict over patient referrals by stating an institutional agreement. While such pathways will need to be locally relevant, there is great opportunity to share efforts and learnings through existing relationships and the HIIRC website.
Close behind the top three challenges is increased demand for ED services, which many DHBs claimed was hiding progress made in other areas. Despite 14 DHBs raising this concern many had done little or no analysis of ED attenders to attempt to ascertain the drivers of increased demand, and only a few had instituted initiatives to mitigate demand. Initiatives included enhanced allied health intervention to prevent admissions, greater access to diagnostics in the community and management of conditions such as cellulitis and deep venous thrombosis in the home.

ED facility deficiencies (too small and/or poor layout) and ED staff deficiencies (particularly medical staff deficiencies) are among the top 10 challenges.

The experience of EDs around New Zealand suggests that increased size alone is not the solution to ED overcrowding. Although greater capacity is often justified, it needs to be designed to match an appropriate model of care. In particular, it was considered beneficial to have a layout which allows ‘streaming’ of patients (triaging them to an area that suits their needs), and ‘command and control’ including good oversight and responsibility for all patients so that they are kept safe, but also to understand and advocate for their needs including facilitating progress through the stages of care.

Often good command and control was achieved by giving staff responsibility for an area of the ED, ensuring clear lines of communication when concerned about patients, and having nursing and medical leadership on a shift with explicit responsibility for oversight of patient flow and distribution of the human resource in response to fluctuating demand in different areas of the ED. With clarity of the functional layout of the department, and the ‘command and control’ relationships and responsibilities of staff on a shift defined, the required number and type of staff becomes dictated by the needs of a roster to achieve this.

Many DHBs have increased senior staffing of the ED to enhance the quality and safety of clinical care in the ED and to enhance ED decision-making.

Difficulty engaging hospital clinical staff in changes was a common concern and was largely seen to be a consequence of the perceived ED-centric nature of the Target. Smaller DHBs seemed to engage staff more easily, but a few of the larger DHBs (one very successfully) have ‘marketed’ the work in a way which promotes the whole of system brief, the intention to enhance the quality of patient care, and the responsibility of all staff to contribute.

Finally, problems at night and weekends completes the top 10. This category included a number of the problems already discussed, which are more pronounced at night and weekends, for example, fewer and more junior staff, delayed decision-making, fewer inpatient registrars on site further delaying inpatient assessment, and poorer access to diagnostics.

Weekend shifts are typically busy in EDs, but hospitals usually have skeletal staffing and reduced access to services. Continuing acute admissions over the weekend, combined with significantly fewer discharges, meant that many of our hospitals started the week with little or no bed capacity. Mondays are typically one of the ED’s busiest days with a high admission rate due to the case mix mobilised after the weekend. It was considered that hospital flow could be greatly improved if activities over the weekend were increased to a level similar to that provided during weekdays.
Although bed availability was not a specific night time concern, transfer to the ward at night was delayed by all the other challenges, and by concern that patients were less safe in the wards at night. At the start of the day shift a number of EDs often have a large accumulation of patients remaining from the night shift. All EDs have an influx of patients starting between 10am and midday and continuing into late afternoon or evening. If this influx is superimposed on a full ED, and particularly if discharges on the wards are not occurring until late in the day to free up beds for new patients, the ED will suffer severe overcrowding.

At least one DHB had addressed this by rostering senior doctors over the night shift, while others were using observation beds to accommodate patients who might go home in the morning (particularly the elderly after falls).

While it was considered inappropriate to have the same access to all services at nights, (demand is less, a daytime service needs to be maintained and many non-urgent interventions are less safely performed at night), it was apparent that our hospitals need to augment acute services at night. An elderly patient spending the night on a hard stretcher, in a bright and noisy ED, scantily clad in public view, simply because the ward does not take admissions at night, or there is no orthopaedic registrar on site, or a CT scan cannot be accessed, or there is insufficient medical seniority to make a decision, is poor care.

Consequent to their limitations, the top 10 challenges presented should not be considered the definitive top 10 in terms of content or ranking. However, the list is based on a significant consensus of many people involved in acute care, informed by experience and local analysis, and representing small, medium and large hospitals from the length and breadth of New Zealand. Hence, they should not be ignored.

Progress towards addressing some of them is excellent in places, but piecemeal nationally, but with a general consensus that significant momentum had been gained since the institution of the Target. It is hoped that this paper will encourage consideration and discussion of the challenges to improving acute care, and the sharing of thoughts and solutions in various forums.

Competing interests: None.

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References:


Emergency nurse practitioners: do they provide an effective service in managing minor injuries, compared to emergency medicine registrars?

Margaret Colligan, Caroline Collins, Bernard Foley, Peter Jones, Jennifer Miles, Irene Zeng

Abstract

Aim To determine whether emergency nurse practitioners (ENPs) are as equivalent to emergency medicine (EM) registrars in minor injury management in a New Zealand environment.

Method A Prospective observational audit (chart review) of a non-consecutive cohort of patients with minor trauma was conducted. The primary outcome measure was length of stay. The secondary outcome measures were: time waiting to be seen, number of unexpected returns, missed injury rate and the number of patients who left the department without being seen. Data was analysed using standard statistical methods using Statview v5.0 (SAS) software.

Results 420 patients were included; ENP group n=305, EM registrar group n=115. The ENPs, saw more males (70% versus 59%, p=0.03), younger (30 years versus 41 years, p=0.0004) and lower acuity patients (p<0.0001). After adjustment for age, gender and acuity, median ED length of stay was longer in EM registrar group by 40 minutes, p<0.0001, and the time to be seen was longer in the EM registrar group by 36 minutes, p<0.0001. Treatment times were equivalent. The missed fracture rate was 1% in both groups. The unexpected return rate was 2% in the ENP group and 1% in the EM registrar group. Left without being seen rate was 5%.

Conclusion ENPs appear to “sign on” to see minor injury patients faster than EM registrars, which may account for the reduced length of stay for ENP treated patients.

Recently the Emergency Nurse Practitioner role (ENP) role has been developed in Auckland City Hospital (ACH). The requirements for registration with the Nursing Council of New Zealand as an NP is Masters in Nursing degree with at least 5 years experience in the particular specialty of practice. The ENP scope of practice focuses on patients with lower acuity injuries and illness (those usually triaged at Triage category 3, 4, and 5). Also uncomplicated injuries and illness that are assessed, diagnosed, treated and discharged, and specific patient groups with complicated injuries or illness that benefit from early diagnosis and referral to inpatient specialty services.

The Adult Emergency Department (ED) at ACH employs the first two ENPs in New Zealand. This study provided an opportunity to review their impact on service provision within the department.

A systematic literature review of electronic databases: the Cochrane Database of Systematic Reviews, CENTRAL, Medline and CINAHL, using a combination of
MeSH and free-text was conducted. Basic terms were: ENP or Emergency Nurse Practitioner or CNS or Clinical Nurse Specialist and Emergency Department, advanced emergency practice, length of stay and waiting times.

Twenty one relevant articles from the Australia, UK, USA and Europe were found. The majority of these were descriptive with only three randomised controlled trials (RCT) and five prospective studies. Overall, it is apparent that there is a role for nurses with extended skills in managing the minor injury population; and that they are effective in reduced length of stay (LOS) and provide good patient satisfaction when surveyed.1–3

However, these studies have had small sample numbers, limited clinical scenarios observed and a range of outcomes assessed. Nursing personnel have had a wide variety of titles, qualifications, skills and job descriptions, consequently comparisons between countries are difficult. Our aims were to determine if ENPs were as effective as Emergency Medicine Registrars (EMR), in managing minor injuries in a New Zealand setting. The primary outcome was LOS in the ED. The secondary outcomes were time to being seen (TBS) by a clinician, unexpected return to the ED, missed fracture rate and number of patients who left without being seen.

Methods

Design—Prospective observational chart review of a non-consecutive cohort of patients with minor trauma.

Setting—Auckland City Hospital ED, 1 February to 5 April 2008 inclusive. The ED sees an annual census of 45,000 patients with a 35% admission rate.

Inclusion criteria—All adult (>15 years) patients presenting to ED with trauma that were seen during the ENP working hours (0900–1930, 7 days a week) were eligible. Patients were identified by the suffix ‘TM’ in the triage assessment field on the electronic patient tracking system (CHiPS, Auckland, NZ), and chosen by either ENPs or EMRs.

Exclusion criteria—Patients admitted to hospital for definitive treatment during this episode, patients seen by another service—e.g. orthopaedics, and those seen by other Emergency Medicine (EM) staff—e.g. consultants, medical officers of special scale (MOSS) or house surgeons.

Definitions—Two discharge times are recorded. The ED discharge reflects the time the electronic discharge summary was printed, however this does not necessarily reflect the time that the patient leaves the department. Daily Attendance Record (DAR) discharge reflects the time that the patient was officially discharged from the electronic system by the clerical or nursing staff.

• ED LOS = length of stay based on discharge time as recorded by printing of electronic discharge summary.
• DAR LOS = length of stay based on discharge time as recorded electronically on daily attendance record.
• TBS = time to being seen by clinician (either ENP or EMR).
• Missed fracture = documented soft tissue injury by clinician, which was later reported as a fracture on the final radiology report.
• Unexpected return = unplanned return of the patient to the ED, with issues directly related to initial injury.
• LWBS = left without being seen.
• Treatment time = ED LOS minus TBS.

Data collection—The study period was from 1 February 2008 to 5 April 2008 inclusive. EM Registrars and ENPs working in the department during this period were informed by letter that the study was taking place and posters were displayed. An electronic data collection form was piloted by two authors together, on 25 case notes. As a result, minor alterations to the form were made. The pilot
study informed the power calculation for the main study. Chart review and data entry was performed simultaneously by an ENP and an ED registrar, disagreements were settled by consensus.

**Data storage**—Electronic storage occurred in a secure file at Auckland City Hospital.

**Ethics**—The study was approved by the Northern X Regional Ethics Committee.

**Statistical analysis**—A pilot study of 25 patients (19 ENP and 6 EMR) was used to determine the number of patients required to detect a minimum clinically significant difference of 15 minutes LOS between groups at a 95% confidence interval (CI) level. After adjustment was made to account for the uneven numbers between the groups in the pilot study, it was determined that 127 patients were required in the smaller group in order to detect a difference.

Mann Whitney U tests were used to test for significant differences in time intervals between the two groups. Analyses of covariance were used to compare time intervals (after transformation using natural log to account for the right skewed distribution) adjusting for age, gender, triage and procedure.

Spearman correlation coefficients were used to assess the association between age and time to discharge. Chi-squared test or Fisher’s exact test (where appropriate) were used to investigate the association between categorical variables. All tests were two-sided and a p-value <0.05 was considered statistically significant. All statistical tests were conducted using Statview for Windows v5.0 software (SAS Institute Inc).

**Results**

**Table 1: Baseline Data**—In total 420 patients were included into the study. Table 1 shows baseline data collected. The median age was 30 years in the ENP group and 41 years in the Registrar group. The ENPs saw more males, more young patients and lower acuity patients than the EMR. Ethnic distribution was similar in both groups, with the majority being NZ European.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>ENP (n=305)</th>
<th>Registrar (n=115)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Median (IQR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30(22,43)</td>
<td>41(25,59)</td>
<td>0.0004*</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>214(70%)</td>
<td>68(59%)</td>
<td>0.03**</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Caucasian</td>
<td></td>
<td>0.75**</td>
</tr>
<tr>
<td></td>
<td>Māori and Pacific</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Islander</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indian</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not stated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triage</td>
<td>2</td>
<td></td>
<td>&lt;0.0001**</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedures performed</td>
<td>% patients</td>
<td></td>
<td>0.62**</td>
</tr>
</tbody>
</table>

* Mann Whitney U test; ** Chi-squared test or Fisher’s exact test where appropriate.

**Table 2: Outcomes**—Median ED LOS and DAR LOS were shorter by 40 minutes and 56.5 minutes respectively for ENP compared to EMR treated patients (Table 2). These differences remained statistically significant after adjustment for age, gender and triage category. There was no difference in treatment time between groups.
The study identified 387 patients who left without being seen (LWBS). 7,755 patients were discharged from ED during the study period. The LWBS rate as 5%. Of the total LWBS (n=387), n=117 (30%) patients left during ENP working hours and n=270 (70%) patients left outside ENP working hours. The median (IQR) wait time for patients who eventually LWBS was 74 (38, 141.25) during ENP hours and 104 (48, 164.25) outside of ENP hours, p=0.0297.

Table 2. ENP- compared to EMR-treated patients

<table>
<thead>
<tr>
<th>Variables</th>
<th>ENP (n=305)</th>
<th>Registr (n=115)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median time in minutes (IQR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to be seen by clinicians</td>
<td>14(5.27)</td>
<td>50(21.78)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Treatment time</td>
<td>78(46,118)</td>
<td>86(35, 135)</td>
<td>0.55*</td>
</tr>
<tr>
<td>Time to ED discharge</td>
<td>99(66,143)</td>
<td>139(100,202)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Time to DAR discharge</td>
<td>117(79,164)</td>
<td>173.5(131,254)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Time between ED discharge and DAR discharge</td>
<td>10(4.22)</td>
<td>26(10.45)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Missed # % patients</td>
<td>4(1%)</td>
<td>1(1%)</td>
<td>0.68**</td>
</tr>
<tr>
<td>Unexpected return % patients</td>
<td>6(2%)</td>
<td>1(1%)</td>
<td>0.68**</td>
</tr>
</tbody>
</table>

* Mann Whitney U test; ** Fisher’s exact test.

When a procedure was required, the median difference in EDLOS was 21 minutes (p=0.03). See Table 3.

Table 3. Length of stay (LOS) associated with performance of a procedure

<table>
<thead>
<tr>
<th>Variables</th>
<th>ENP (n=305)</th>
<th>Registr (n=115)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>199</td>
<td>78</td>
<td>0.62 **</td>
</tr>
<tr>
<td>Yes</td>
<td>106</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Type of procedure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>256</td>
<td>93</td>
<td>0.64**</td>
</tr>
<tr>
<td># manip</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>dislocation</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MUA</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Pop</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Wound repair</td>
<td>24</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>LOS [median(IQR)]</td>
<td>without procedure</td>
<td>with procedure(s)</td>
<td></td>
</tr>
<tr>
<td>ENP</td>
<td>92(62, 132)</td>
<td>119(68,154)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Registrar</td>
<td>135(96,200)</td>
<td>165(118,214)</td>
<td>0.0002*</td>
</tr>
<tr>
<td>Type of anaesthetic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAB</td>
<td>6</td>
<td>1</td>
<td>0.62**</td>
</tr>
<tr>
<td>Local</td>
<td>47</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>230</td>
<td>87</td>
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<tr>
<td>Entenox</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Regional Block</td>
<td>17</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>LOS [median(IQR)]</td>
<td>IAB</td>
<td>147(129,210)</td>
<td>395(n/a)</td>
</tr>
<tr>
<td>ENP</td>
<td>84(49,128)</td>
<td>153(100,211)</td>
<td></td>
</tr>
<tr>
<td>Registrar</td>
<td>94(62,142)</td>
<td>139(97,206)</td>
<td></td>
</tr>
<tr>
<td>Type of anaesthetic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAB</td>
<td>207(162,304)</td>
<td>175(137,223)</td>
<td></td>
</tr>
<tr>
<td>Regional Block</td>
<td>130(73,138)</td>
<td>122(112,161)</td>
<td></td>
</tr>
</tbody>
</table>

* IAB=Ischemic Arm Block, PSA=Procedural Sedation Anaesthetic, MUA=Manipulation under Anaesthetic; ** POP=Plaster Of Paris, # manip=Fracture manipulation.
Discussion

The primary outcome of length of stay (LOS), as measured by ED discharge and DAR discharge was significantly shorter for those patients seen by ENPs compared to those seen by ED registrars. This complements findings in a recent retrospective Australian study conducted in 2005.

There are a number of potential reasons for a difference between these two times. These include: ENPs are more likely to complete patient care themselves, while Registrars may delegate final care to a registered nurse (RN) for example, application of dressing/crutches after which the DAR is completed. Also the Registrars may delegate the DAR discharge to the clerical staff even if no further care is needed. EM registrars may also be delayed in completing administration tasks due to other clinical activities taking precedence.

There was a difference of 40 minutes between ENP and ED registrar; which accounted for most of the extra time in LOS in the EM registrar group. The reasons for the delay in ED registrars seeing these minor injury patients, is likely to be multifactorial and will include: Registrars seeing higher acuity patients with other pathology ahead of the minor injury population, whereas ENPs see the only the minor injury patients. ED registrars will be balancing a wider case mix of patients compared to ENPs, and any complications or deterioration in those patients will delay ED registrars in picking up new patients.

Missed fracture rates are used as key performance indicators (KPI) to reflect quality of the service provision. Rates have been quoted as wide as 1 to 6% but many facilities report a 3% rate as acceptable. Our overall rate was 1% (95%CI 0–3%). There were too few missed fractures to detect any difference between the groups.

Left without being seen (LWBS) rates are also considered a KPI of ED function and performance. Our overall rate was 5%. Rates vary between institutions and countries, levels ranging from 4.5% to 8.6% have been reported. Factors pertinent to LWBS appear to include: time to being seen, lower triage category, previous LWBS, presentation at night, being male and young.

Fewer patients left when an ENP was rostered on duty; however the medical staffing is also better during the times that ENPs work. During the hours of 0800–0200 there are 4–6 doctors working at any one time, compared to only three working from 0200–0800. The number of patients LWBS, both in and after ENP working hours is concerning and this may have implications for resource allocation in the department in the future.

Although ENPs may provide a rapid and efficient service for the minor trauma patients, there is a potential drawback in terms of EM registrar training, with reduced exposure to this group of patients for the EM registrars in our department. There should be a balance between service provision for the population and adequate training experience for EM registrars.

This study has a number of important limitations. The original sample size calculated n=127 in the ED registrar group, this meant the study was underpowered to detect the
projected difference in LOS of 15 minutes. However the observed difference was more than double the expected difference, regardless of which LOS measure was used (40 or 56 minutes), and the study was sufficiently large to detect this difference, which we believe is clinically important.

The other main limitation is the potential for selection bias. There was no randomisation or attempt at allocation concealment between the study groups, and all clinicians were informed that the study was taking place. It is possible that any differences observed were due to the “Hawthorn” effect—the clinicians may have changed their practice because they were aware the study was underway. 14

Use of a non-consecutive cohort means patients who would have met inclusion criteria were not included, based on their time of presentation and/or what type of clinician they saw in the department. This was done to minimise the effect of the different staffing levels in the department “after hours” and we believe that only comparing times when both ENPs and EM Registrars were working was reasonable in this instance.

The data collectors (MC and CC) were not blinded to the clinician type, however with dual data entry (disagreements resolved by consensus) and use of objective outcome measures reduced the chance of observer bias.

The use of electronically recorded times may not always accurately reflect actual patient transit times, both at presentation (patients presenting at triage may experience delay due to the number and/or complexity of other patients in the queue before them, and at discharge from the department as previously discussed. However, the times used are the best estimation available in our department and are used to report the Key Performance Indicators (KPIs) “Triage Time” for our department to the Department of Health.

In conclusion, ENPs sign on to see minor injury patients faster than EM Registrars, which may result in a shorter length of stay. They play a significant role in meeting “Triage Time” KPIs for our department; however, it is not clear whether these results can be generalised to other emergency departments in New Zealand.

Competing interests: None.

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References:


Outcomes from out-of-hospital cardiac arrest in the Wellington region of New Zealand. Does use of the Fire Service make a difference?

Andrew H Swain, Tasmin Barry, Sarah R Hoyle, Grant Haywood, Hayley Cameron, Peter D Larsen

Abstract

Aims Survival from community cardiac arrest in the Wellington region was analysed and compared with similar data reported nationally and internationally. In particular, the impact of a dual fire and ambulance service response was studied.

Method A retrospective comparative study was undertaken of out-of-hospital cardiac arrests in the Wellington region between 1 July 2007 and 31 December 2009. Data was collected from Wellington Free Ambulance and hospital records in accordance with the Utstein template. The New Zealand Fire Service provided details of firefighter attendance and timings. The primary outcome measure was survival to hospital discharge.

Results Overall survival to hospital discharge was 11% (37/339) whilst survival from initial ventricular fibrillation or tachycardia (VF/VT) was 21% (34/161). Initial VF/VT was more common in witnessed than unwitnessed arrests (57% v. 35%, p=0.001) and this mirrored survival in these groups (15% vs 6%, p=0.01). Survival to hospital discharge was also associated with younger age and shorter emergency service response time. Bystanders attempted CPR in 55% and the fire service in 50% but neither intervention influenced outcome. Although, when activated, the fire service arrived on average 1–2 minutes ahead of the ambulance, the dual response did not influence survival to hospital admission or discharge.

Conclusion Survival from out-of-hospital cardiac arrest in Wellington is similar to that of other New Zealand cities and better than that reported from several large centres overseas. The combined fire and ambulance response was not shown to have any beneficial impact on survival over and above that achieved by the ambulance service alone. System changes are proposed to try and improve survival from community cardiac arrest in Wellington.

Survival from out of hospital cardiac arrest remains low internationally, despite attempts to optimise clinical guidelines. Factors that correlate with improved outcome include bystander CPR and time to defibrillation.1,2–4

A study undertaken in Melbourne, Australia showed that response time could be significantly decreased if a combined fire and ambulance response system was used5 and this has been mirrored in similar studies conducted in Stockholm and Canada.6,7 Programmes which dispatch firefighters (or even the police8) as a first response team have long been in place in the USA and Canada9 and these systems have improved survival rates from out-of-hospital cardiac arrest.6,7
Wellington Free Ambulance (WFA) serves an area of approximately 4000 square kilometres and a population of 473,700 (Greater Wellington Regional Council, June 2008). It attends three to four cardiac arrests each week. Emergency 111 calls are received by the Ambulance Communication Centre and in cases of respiratory or cardiac arrest, these calls can be transferred manually to the New Zealand Fire Service (NZFS) dispatch centre.

NZFS personnel are trained in CPR and the use of AEDs (automatic external defibrillators). This training is undertaken by instructors within the fire service and is accredited by the New Zealand Qualifications Authority. All fire vehicles in the Wellington region carry an AED and basic first aid supplies including oxygen, bag and mask ventilators, oropharyngeal airways and bandages.

The study hypothesis was that the NZFS response to cardiac arrest would be faster than that of WFA, and that this would result in improved survival to hospital discharge. Secondary endpoints were a return of spontaneous circulation (ROSC) and survival to hospital admission.

Methods

Emergency medical services (EMS) system—When a 111 call consistent with cardiac arrest is received by the ambulance communication centre, the dispatcher activates the nearest available ambulance and can then choose to dispatch either a second ambulance or a fire appliance. This decision was based upon the location and availability of the second ambulance at the time. To activate a fire appliance, the ambulance dispatcher called the fire dispatch centre directly to request assistance. Since 7th July 2009, the two dispatch centres have been linked by an Intercad system. Ambulances are normally staffed by two paramedics and fire appliances by four firefighters.

Study period—All out-of-hospital cardiac arrests attended by EMS over the period 1 July 2007 to 31 December 2009 were included in the study. All adult patients (aged over 16 years) suffering out of hospital cardiac arrest where any type of resuscitation was started were included in the study. Exclusion criteria included cardiac arrests resulting from trauma, suicide or hanging, and those occurring in the presence of paramedics. For each case, data was collected from the New Zealand Resuscitation Council Registry in accordance with the Utstein template. For each case within the registry, fire service dispatch records were accessed to determine whether that service had been used and if so, its response time.

Data collected—Standard Utstein definitions were used. A witnessed cardiac arrest was one that was seen or heard by another person. If this person was a member of EMS, then the event was classified as EMS-witnessed. Bystander CPR was recorded if the paramedic believed that CPR was performed prior to arrival by a member of the public, either because this was occurring on arrival or it was said that CPR had been performed. The presenting rhythm was the first monitored cardiac rhythm when a defibrillator was attached to the patient.

Survival to hospital admission was defined as survival to admission beyond the emergency department. Survival to discharge was survival to discharge alive from the hospital acute care unit, regardless of neurological status or destination.

The ambulance response time was defined as the difference between the time the ambulance dispatcher received the 111 call and the time the crew reported arrival at the scene. Both of these times were rounded to the nearest minute. For statistical analysis, response times were categorised as 0–4 minutes, 5–8 minutes, 9–12 minutes, 13–16 minutes and greater than 16 minutes.

The fire response time was defined as the difference between the fire dispatcher receiving the request for assistance and the fire crew reporting arrival at the scene. This data was taken from the fire dispatch system log.

Statistical analysis—A Chi-squared test was used to compare outcomes and presenting rhythms for witnessed and unwitnessed cardiac arrests. Multinomial logistic regression was used to examine factors associated with survival to hospital discharge and survival to hospital admission. P-values <0.05 were
considered statistically significant. All statistical tests were performed using PASW 18.0 (SPSS, Chicago, Il.).

**Results**

During the study period there were 362 attempted resuscitations. In 23 cases the cardiac arrest occurred with a paramedic in attendance, leaving 339 out-of-hospital cardiac arrests (OHCA) in the study. Details of these cases are provided in Table 1 and Figure 1. Overall, in 37 cases (11%) the victim survived to hospital discharge.

**Table 1. Community cardiac arrests, Wellington, 2007–2009**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Whole cohort</th>
<th>Witnessed arrests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=339</td>
<td>N=192 (57%)</td>
</tr>
<tr>
<td>Age</td>
<td>67 (IQR 53–77)</td>
<td>67 (53–78)</td>
</tr>
<tr>
<td>Gender</td>
<td>230 Male (68%)</td>
<td>138 Male (72%)</td>
</tr>
<tr>
<td>Bystander CPR</td>
<td>186 (55%)</td>
<td>114 (59%)</td>
</tr>
<tr>
<td>Ambulance response time (to nearest minute)</td>
<td>9 (IQR 7–11)</td>
<td>9 (7–11)</td>
</tr>
<tr>
<td>Fire Service used</td>
<td>169 (50%)</td>
<td>80 (42%)</td>
</tr>
<tr>
<td>Presenting rhythm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VF/VT</td>
<td>161 (47%)</td>
<td>110 (57%)</td>
</tr>
<tr>
<td>Asystole</td>
<td>120 (35%)</td>
<td>45 (23%)</td>
</tr>
<tr>
<td>PEA</td>
<td>58 (17%)</td>
<td>37 (19%)</td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROSC</td>
<td>141 (42%)</td>
<td>94 (49%)</td>
</tr>
<tr>
<td>Admitted to Hospital</td>
<td>123 (36%)</td>
<td>83 (43%)</td>
</tr>
<tr>
<td>Discharged</td>
<td>37 (11%)</td>
<td>29 (15%)</td>
</tr>
</tbody>
</table>

In 192 cases (57%) the cardiac arrest was witnessed. Of these witnessed cases, 29 (15%) survived to hospital discharge, significantly greater than for unwitnessed cardiac arrests (8 survivors, 5%, p=0.01, Chi-squared test). Ventricular fibrillation (VF) or ventricular tachycardia (VT) was more likely to be the presenting rhythm in witnessed arrest compared with unwitnessed arrest (110/192 (57%) of witnessed arrests versus 51/147 (35%) of unwitnessed arrests, p = 0.001, Chi-squared test). A total of 161 patients presented with an initial rhythm of VF/VT, and in this group 34 survived (21%).

Cardiac arrest survival data from other centres in New Zealand and overseas are summarised in Table 2.

While paired comparison of fire and ambulance response times to the same calls demonstrates that the fire response was faster, with a mean of 6.5 minutes (standard deviation 2.5) for fire versus 9.7 minutes (standard deviation 5.0) for ambulance, the level of documentation regarding the function of the fire service at the cardiac arrest and the times derived from control centres without synchronised clocks did not allow us to accurately determine which vehicle arrived first in all cases.

From the limited number of cases for which documentation was available, we estimate that there was an average delay of 2 minutes from dispatch of the ambulance to the dispatch of a fire crew to the scene, such that the fire service arrived only a minute or two before the ambulance.
A comparison of the cases attended by the ambulance service alone, and by the ambulance and fire services is given in Table 3. While this shows no difference in ROSC, survival to admission or survival to discharge between the two groups, the cardiac arrests attended by both fire and ambulance services were less likely to have been witnessed, less likely to have received bystander CPR, and were more likely to have a presenting rhythm of asystole than those attended by the ambulance service alone.

To take into consideration the differences in bystander witnessed events, bystander CPR rates and initial presenting rhythm between the events attended by fire and ambulance versus ambulance alone, we conducted a multinomial logistic regression analysis of characteristics associated with both survival to hospital admission and to hospital discharge.
The results of this are shown in Table 4. Survival to hospital admission was associated significantly with the presenting rhythm, witnessing of the arrest and ambulance response time, while survival to hospital discharge was associated with the presenting rhythm, patient age and ambulance response time. After correcting for these variables, the use of the fire service was not shown to be a significant determinant of outcome within this model.

Table 2. Survival to hospital discharge following out-of-hospital cardiac arrest: national and international comparisons

<table>
<thead>
<tr>
<th>Overall survival to discharge</th>
<th>Survival to discharge VF/VT (witnessed or unwitnessed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland 12%</td>
<td>New York 7.3%</td>
</tr>
<tr>
<td>Christchurch 11%</td>
<td>Perth 11%</td>
</tr>
<tr>
<td>New York 2.1%</td>
<td>London 15%</td>
</tr>
<tr>
<td>Victoria 4%</td>
<td>Victoria 16%</td>
</tr>
<tr>
<td>Queensland 6%</td>
<td>Wellington 21%</td>
</tr>
<tr>
<td>London 6%</td>
<td>Denver 27%</td>
</tr>
<tr>
<td>Perth 7%</td>
<td>Oslo 31%</td>
</tr>
<tr>
<td>Denver 8%</td>
<td>Copenhagen 39%</td>
</tr>
<tr>
<td>Wellington 11%</td>
<td>Seattle/King County 46%</td>
</tr>
<tr>
<td>Oslo 13%</td>
<td>USA (35 centres) 8%</td>
</tr>
<tr>
<td>Copenhagen 16%</td>
<td>USA (35 centres) 18%</td>
</tr>
<tr>
<td>Seattle/King County 15%</td>
<td></td>
</tr>
<tr>
<td>USA (35 centres) 8%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Data for Fire-and-Ambulance versus Ambulance alone

<table>
<thead>
<tr>
<th>Variables</th>
<th>Fire and Ambulance n=169</th>
<th>Ambulance alone n=170</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>62 (IQR 52-77)</td>
<td>68 (IQR 55-78)</td>
<td>0.41</td>
</tr>
<tr>
<td>Bystander CPR</td>
<td>73 (43%)</td>
<td>113 (66%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Witnessed</td>
<td>75 (44%)</td>
<td>117 (69%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Presenting rhythm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VT/VF</td>
<td>76 (45%)</td>
<td>85 (50%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Asystole</td>
<td>71 (42%)</td>
<td>49 (29%)</td>
<td></td>
</tr>
<tr>
<td>PEA</td>
<td>22 (13%)</td>
<td>36 (21%)</td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROSC</td>
<td>68 (40%)</td>
<td>73 (43%)</td>
<td>0.61</td>
</tr>
<tr>
<td>Admitted to hospital</td>
<td>58 (34%)</td>
<td>65 (38%)</td>
<td>0.45</td>
</tr>
<tr>
<td>Discharged</td>
<td>18 (11%)</td>
<td>19 (11%)</td>
<td>0.87</td>
</tr>
</tbody>
</table>
Table 4. Multivariate analysis of characteristics associated with survival to hospital admission and to hospital discharge

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Admitted to Hospital</th>
<th>Discharged</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p value</td>
<td>p value</td>
</tr>
<tr>
<td>Presenting rhythm</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
<tr>
<td>Bystander witnessed</td>
<td>0.05</td>
<td>0.13</td>
</tr>
<tr>
<td>Age</td>
<td>0.41</td>
<td>0.001</td>
</tr>
<tr>
<td>Gender</td>
<td>0.14</td>
<td>0.54</td>
</tr>
<tr>
<td>Ambulance response time</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>Fire attendance</td>
<td>0.65</td>
<td>0.51</td>
</tr>
<tr>
<td>Bystander CPR</td>
<td>0.77</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Discussion

Survival from out-of-hospital cardiac arrest in the Wellington region—Survival to discharge from hospital following community cardiac arrest in Wellington has been studied over a 2.5-year period and is compared with similar data from other national and international centres in Table 2. Previous survival figures for all cardiac arrest rhythms in Auckland\(^1\)\(^2\)\(^3\) and Christchurch\(^1\)\(^3\) are very similar to the 11% reported from Wellington in this paper but a number of reputable centres overseas have lower overall survival and a few cities report better outcomes in this category.

It is well established that an initial rhythm of VF or VT is associated with a more favourable outcome from cardiac arrest and this is endorsed by the survival data for VF/VT arrest contained in Figure 1. Some centres have ceased to report survival from non-shockable cardiac rhythms and many also exclude unwitnessed arrests in the VF/VT category.\(^2\)\(^4\)\(^2\)\(^5\) Taking that into account, the authors consider that 21% survival to hospital discharge from out-of-hospital VF/VT in the Wellington region is more favourable than that reported internationally from a number of centres with well developed EMS systems.

Factors affecting survival—In common with other studies,\(^2\)\(^3\)\(^1\)\(^7\) survival to hospital admission was associated significantly with a presenting rhythm of VF/VT, witnessing of the arrest, and ambulance response time.\(^2\)\(^4\)\(^2\)\(^5\) Survival to hospital discharge was also associated with the presenting rhythm but increasing patient age had an adverse effect which has been reported to continue after leaving hospital.\(^2\)\(^6\)

The rate of bystander CPR was 55% but this was not found to be a significant determinant of outcome, which raises a question regarding the effectiveness of CPR undertaken by lay people. This finding has highlighted a potential shortfall in the recognition of cardiac arrest and performance of CPR by lay persons in the region and an initiative to address this has been introduced by Wellington Free Ambulance.

In the Wellington region, use of a dual fire and ambulance response, as opposed to ambulance response alone, has not been shown to improve survival from cardiac arrest. This is disappointing as basic life support (BLS) teams consisting of either fire, police, or BLS ambulance staff working with advanced paramedics have achieved improved outcomes in other centres.\(^5\)\(^8\)\(^2\)\(^7\)\(^2\)\(^8\)
Several factors may have contributed to an apparent lack of benefit in Wellington and these need to be considered:

- There was inconsistency in the activation of a dual response by ambulance dispatchers. No standard criteria for co-responding fire and ambulance to the scene had been agreed and dispatchers may have considered manpower to be a more important factor than the speed of response. It is now agreed that fire and ambulance services in the Wellington region will be activated simultaneously in response to all cardiac arrest calls.

- Communication between the ambulance and fire dispatchers is not automated. One of the major limitations in this study was the inability to reliably determine which service arrived on scene first. Although accurate dispatch-to-arrival times were available separately from the fire and ambulance communication centres, a precise comparison of response times for the two services was not possible because their clocks were not synchronised. This problem has now been rectified. The defibrillator clocks for both services are also being synchronised. Although fire personnel arrived more rapidly overall, we have not been able to demonstrate any survival benefit from this.

- Better documentation of the event by both firefighters and paramedics is essential if the initial rhythm, bystander CPR, treatments given, and timings are to be accurately recorded. The Fire Service has now designed a form to enable more accurate documentation of cardiac arrests by its personnel. More details of fire service actions at the arrest will also be incorporated into future ambulance reports and data will be downloaded from automated defibrillators used by the fire service. Data collection will continue indefinitely as outcome from prehospital cardiac arrest is one of the new multidisciplinary performance indicators established for New Zealand ambulance services.

- Although the ambulance service assists with the resuscitation training of firefighters, there has been no regular joint training to improve coordination between the two groups on scene. This is under discussion but as a first step, resuscitation guidelines have been shared between the services.

Ambulance and fire service data (Table 3) reveal a significant reduction in witnessed arrests and bystander CPR when fire and ambulance staff both attended the cardiac arrest. This finding may be explained by a paucity of information regarding bystander involvement from firefighters who were already on scene.

Another unexpected finding was a significantly higher proportion of asystole in patients attended by both fire and ambulance staff. This initial rhythm would have been documented by paramedics and during the period of the study, the fire service was most commonly activated because of an anticipated delay in paramedic arrival. It is known that the incidence of asystole increases with time during cardiac arrest.

The principle of the ‘Chain of Survival’ emphasises that the earlier the emergency services, CPR, defibrillation, and advanced life support are activated, the better is the outcome for the patient.

Other centres have reported similar ambulance response times and survival so a well coordinated dual-service response is required in Wellington to improve both.
Ways of achieving this are currently under discussion but automatic dual activation for cardiac arrest call, synchronised timings, and more comprehensive documentation are being introduced. The focus will remain a reduction in call-to-shock times for both fire and ambulance services.

Although our ambulance call-to-arrival times are similar to those in several European countries, they do not compare favourably with those quoted by some groups in North America where call-to-first-shock times of 5–6 mins have been associated with survival-to-discharge rates of 16% (for all cardiac rhythms). 22,23

Conclusion

Survival from out-of-hospital cardiac arrest in Wellington is similar to that of other New Zealand cities and better than that reported from several large centres overseas. Survival to hospital discharge was higher when the emergency service response time was short, the initial cardiac rhythm was shockable and the patient was younger.

Patients whose arrest was witnessed were more likely to reach hospital alive. The activation of a combined fire and ambulance response was not shown to have any beneficial impact on survival over and above that achieved by the ambulance service alone. As a result, system changes are being introduced to try and improve data collection and survival from community cardiac arrest in Wellington.

Competing interests - none.

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We acknowledge the helpful advice and comments from Mr Paul Fake, Manager of Project Heartbeat (Wellington).

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References:


Be wary of a mature adult, who presents with a parent

Syed H Ahmed, King S Leong

Abstract

The importance of interviewing a patient alone cannot be overemphasised, especially when a mature adult patient presents with a parent. We present the case of a 47-year-old man who was seen in the outpatient clinic with his mother, as his general practitioner (GP) was concerned whether he had a pheochromocytoma. The GP had arranged a CT scan of the abdomen, to investigate for an abdominal cause for oedematous legs. This had picked a benign growth in the right adrenal gland. A 24-hour urinary normetanephrine level checked was raised. Further tests and regular monitoring showed persistently raised levels of catecholamines to the point that adrenalectomy was being considered. He was always accompanied by his mother except on the clinic visit, when he admitted to taking amphetamine. Urinary catecholamine levels normalised, after he stopped taking it.

Report

A 47-year-old man was seen in the endocrine clinic for evaluation of possible pheochromocytoma, suspected by the general practitioner (GP). The patient had presented to his GP with oedematous legs for which the GP had arranged abdominal ultrasound to investigate for an abdominal cause. This was followed by a CT (computed tomography) of the abdomen, as ultrasound scan was normal. This had picked up a benign-looking cystic lesion in the right adrenal gland.

A subsequent 24-hour urine metanephrines were raised (11 micromol/24hr) (Table 1) and another at the upper limit of reference range (7 micromol/24hr).

Table 1. Urinary catecholamine levels over an 18-month period, at 6 monthly intervals (urine amphetamine screens included)

<table>
<thead>
<tr>
<th>Tests</th>
<th>On presentation</th>
<th>Repeated</th>
<th>6 months later</th>
<th>12 months later</th>
<th>18 months later *</th>
<th>Reference ranges (micromol/24hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normetadrenaline</td>
<td>11</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>1–7</td>
</tr>
<tr>
<td>Adrenaline</td>
<td>35</td>
<td>78</td>
<td>41</td>
<td>18</td>
<td>&lt;190</td>
<td></td>
</tr>
<tr>
<td>Noradrenaline</td>
<td>924</td>
<td>623</td>
<td>671</td>
<td>52</td>
<td>120–590</td>
<td></td>
</tr>
<tr>
<td>Dopamine</td>
<td>4748</td>
<td>2103</td>
<td>1613</td>
<td>312</td>
<td>650–3270</td>
<td></td>
</tr>
<tr>
<td>Urine amphetamine</td>
<td>Positive</td>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After stopping amphetamine use.
He presented with his mother to the clinic and the only symptom that would have suggested a pheochromocytoma was excess sweating, but as it occurred after exercising, it was thought to be physiological.

He didn’t report taking any medications or drugs. There was a family history of diabetes, colon cancer and no history of endocrinopathy or hypertension.

Clinically he was found to have gingivitis from poor oral hygiene and an ejection systolic murmur localised to the aortic area. BP was normal. He had further investigations done, and these included (2 ×) 24-hour urinary cortisol excretions, renal, liver, thyroid profiles, serum glucose, prolactin, testosterone, LH (luteinizing hormone), FSH (follicle stimulating hormone), gut hormones, and IGF-1(insulin-like growth factor) level, the results of all of which were normal.

Repeat 24-hour urinary catecholamine levels showed raised normetadrenaline, noradrenaline and dopamine levels (Table 1). An echocardiogram showed a bicuspid aortic valve and no evidence of cardiomyopathy.

A repeat CT of the adrenal confirmed the presence of a cyst in the right adrenal measuring 22mm × 16mm and having a radiodensity of <10 Hounsefield Units (HU). A metaiodobenzylguanidine (MIBG) scan didn’t show increased uptake of the tracer.

He was asymptomatic and we didn’t see the need for intervention at this point; he was monitored on a 6 monthly basis with pre-clinic urinary catecholamine levels measured.

Over the next 12 months, he was found to have persistently raised urinary catecholamine levels. He reported no symptoms of concern and BP was always normal.

It was thought at this point, that the right adrenal lesion may be a pheochromocytoma that was secreting excess catecholamines and that the patient was neither clearly symptomatic or hypertensive which was reflection of receptor response desensitisation from chronic stimulation.

He was brought into clinic and was about to be referred for adrenalectomy, when he admitted to taking amphetamines on a regular basis. He came unaccompanied to the clinic for the first time, on this occasion, and hence was more forthcoming with the history of amphetamine use (he always came with his mother on all his previous appointments). He was certain that he had taken them whenever he had done 24-hr urine collections for catecholamines. A urine drug screen at that point confirmed that presence of amphetamines. Repeat 24-hour urinary catecholamine done 6 weeks after patient stopped taking amphetamines were normal.

He was reviewed again 6 months later. A urine screen for amphetamine was negative and 24-hour urine catecholamine levels were normal. In the interim of these visits, he had undergone excision of a left vocal cord pre-cancerous lesion under general anaesthetic cover without any complication and without the need for preoperative alpha- or beta-blockade.

**Discussion**

Pheochromocytomas are rare catecholamine-secreting tumours, with an incidence of 2–8 cases per million.\(^1,\(^2\) Nevertheless it is very important to suspect, confirm, localise
and remove these tumours as they can be associated with significant morbidity and mortality.\textsuperscript{3,4} Initial screening is by testing urine and blood for raised catecholamines.

Various drugs and conditions (Table 2) can affect the results (increase or decrease), that should therefore be interpreted cautiously. Other common agents not tabulated below that could affect the results are caffeine, nicotine, nitroglycerine, salicylate, antihypertensives like labetalol, clonidine, methyldopa, antibiotics like tetracycline, and erythromycin.\textsuperscript{6–8}

Table 2. Drugs and conditions that can affect measured levels of catecholamines\textsuperscript{6–8}

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Medical conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricyclic antidepressants</td>
<td>Stroke</td>
</tr>
<tr>
<td>Levodopa</td>
<td>Myocardial infarction</td>
</tr>
<tr>
<td>Decongestants containing ephedrine, pseudoephedrine, phenylephrine</td>
<td>Heart failure</td>
</tr>
<tr>
<td>Prochlorperazine</td>
<td>Sleep apnoea</td>
</tr>
<tr>
<td>Antipsychotics, even the newer agent clozapine</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Reserpine</td>
<td>Shock</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Sepsis</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>Brain tumours</td>
</tr>
<tr>
<td></td>
<td>Subarachnoid haemorrhage</td>
</tr>
</tbody>
</table>

Patients should be advised to possibly, stop taking such medications, for at least 2 weeks before and during the test.\textsuperscript{5} They should also be advised to stop smoking and avoid physical and emotional stress for 24 hours before the test.\textsuperscript{8}

Eliciting a complete accurate history of drugs that are both prescribed and recreational is important. If our patient had not been forthcoming with the history of amphetamine use on that crucial visit, he may have undergone further unnecessary testing or even an adrenalectomy. The anaesthetist would have had to consider alpha- and beta-blockade prior to the vocal cord surgery if the diagnosis of pheochromocytoma had been confirmed.

It is uncommon to see a mature adult visiting a clinic, with a parent and should alert the clinician to consider interviewing the patient alone, especially in a situation, where multiple factors could affect the results.

A diagnosis or a cause can sometimes become clearly obvious just after eliciting an accurate history. Interviweing a patient alone provides an opportunity to establish a doctor-patient relationship which is invaluable, during a consultation; the patient gets a sense of confidentiality and privacy that can help reveal aspects of a history that the patient would have been unwilling to disclose in the presence of someone else. The presence of a close relative can hinder the development of this unique doctor-patient relationship.

Mature adults, who may depend on their parent for emotional, and/or financial support, may fear loss off this support, if certain facts are revealed. It is up to the discretion of the physician taking into consideration the patient’s wishes and best
interests, as to whether these facts are to be disclosed to the relevant individuals such as the general practitioner, relatives and other health professionals.

**Competing interests:** None.

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**References:**

Softball injury causing haemoperitoneum due to ruptured Meckel’s mesodiverticular band

Julie Woodfield, Mark Barnett, Peter Shapkov

Abstract
A 16-year-old male sustained an intra-abdominal haemorrhage after diving for last base during a softball game. At laparotomy a ruptured patent mesodiverticular band supplying a large Meckel’s diverticulum was found. Traumatic rupture of a mesodiverticular band leading to massive intra-abdominal haemorrhage is a rare event, and has never been reported as a single injury or in the context of a sport’s injury.

Case report
A 16-year-old male dived for third base and then again for last base during a softball game. Following the game he developed gradually worsening abdominal pain. On arrival at the emergency department, he was tachycardic at 110 bpm with a blood pressure of 112/98 mmHg. His initial haemoglobin was 142 g/L.

On examination, his abdomen was diffusely tender. FAST demonstrated the presence of free fluid and a CT was performed. CT showed a large volume of intraperitoneal blood and a sentinel blood clot in the right iliac fossa which in retrospect is surrounding a Meckel’s diverticulum (Figure 1). No solid intra-abdominal organ damage was identified.

Figure 1. Axial CT slice of Meckel’s diverticulum within the right iliac fossa surrounded by blood clot
An explorative laparotomy was performed and the bleeding point was identified as an avulsed medium-sized artery arising from the small bowel mesentery and supplying a large Meckel’s diverticulum (Figure 2).

Haemostasis was achieved by ligating and excising the vessel and the Meckel’s diverticulum. Histological examination revealed an antimesenteric Meckel’s diverticulum measuring 45×35 mm with a small focus of gastric mucosa. The patient made an uncomplicated postoperative recovery.

**Figure 2: Intraoperative photograph of avulsed Meckel’s mesodiverticular band and Meckel’s diverticulum**

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**Discussion**

Meckel’s diverticulum is the most common gastrointestinal congenital anomaly, occurring in approximately 2% of the population. Meckel’s diverticulum occurs when the omphalomesenteric or vitelline duct fails to completely obliterate during development.

The vitelline duct is initially supplied by the vitelline arteries, branches of the abdominal aorta. A remnant of the right vitelline artery may remain as a mesodiverticular band extending from the small bowel mesentery to supply the Meckel’s diverticulum. Approximately 10% of Meckel’s diverticula are associated with mesodiverticular bands, and these are usually the only blood supply to the diverticulum.

Traumatic bleeding from a Meckel’s mesodiverticular band has been reported twice following road traffic accidents, but never from a sports injury, or as a single injury.
Kazemi et al reported bleeding from the mesodiverticular band associated with rupture of the Meckel’s diverticulum in a 36 year old man involved in a road traffic accident.\(^5\)

In another road traffic accident, a bleeding mesodiverticular band was found to be responsible for one litre of free blood in the peritoneal cavity at laparotomy.\(^6\) This patient also sustained a closed head injury and a spinal cord contusion.

Diving for a softball base onto a hard grass surface ruptured the vascular mesodiverticular band without causing damage to any other intra-abdominal organs. Athletes competing in other sports involving diving to the ground may be at risk of developing similar injuries. The force applied to the abdomen when diving may be similar in nature to that experienced by people wearing seatbelts in road traffic accidents.

A trauma CT was unable to precisely identify the origin of the haemorrhage, although bleeding from a right sided mesenteric artery was thought likely to be responsible for the appearance. A ruptured Meckel’s mesodiverticular band could be considered in cases with a similar mechanism of injury where a clear bleeding point cannot be identified on CT.

This is the first report of a sport’s injury causing rupture of a mesodiverticular band, and the first report of any rupture of a mesodiverticular band as the sole traumatic injury sustained.

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**References:**

Listeria rhomboencephalitis

Mohamed Ramadan, Nicole M McGrath

A previously fit 78-year-old electrical linesman described a 1-week history of gradual non-specific deterioration in his general health without headache, and progressive generalised weakness. He became unsteady 3 days before presentation. The next day he developed difficulty swallowing, poor appetite and dry retching, then left-sided facial weakness on the day of admission. He had known chronic atrial fibrillation on warfarin, treated hypertension and was a current smoker.

At presentation he was afebrile with no meningism. Neurological examination revealed rotatory nystagmus in the primary gaze, left lower motor neurone facial weakness, dysarthria, right palatal weakness with profound dysphagia, right tongue deviation and truncal ataxia.

His peripheral white cell count was 14.2 × 10^6 mmol/litre with a neutrophil predominance; INR 3.4. A CT head scan showed moderate vascular calcification and mild cerebral atrophy only.

At admission, the patient was thought to have had a vertebrobasilar territory stroke and was given aspirin. That night, the patient’s breathing deteriorated acutely, progressing rapidly to respiratory arrest. The patient was resuscitated, intubated and mechanically ventilated, then transferred to the Intensive Care Unit. The following morning he was alert and able to communicate fully via hand signals and writing. Limb strength was normal.

Two days after admission he developed a temperature spike of 38.4°C. He was commenced on cefuroxime and blood cultures were taken that subsequently grew *Listeria monocytogenes*, identified initially on Gram stain and confirmed by culture of typical colonies, and use of Oxford media and API Coryne. An MRI brain scan revealed brain stem and upper spinal cord small ring enhancing lesions (Figures 1–4).

The patient was changed to intravenous amoxycillin and gentamicin therapy 3 days after admission, when listeriosis was first identified. However there was no improvement in his respiratory function. Several attempts at extubation over the next few days were unsuccessful.

After discussion with the patient and the family, while the patient was still conscious, a decision of discontinuing treatment and extubation was made. The patient was declared dead 9 days post admission. A subsequent public health investigation concluded that the source of *Listeria* was “unknown, most likely an unidentified food”.

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Figure 1. Axial MRI, T1 window showing two ring enhancing lesions in the midbrain

Figure 2. Sagittal MRI T1 Window showing a column of ring-enhancing lesions extending up the brain stem
Figure 3. T2 Axial MRI showing homogenous opacity in brain stem and left cerebellar hemisphere

Figure 4. Coronal T1 MRI film showing multi-enhancement lesions extending up the brain stem mainly on the left
Discussion

Listeriosis is very uncommon, with a notification rate of 0.6 cases per 100,000 in New Zealand. It can present in sporadic or foodborne outbreaks. Unlike most other foodborne organisms, Listeria can multiply in refrigerated food that is contaminated.

It mainly affects pregnant women, neonates, immunocompromised personnel and the elderly. Central nervous system (CNS) involvement occurs in 47% of cases and there are three distinct forms of CNS infection.

Meningoencephalitis, the most common, and cerebritis that can extend to cerebral abscess, are usually found in immunocompromised patients. Rhombencephalitis (brainstem infection) accounts for 9% of CNS listeriosis cases and can affect healthy elderly.

Patients with Listeria rhomboencephalitis typically present with a prodroma of headache, nausea, fever and malaise for several days followed by progressive asymmetrical cranial-nerve lesions, cerebellar signs, hemiparesis or hypoesthesia, and impairment of consciousness. 41% develop respiratory failure. At presentation, 85% of patients have fever and 90% have cranial nerve deficits. There is often only a mild CSF lymphocytosis, and in 22% there is no CSF pleocytosis at all. Listeria is more commonly isolated in blood culture (61% of cases) than cerebrospinal fluid (CSF) (41%). MRI with contrast is much more sensitive and specific than CT brain and is the preferred examination in patients with brainstem signs.

The treatment of choice is penicillin with or without an aminoglycoside for at least 2 weeks or until blood cultures and MRI are negative. Cotrimoxazole is an effective alternative, or meropenem if there is no history of an IgE-type immediate hypersensitivity, in penicillin allergic patients. Overall mortality is 51% and 61% of survivors have permanent neurological deficits.

This case illustrates that, in the absence of fever, headache or meningism at presentation, CNS infection, particularly listeriosis, can be overlooked. In fact, the striking absence or only subtle symptoms and signs of meningitis relative to brainstem symptoms and signs in Listeria rhomboencephalitis previously inspired the term “ameningitic encephalitis”. Focal neurological signs in older immunocompetent patients are often attributed to stroke. However, prodromal illness is not typical of stroke and an alternative aetiology, particularly infection, needs to be considered, even in the absence of fever at presentation.

An urgent MRI brain scan is indicated for patients with progressive disabling brainstem signs. As in this case, the MRI findings may raise the possibility of CNS infection and, in particular, Listeria rhomboencephalitis. Blood cultures are more likely to lead to a diagnosis than CSF culture but ideally and if possible, both should be performed.

Empiric antibiotic treatment that includes IV amoxycillin to cover the possibility of Listeria rhomboencephalitis is advised in the elderly, pregnant women, neonates and immunocompromised patients who present with the febrile-brainstem syndrome. However, prodromal fever is not universal and, as in our case, vague systemic
symptoms preceding progressive brainstem symptoms and signs should also alert the clinician to the possibility of *Listeria* rhomboencephalitis.

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**Acknowledgement:** We thank the Radiology Department staff at Whangarei Hospital for their assistance with imaging and interpretation.

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Retinal macroaneurysm following a branch retinal vein occlusion

Andrew Bastawrous, Vineeth Kumar, Som Prasad

Retinal macroaneurysms are a common complication of retinal vein occlusions. Retinal vein occlusion is the second most common retinal vascular disease after diabetic retinopathy and is a common cause of vision loss in older people.

Prevalence data suggests 16 million people are affected by retinal vein occlusions worldwide, with up to 2% of people over 40 being affected. Conservative estimates are that 20% of eyes affected by a branch retinal vein occlusion (BRVO) will develop a retinal macroaneurysm. The strongest risk factor for both BRVO and retinal macroaneurysms is hypertension, other associations include cigarette smoking, diabetes mellitus and dyslipidemia.

We present a case of a 58-year-old female patient with a history of hypertension and previous BRVO in which a macroaneurysm occurred 2 years later. Her vision at initial diagnosis of an inferotemporal BRVO was 20/20 in the left eye. When she represented 2 years later with sudden onset, marked visual loss her presenting Snellen acuity was 20/400. A diagnosis of retinal macroaneurysm with extensive haemorrhage and exudation at the fovea was made (Figure 1).

Figure 1. Colour fundus photograph showing inferotemporal branch retinal artery macroaneurysm with surrounding haemorrhage and exudation to the fovea
Diagnosis was confirmed with a fundus fluorescein angiogram (Figure 2) and subfoveal exudation was quantified using an optical coherence tomography scan (Figure 3). Focal argon laser was applied to the macroaneurysm to prevent further exudation and sight loss.

**Figure 2. Fundus fluorescein angiogram showing hyperfluorescent macroaneurysm**

![Fundus fluorescein angiogram showing hyperfluorescent macroaneurysm](image1)

**Figure 3. Optical Coherence Tomography scan demonstrating subfoveal exudation**

![Optical Coherence Tomography scan demonstrating subfoveal exudation](image2)
Retinal macroaneurysms following a vein occlusion are thought to occur due to chronic venous stasis leading to local arterial thrombosis, endothelial damage, and aneurysm formation. Panton and colleagues found that in patients with both a retinal macroaneurysm and venous occlusion there was a 12 times higher prevalence of retinal macroaneurysms in the area of retina drained by the occluded vein (p<0.05). Retinal macroaneurysms represents a sight-threatening secondary complication of vein occlusions that treating physicians should be aware of.

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Gigantic evidence for a microscopic disease

Anna Ashcroft, Gary J Lim

An 81-year-old female presented with a history of recurring intermittent diarrhoea and weight loss over a 2-month period. Her haemoglobin was 111 g/L, mean cell volume 86 and ferritin 35 mcg/L.

Medications included: accupril, simvastatin, oxazepam, aspirin, metoprolol and cholecalciferol once monthly. Both the aspirin and simvastatin were started in 2009 following an acute coronary syndrome that was treated medically. An echocardiogram had shown preserved left ventricular function.

Her past history was otherwise unremarkable, with no previous abdominal surgery or previous colonoscopy and no admissions for abdominal pain or colitis.

A colonoscopy was performed which demonstrated a long linear scar in the transverse colon (Figure 1). Mucosal biopsies were taken for histological examination.

Figure 1. Linear scar in the transverse colon

When reviewed in clinic, her diarrhoea was mild, with 1–2 bowel motions daily. Biopsies demonstrated evidence of collagenous colitis with a thickened and abnormal subepithelial collagen plate (Figure 2).

Given her mild symptoms, she was commenced on loperamide as required and she continued on her previous medications unchanged.
Figure 2. H&E stain. Thickened subepithelial collagen plate at 50 and 100 microns

Discussion

Microscopic colitis refers to two relatively rare inflammatory conditions affecting the colon, collagenous colitis and lymphocytic colitis. Both conditions present with chronic watery diarrhoea, which can be sudden or gradual in onset. Collagenous colitis is named due to a thick subepithelial collagenous deposit that can be seen on histology.\(^1\)

While the pathogenesis of collagenous colitis is unclear, it is more common in middle-aged females, patients with celiac disease and has a peak incidence at 65 years.\(^2,3\) It is frequently associated with medications such as NSAIDs, aspirin, simvastatin and proton pump inhibitors.\(^4,5\)

Typically, endoscopic findings are normal, but rarely patchy erythema, mucosal tears or linear scars have been noted, especially in relation to lanosoprazole.\(^6,7\) Colonic mucosal tears have been reported during colonoscopy in a small number of patients with collagenous colitis and it has been hypothesised that spontaneous tears could be a cause of the linear scar.\(^7\)

In patients with collagenous colitis, symptoms often improve with the cessation of the offending medications. In our patient, as her symptoms were very mild, no change to her treatment was made.

While linear mucosal defects in the colon are uncommon, they have a known association with collagenous colitis, reinforcing the need to take biopsies for diagnosis.

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Bahrain health workers in danger: call to action

Violence against health-care workers is a serious humanitarian challenge in the world today and one that has profound public health consequences. It is not possible to provide health services and deliver public health programmes if infrastructure is destroyed or health workers are killed or forced to flee.

The impact of this violence is often greatest on the most impoverished countries. For example, a suicide bomber murdered a number of medical students in 2009 in Mogadishu, Somalia, when he detonated his bomb at a university graduation ceremony; the students were only the second group of medical graduates to emerge in that country in the last 20 years.1

More developed countries are not immune. Earlier this year health workers were arrested for treating prodemocracy protestors injured in demonstrations in Bahrain. The health workers, many of them leading medical specialists, treated the injured and had witnessed the atrocities committed by the security forces. As a consequence, many were abducted, detained and interrogated.2 At the time of writing, trials before military courts continue for many of those arrested.3 Health professionals have a duty to treat all patients without regard to politics race or religion; this being a fundamental tenet of the principle of medical neutrality. The treatment of the Bahrain health workers has been described as “one of the most egregious sets of violations of medical neutrality and breaches of international law that … [has been] seen in decades”.4

It seems there is an increasing incidence of serious attacks on health workers.5,6 Assaults against health workers have become a feature of armed conflict despite their prohibition by the laws of war; these attacks are often part of a broad assault on civilians, used for military advantage and committed without regard for the ethical obligation of health professionals to provide care to patients irrespective of affiliation.7

There is a need for improved information gathering in order to better understand and react to these acts of violence. It has been suggested that the World Health Organization (WHO) is best positioned to provide leadership in this area.8 The WHO has shown leadership in other seemingly intractable problem areas such as the ethical recruitment of health workers from developing countries.9

Health professionals in all countries, including our own, are no strangers to dealing with violence in the workplace as Waikato District Health Board’s zero tolerance campaign against such violence has highlighted.10 However, the increasingly violent and complex environment that our colleagues have to endure in conflict countries is on a scale unimaginable to most of us. More must be done to ensure the wounded and sick have timely access to health care. Primary responsibility for safeguarding health care rests with politicians and combatants. However, all health professionals can help
by building a community of concern. The International Committee of the Red Cross seeks to increase awareness of this issue through its Health Care in Danger campaign.

The New Zealand Medical Association (NZMA) has shown leadership in New Zealand by writing to the World Medical Association calling for more assertive protest against the treatment of the detained Bahrain health workers. The medical profession has a strong legacy of advocacy on issues such as nuclear disarmament, climate change and other challenges facing society. Those wishing to support measures to protect health workers against violence in conflict countries are encouraged to seek further information by visiting relevant websites, including those of the ICRC, Amnesty International and Physicians for Human Rights.

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References:


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New Zealanders’ favourite natural health products are ineffective

Significant numbers of adults and children use one or more forms of complementary and alternative medicine (CAM), and the industry is worth billions of dollars globally.\textsuperscript{1,2} There are a plethora of different therapies and products, but the vast majority are either not biologically plausible and/or not support by research evidence.\textsuperscript{3–5}

Based on feedback from talks to patient groups on the subject, from local health professionals and the media, it is apparent that some natural health products are particularly popular with the New Zealand public. These therapies and products are often advertised in local newspapers and on radio and are usually manufactured in New Zealand, which may be driving demand. They include:

**Colloidal silver**—consists of tiny silver particles suspended in a liquid base and is taken orally, sprayed on the skin or even injected intravenously. Products are marketed as being beneficial for the immune system and for serious diseases including cancer, HIV and pneumonia. Silver does have some antimicrobial actions, but not only is there no clinical evidence of any efficacy for these serious indications, products have been shown to contain widely variable amounts of silver and can cause argyria—dangerous and untreatable silver poisoning.

**Deer velvet**—a dietary supplement made from the antlers of deer that have been surgically removed whilst they are still growing. The idea that deer velvet has healing properties likely originates from the fact that as it is the only mammalian organ with the ability to regenerate itself, if used as dietary supplement it will confer health benefits. Very little human clinical research has been undertaken.

**Rescue remedy**—Bach flower remedies were developed by homeopath Edward Bach who believed that he had a psychic connection to plants. He developed 38 individual flower products and one combination of 5 flower extracts called “rescue remedy”, to be used in cases of emergency and emotional trauma. Products contain tiny amounts of flower extract and it is not surprising that studies have shown no positive effects greater than placebo.\textsuperscript{4}

**Arnica**—Arnica is a herbal medicine used for the treatment of sprains and bruises. While there is evidence that preparations of arnica species might promote wound healing, arnica is largely sold as a homeopathic remedy which in rigorous trials is no more efficacious than placebo.\textsuperscript{6}

**Megadoses of vitamin C**—the use of very high doses of vitamin C to treat people with cancer can be traced back to Linus Pauling's book “Vitamin C and Cancer”, in which he claimed that massive doses of vitamin C could help to treat cancer. However, his study was flawed and studies undertaken later at the Mayo Clinic found no benefits. More studies are ongoing, but currently the research evidence does not support this treatment and it can actually reduce the effectiveness of radiation therapy and some forms of chemotherapy.\textsuperscript{7}
Propolis—a resin-like material from the buds of some trees which is usually obtained from beehives and therefore also contains bee products. It is taken orally or applied topically for a wide variety of conditions, most of which have no supporting evidence other than possible antimicrobial activity when applied topically.

Magnets—static magnets are widely marketed for many health benefits, particularly pain relief, in many forms including mattress underlays, bracelets, necklaces and shoe insoles. The underlying theory is that they can influence blood flow by interacting with iron in red blood cells. However, iron in the blood is not in a form that can be influenced by magnets and there is no good clinical research evidence to support their use for any condition.

Shark cartilage—is widely used, particularly by patients with cancer, as it is reported to have antiangiogenic and antitumour activity in vitro. However, no clinical studies have demonstrated any benefits in patients with cancer and harvesting of sharks for their cartilage is contributing to the recent dramatic decline in shark populations.

Lemon detox diet—This is a form of juice fast. In the ‘classic’ version, all meals are substituted with the lemon detox drink for 5–10 days and the fasting is claimed to ‘cleanse’ the body of accumulated toxins. However there are no clinical studies to support this theory and there are potentially serious consequences from prolonged fasting, severe caloric restriction and excessive concurrent fluid intake.

Therefore, despite their popularity, some of the most popular natural health products used by people in New Zealand are at best a waste of time and money, and may also be harmful.

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References:


Potential dangers of chest drains: response to case report by Drs Jayathissa and Dee

The case report by Dr Jayathissa and Dr Dee published in the 23 September 2011 issue of the Journal is an important reminder of the potential dangers even small bore chest drains can pose to patients.1

In recent years the availability of Seldinger chest drains has seen a move away from large bore tubes inserted by blunt dissection. While this is generally considered to be a positive thing for our patients, one might question whether their relative ease of insertion has led to them being overused by junior staff.

In general terms there are only three indications for the insertion of an indwelling chest tube, whatever the size: treatment of pneumothorax where aspiration has failed; management of pleural infection or empyema; and when the intention of draining the fluid is to perform a medical pleurodesis.

In almost all other clinical scenarios, including the one in the case presented, if the goal is to relieve dyspnoea then a simple thoracocentesis is all that is required. Whether this is done using an intravenous cannula, or a pre-packed thoracocentesis kit, the risk of complications is much lower than with drain insertion.

Even in patients with large effusions, the aspiration of just a litre of fluid is usually enough to make them more comfortable. The authors have thoroughly highlighted all the key features associated with the safe insertion of chest drains, but I would also emphasise an even earlier decision: is a chest drain required at all?

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Capital and Coast District Health Board
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Reference:
A policy of no pharmaceutical industry sponsorship: a case for health equity

The recent viewpoint by Wyber and colleagues in the NZMJ\(^1\) mentioned the New Zealand Medical Students’ Association (NZMSA) further developing policy on our stance passed in 2009 to not accept funding from pharmaceutical companies. This letter provides an update on NZMSA’s position and informs readers of our publically available position statement on pharmaceutical industry sponsorship.\(^2\) Unlike our Australian medical student colleagues who have an elaborate guideline\(^3\) to consider different situations for pharmaceutical industry interaction, our position is simple: NZMSA does not, and will not, accept support from the pharmaceutical industry, monetary or otherwise.

In contrast to the viewpoint by Wyber et al, we believe that there are no workable models to balance ethical, education and commercial demands, and as such the best practice for medical students is to not accept support from the pharmaceutical industry. We are increasingly concerned about the activities of the industry in light of reports of dubious practices of industry marketing through social media.\(^4\) This is an area where medical students, as active users of social media, are potentially most vulnerable. The Spanish Federation of Medical Students Association for International Cooperation (IFMSA-Spain) provide an example of a successful project ([www.farmacriticxs.org](http://www.farmacriticxs.org)) that has influenced popular physician blogs in Spain to be pharmaceutical industry-free\(^5\).

Our Spanish colleagues’ ‘Zero Sponsorship Policy’\(^6\) also identifies the issue of health equity as a reason to reject pharmaceutical industry support. There is evidence to suggest that the marketing practices of the industry are responsible for creating inequalities to access to essential medicines and the patent regimes and the World Trade Organisation trade agreements (TRIPS: trade-related aspects of intellection property rights) advocated for by the industry also contributes to this inequality.\(^7\)

Large pharmaceutical companies are often multinational corporations whose influence spans across national boundaries. Although we are fortunate in New Zealand to have PHARMAC, which mitigates the rise in pharmaceutical costs, there have been concerns about how trade agreements may affect its future effectiveness.\(^8\) Thus we believe that a policy of no pharmaceutical sponsorship is the right step to achieving national and global health equity.

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Response to article “Spinal manipulation: an update of a systematic review of systematic reviews”

With reference to the above article from Posadzki and Ernst, the question “is spinal manipulation effective?” is relevant, but more broadly one may ask “does evidence-based medicine (EBM) deliver what it promised?” The answer must be “no” if the evidence is of the quality of this article.

The hierarchy of evidence associated with EBM puts meta-analysis and randomised controlled trials (RCTs) above opinion of the expert, who uses knowledge from a variety of sources, including knowledge of pathophysiological mechanisms, and knowledge derived from clinical experience, to inform decisions.

The evolution of EBM has seen a softening of strict adherence to “evidence from research is the best evidence”, to include clinicians’ experiential evidence, and the patient’s goals and values.

Therefore, the Sackett et al (2000) definition that EBM is “the explicit, judicious, and conscientious use of current best evidence from health care research in decisions about the care of individuals and populations” has more recently been modified by Tonelli (2006) to “the integration of individual clinical expertise and patient preferences with the best available external clinical evidence from systematic research and consideration of available resources”. Tonelli goes further by breaking down the issues and processes underlying any clinical decision into five distinct areas:

2. Experiential evidence: derived from personal clinical experience or the clinical experience of others (i.e. expert opinion).
3. Pathophysiologic rationale: based on underlying theories of physiology, disease, and healing.
4. Patient values and preferences: derived from personal interaction with individual patients.
5. System features: including resource availability, societal and professional values, legal and cultural concerns.

It is proposed that any good clinician who considers information from these five domains in making an informed decision to administer a treatment, despite what the empirical evidence (alone) might suggest, by definition, is also practicing EBM.

A critical review of research should attempt to investigate the validity and robustness of interventions targeted as techniques commonly used in the management of spinal conditions. Systematic reviews are recognised as the gold standard level in EBM. However, they are not without their own sources of bias, and this needs to be taken into account when considering any recommendations from such reviews.
Readers need to be aware when reading research articles that systematic reviews are only as good as the studies that have been included and the systematic reviewer’s interpretation of the studies.\textsuperscript{4}

Good systematic reviews must include analysis of multiple well-designed randomised control trials amongst others. However, in this review the studies include heterogeneous patients, different professions, multiple targets for the intervention in question and poorly defined methodology.

The use of systematic reviews must be questioned; basically, pooling of data from systematic reviews is very controversial. The heterogeneity of the included reviews a serious issue, and the fact that if they are looking at the same topic you would assume they are all accessing the same literature and should come up with the same answer; that is not the case, as demonstrated by Posadzski and Ernst. A systematic review of systematic reviews amplifies any biases that were inherent in the included studies. Using the conclusions from such reviews in order to validate the use of or exclusion of any intervention is fraught with danger.

The bulk of the spinal pain studies the reviews reviewed by Posadzki and Ernst were based on heterogeneous samples. This methodology is now discredited.\textsuperscript{5,6} In reality, any review that uses these old studies is, by definition, inappropriate and will necessarily produce ‘no effect’ or ‘minimal benefit’ outcomes. A new systematic review should only be including those studies where attempts to sub classify spinal pain patients has been made.

Posadzki and Ernst have not addressed these issues and so their conclusions are invalidated at root at least for the spinal pain patients anyway. Where a specific pathology or homogeneous clinical sample has been identified—e.g. tennis elbow, or asthma, and treated by spinal manipulation (SM), the results are meaningful. Where the condition is non-specific e.g. low back pain (LBP), neck pain, shoulder pain, ‘colic’, their results are meaningless. Had they modified their review and included studies that targeted valid subgroups and systematically reviewed those, we suspect they may have found that there are insufficient studies to reach any conclusion.

If it is actually true that it doesn’t matter what treatment is provided, because the outcomes are the same, then there is no reason NOT to do SM. It is as valid/invalid as everything else. Their conclusion that SM is ‘not supported’ and perhaps should be discouraged amounts to the conclusion that all treatments should be discontinued. Is it their intention that professionally we should deny treatment for spinal pain sufferers? To single out SM as useless is simply polemics and demonstrates that the authors have an axe to grind.

Evidence-based practice is used to assist with quality clinical decisions and cost-effective treatment. Systematic reviews of systematic reviews do not investigate the effectiveness of a given intervention when the conclusions are based on poor methodology. Therefore, it may be more prudent in future to also pay attention to the five areas indicated by Tonelli to gauge the benefits of the use of spinal manipulative therapy as well as reference to current clinical guidelines; supposedly derived from the same literature.
Dusty Quinn
President
On behalf of The New Zealand Manipulative Physiotherapists Association Inc

References:
Ernst response to Poelsma regarding spinal manipulation

Whenever I publish a critical analysis of the evidence on chiropractic or spinal manipulation (something I do, not because of a personal grudge but because it is my job), chiropractors launch vitriolic ad hominem attacks against me. The letter by Corrian Poelsma is no exception. I am glad it mentions Morley’s previous allegation against me claiming I use “references inaccurately with the apparent intent to mislead”. Morley was so dissatisfied with my response to his rather silly accusation that he later took his complaint to the UK General Medical Council which turned it down. It seems easy for a chiropractor to make claims but difficult to substantiate them.

When the British Chiropractic Association was discovered to make a host of bogus and dangerous claims about the treatment of children, I was asked by the BMJ to analyse them. This evaluation clearly showed that it was the chiropractors who were trying to mislead us by using references in the most bizarre fashion.

When we systematically evaluated the possibility of bias in the published literature, we found that the conclusions of research on spinal manipulation were strongly influenced by the profession of the authors. Chiropractors seem to have considerable difficulties in assessing their own treatments objectively.

When we determined how many professional chiropractic organisations made therapeutic claims that are not supported by sound evidence, we found that this was done by virtually all of them. The chiropractic profession is all too familiar with false claims, and Poelsma’s letter is merely further evidence for that fact.

Whenever there is debate or disagreement about the value (or otherwise) of a therapy we should ask ourselves the following question: who should we trust more, those who earn their living by using that therapy or academics (contrary to Poelsma’s assertion I still am employed by my Medical School) with no conflict of interest who simply analyse the available data and report the results transparently?

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Reference:
End-of-term brief review of the New Zealand Government’s actions on five major health risk factors

Near the end of each electoral term is an appropriate point to review New Zealand (NZ) Government performance in implementing primary prevention initiatives aimed at preventing poor health outcomes. To structure such a review, we selected five risk factors for lost disability-adjusted life years (DALYs). These are the top five risk factors for high-income countries in the World Health Organization region which includes New Zealand (Western Pacific Region).¹

These risk factors are listed in descending order of importance in Table 1 and this list reasonably equates with the top risk factors for causes of death from previous NZ-specific work.² We then searched for new government actions relating to primary prevention of these risk factors. This was via Medline searches, searches of the Ministry of Health website, and the media releases by the Minister of Health covering the November 2008 to September 2011 period.

Results in the form of new policies implemented and areas of relative inaction are presented in Table 1.

Table 1: New primary prevention policies and areas of apparent inaction by the NZ Government in the last electoral term (November 2008 to September 2011) that relate to primary prevention of the top five health risk factors

<table>
<thead>
<tr>
<th>Key risk factor (ranked)*</th>
<th>New primary prevention policies and apparent areas of inactivity</th>
<th>Summary around progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco use</td>
<td>The Government was involved in a landmark inquiry by the Maori Affairs Select Committee³ and followed this up in its response to the inquiry’s recommendations by adopting the goal of “reducing smoking prevalence and tobacco availability to minimal levels, thereby making New Zealand essentially a smoke-free nation by 2025.”⁴ It instituted a series of three above-inflation tobacco tax increases and enacted legislation to ban point-of-sale tobacco displays (along with other minor refinements to the law), to be implemented in 2012. There were ongoing tobacco-related social marketing interventions by the Health Sponsorship Council (albeit with declining funding⁵), the national Quitline Service continued to support quitting, and there were improvements in access to pharmacotherapies for smoking cessation, and the delivery of smoking cessation interventions in primary and secondary care settings. Smoke-free prisons were also successfully introduced in 2011. Ministers have made public commitments to introduce plain packaging of tobacco products in line with the forthcoming Australian policy. However, there was no other action to further advance smoke-free environments legislation (despite the gaps⁶). Also, many other areas of tobacco control were not substantively advanced,⁷ and there are unresolved issues around achieving the smoke-free nation 2025 goal, notably the lack of any coherent strategy or milestones for achieving this goal.⁸ ⁹</td>
<td>Some progress, but gaps remain which need to be addressed if substantive progress towards the smoke-free nation goal is to be achieved</td>
</tr>
<tr>
<td>Key risk factor (ranked)*</td>
<td>New primary prevention policies and apparent areas of inactivity</td>
<td>Summary around progress</td>
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<td>Alcohol use (heavy and binge drinking)</td>
<td>A major Law Commission Report(^\text{10}) (initiated by the preceding Government) was considered by the current Government. This Report and ensuing debate have increased awareness of the public health threat that excessive alcohol use presents in NZ. A Select Committee process has considered draft legislation and produced a Report (but no legislation was passed prior to the 2011 election). Nevertheless, key components of the Law Commission’s recommendations were missing from the Select Committee’s Report (e.g., higher alcohol taxes, lower drink driving levels, major restrictions on marketing, and substantive limitations on access). Various criticisms of the limited response by the Government have been published.(^\text{11, 12}) Also, the lack of action contrasts with high NZ public support for improved policies around access to alcohol and enforcement of alcohol-related laws(^\text{13}) and very extensive public involvement in the Select Committee process. Furthermore, the lack of action on alcohol pricing is not consistent with the evidence for price increases being the most effective(^\text{14}) and cost-effective intervention to reduce alcohol-related harm.(^\text{15, 16}) Sustainable (\text{Some limited plans for legislative reforms that do not adequately utilise major interventions such as alcohol tax.})</td>
<td>Some limited plans for legislative reforms that do not adequately utilise major interventions such as alcohol tax.</td>
</tr>
<tr>
<td>High blood pressure</td>
<td>The Government has made no moves to consider regulations to reduce dietary salt intake or improved food labelling to indicate “high salt” foods (despite the importance of excess salt in terms of cardiovascular disease in NZ(^\text{17})). This inaction is problematic given the many international studies suggesting how cost-effective interventions to reduce salt intake would be (e.g., various studies(^\text{18-21})). (See also elsewhere in this Table concerning nutrition-related and alcohol-related interventions that may impact on the risk of high blood pressure.)</td>
<td>No progress on reducing salt intake by Government.</td>
</tr>
<tr>
<td>High blood glucose</td>
<td><strong>Nutrition:</strong> The Government reversed an existing policy limiting the availability of unhealthy food at school tuck-shops.(^\text{22}) Consideration of a Bill to remove GST from healthy food (&quot;Goods and Services Tax (Exemption of Healthy Food) Amendment Bill&quot;) was rejected with no opportunity for further consideration by a Select Committee. There was no substantive progress on: (i) limiting the marketing of unhealthy food; (ii) improving the provision of healthy food to school children; and (iii) considering taxes on soft drinks (as per various US jurisdictions) or taxes on high sugar/fat foods such as in several European countries.(^\text{23}) Others have reported on the lack of a national strategy to address obesity and that in NZ &quot;population approaches to reduce the burden of obesity have been systematically cut in the last 3 years; for example, the National Healthy Eating Health Action Strategy is no more, Mission On has disappeared [a physical activity programme], and the requirement for schools to provide healthy food has been abolished.&quot;(^\text{24})  <strong>Physical activity:</strong> The Government has enhanced support for sport in schools (Kiwisport(^\text{25})), has provided modest support for parts of a national cycleway, and has funded some innovative local initiatives to improve cycling and walking.(^\text{26}) Nevertheless, the focus and budget for public transport (and cycling and walking) remains tiny compared to established roading in recent government agency plans.(^\text{27})</td>
<td>No progress on improving nutrition and mixed progress on supporting enhanced physical activity</td>
</tr>
<tr>
<td>Overweight and obesity</td>
<td>As above for “high blood glucose” – particularly the issues around nutrition.</td>
<td>As above.</td>
</tr>
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</table>

**Note:** * Ranked by lost DALYs for high-income countries in the region which includes New Zealand (Western Pacific Region).\(^\text{1}\)
In summary, there has been some progress by the current Government on tobacco control in this last electoral term. However, the impact of the measures implemented is difficult to assess as there are no recent data on the key indicator of progress (reductions in smoking prevalence) since 2009.28

There has been very limited progress in each of the other four risk factor areas in Table 1. This lack of attention to prevention may be considered wasteful, given the growing evidence that many preventive interventions are cost-effective and will ultimately save funds for the taxpayer-funded health sector.29 Indeed, improved prevention of heavy alcohol use and misuse would probably generate a rapid return on investment (e.g., with short-term reductions in hospitalisations for injury and in crime prevention). Improved alcohol control would also protect front-line health workers from abuse and assault, and improve the efficiency of delivering acute health services (especially in emergency departments).30

A more detailed review of the NZ Government’s performance in the area of primary prevention would encompass other important risk factors (e.g., high cholesterol and fruit and vegetable consumption31), the acute crisis of the 2009 influenza pandemic, and the critical need to both mitigate and start to adapt to global climate change. A more comprehensive review would also assess the degree to which primary preventive measures have been implemented, or have impacted upon, the marked disparities in levels of these five risk factors by ethnicity and socio-economic status.31 Similarly, such a review could also make comparisons with the previous Government. On this point we briefly note that the previous Government made some progress in reducing smoking prevalence and reducing exposure to second-hand smoke (over a nine-year period for the Labour-led Government).28 Nevertheless, that previous Government also generally made very limited progress on the other risk factors in Table 1.

Reasons for the lack of progress by NZ Governments in addressing these risk factors may reflect ideology (tending towards a minimal role of the state), the role of vested commercial interests in influencing policy in NZ,32 and a focus by politicians on crises (e.g., the global financial crisis and events such as the Christchurch earthquake). Nevertheless, addressing primary prevention should not be sidelined, if politicians wish to protect health, reduce inequalities, and at the same time make the best use of limited health dollars.

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References:


Dominion Notes: Good work by the Inspector-General

Published in NZMJ May 1912:11(42).

The North Canterbury Hospital and Charitable Aid Board has proposed to expend £20,000 for an administrative block at the Christchurch Hospital.

Dr. Valintine, Inspector-General of Hospitals, attended, and gave reasons why such a large sum should not be expended. He stated that the estimated capital expenditure to be raised for hospital buildings in New Zealand during the next five years was £400,000, and that did not include the cost of maintenance. He had certainly approved of plans for the administrative block, but had not imagined that they were to cost £20,000.

He considered that amount too great and had, in consequence, thought it necessary to cut down the expenditure. It would certainly be false economy to erect the building in sections if that would cost £3000 more, but he considered that the question was whether the buildings were necessary.

It was only a matter of time when Christchurch would have to have an infectious diseases hospital, and, taking that into consideration, he did not consider the erection of an administrative block a wise proposition. An isolation ward was much more necessary.

Those anxious for the erection of new buildings did not perhaps realise that, during the next few years, it would be necessary to spend £56,000 in Christchurch, as follow:—Infectious diseases hospital, £12,000; administrative buildings, £20,000; isolation ward, £800; remainder to he spent in renovating present buildings. Local bodies would be taxed during the next few years as follows:—This year, £6000; 1913 £6000 to £7000; 1914, £5000; 1915, £5000; 1916 £5000—a total of £28,000, which with Government subsidy, would total £56,000.

It was remarkable, too, that though Christchurch was the smallest of the four big hospital centres, yet it wanted the biggest and most expensive administrative buildings. Wellington was nearly twice as large as Christchurch, as far as the hospital was concerned, but was managed with one-half the accommodation proposed to be established by the Christchurch Board. The wards of the Christchurch Hospital certainly required attention before the administrative section.

It was decided, after discussion, that further plans should be prepared for an administrative block estimated to cost from £10,000 to £12,000, and, for an isolation ward, at an estimated cost from £6000 to £7000.
Proceedings of the 209th Scientific Meeting of the Otago Medical School Research Society: Wednesday 28 September, 2011


((Libraries, download and print the PDF above to replace this page))
Gender imbalance in China

The 2010 Chinese Census reveals that the gender ratio at birth was 118 boys born for every 100 girls. Underlying factors include a deeply rooted cultural preference for sons, a falling fertility rate, and the one-child policy. Does this imbalance, which is the highest in the world, matter? It does, in particular it is estimated that by 2020 there will be 30 million Chinese men who will be unable to find wives. This imbalance has been facilitated by ultrasound technology, which made reliable sex-selection abortion possible.

To tackle the issue, the Chinese Government is launching a national campaign against the non-medical use of prenatal sex determination and sex-selective abortion. Any health professionals indulging in such practises will be in danger of revocation of their licences or criminal charges. Makes sense but a bit late for the class of 2010.


Plain packaging for cigarettes

The Australian Government plans to make plain packaging of cigarettes compulsory from next year. This is causing considerable angst amongst tobacco companies. Philip Morris Asia, in particular, argue that removing brands from packaging devalues the company’s intellectual property. And even worse, could cause them considerable financial losses. They intend legal action to seek compensation which may amount to millions of dollars. British American Tobacco Australia has also threatened legal action but is taking the higher moral ground arguing that plain packaging will encourage tobacco smuggling and will not reduce sales.

What integrity. If the Australian Government proceeds with this plan others will follow and global tobacco industry perceives this as a very big threat. And the rest of us would see it as a beneficial public health measure.

BMJ 2011;343:d4270.

Atrial fibrillation (AF), stroke prevention: warfarin, dagibatran, rivaroxaban, and apixaban

Vitamin K antagonists are highly effective in preventing stroke in patients with atrial fibrillation but have several limitations—the need for monitoring, dose adjustment, interference by other drugs and the risk of haemorrhage. Hence the rash of trials with new drugs, such as dagibatran and rivaroxaban (abstract NZMJ 23/9/11). And now apixaban—a novel oral direct factor Xa inhibitor that has been shown to reduce the risk of stroke in a similar population in comparison with aspirin (abstract NZMJ 13/5/11).

In this trial, apixaban 5mg twice daily has been compared with warfarin (target INR 2–3) in over 18,000 patients with AF and at least one additional risk factor for stroke.
And the conclusion is that apixaban was superior to warfarin in preventing stroke or systemic embolism, caused less bleeding, and resulted in lower mortality.

A very interesting editorial makes a number of salient points. One is that the mean percentage of time in which the INR was between 2 and 3 was 64% in the dagibatran trial, 55% in the rivaroxaban trial and 62% in the apixaban trial. And switching from warfarin may be unnecessary in those who have a well controlled INR. It is again noted that there is no antidote for bleeding with the newer agents. And of course the new agents will be more expensive, even when the monitoring costs are considered.


Glycated haemoglobin abnormalities in nondiabetic patients after acute myocardial infarction (MI)

Prognosis after myocardial infarction in patients with diabetes mellitus is worse compared with patients without diabetes mellitus. And there is some evidence that nondiabetic patients with hyperglycaemia after MI may have worse outcomes. Glycosylated haemoglobin (HbA\textsubscript{1c}) is an established marker of long-term glycaemic control in patients with diabetes mellitus and a recent report found that elevated HbA\textsubscript{1c} levels are also predictive for cardiovascular disease and mortality in patients without diabetes mellitus.

This observational study from the Netherlands involves 4176 nondiabetic patients admitted with a ST segment elevation MI. They report that both elevated admission glucose and HbA\textsubscript{1c} levels were associated with adverse outcome. They suggest that the elevated glucose probably reflects the infarct size and stress response and the raised HbA\textsubscript{1c} relates to longer term microvascular problems. They recommend these tests at presentation in order to identify the high risk subset so that appropriate secondary risk prevention can be initiated.


Measuring the PaCO\textsubscript{2} in acute respiratory disease patients in the emergency department with a transcutaneous carbon dioxide device

Pulse oximetry is a readily available to measure the arterial oxygen saturation in those with acute respiratory disease such as asthma or pneumonia. However, the CO\textsubscript{2} estimation requires an arterial blood sample. The authors of this paper point out that there are devices that can measure the transcutaneous partial pressure of carbon dioxide PtCO\textsubscript{2} and that such devices are used with success in intensive care units and sleep laboratories. They have studied 25 patients with acute respiratory illness, without a history of chronic obstructive pulmonary disease. The transcutaneous probe was attached to the subject’s earlobe for a minimum of 10 minutes and the PaCO\textsubscript{2} result obtained was compared with the PaCO\textsubscript{2} obtained by a simultaneous arterial blood sample. The readings from the device were accurate when compared with the arterial samples.

Harold Thomas

At 7:15am on 8 June 1961, three great blasts echoed across Southampton Harbour marking the departure of the Queen Mary as she sailed away from the UK, across the Atlantic and onto North America. On board was Harold Thomas who was 36 at the time.

His previous sea voyage had been in 1957 aboard the Flowergate. This was an old cargo freighter carrying timber strapped high above the deck.

Harold back then had travelled as ship’s doctor from Auckland across the Pacific, through the Suez and then onto Marseille. From here he went to London where he spent the next 4 years working at the historic St Paul’s Hospital in Endell Street, Covent Garden.

During this time Harold completed his Fellowship of the Royal College of Surgeons.

After embarking from the Queen Mary in New York, Harold immediately purchased a new 1961 light blue 4 door Chevy Belair. With wife Shirley beside him and young Michael and Philip in the back, off they drove heading west to Southern California.

Harold had met Shirley at Auckland Hospital after asking his colleagues who was the best looking nurse in the hospital. When they replied Shirley, he wasted no time in asking her out on a first date, which he did as she was leaning down changing a patient bedpan. They were soon married.

In California, Harold trained under Rodger W Barnes, who was one of America’s most prominent urologists and a pioneer of endoscopic surgery. He completed his Fellowship of the American College of Surgeons and worked at Riverside County Hospital attached to Loma Linda University School of Medicine.

Believing that Australia was an ideal family destination, Harold and Shirley once again packed their bag and this time moved to Sydney. Before long they settled into Esther Road in the sleepy seaside suburb of Balmoral. Two more children Kay and Geoffrey were added to the family.

Harold became a Fellow of the Royal Australian College of Surgeons and would get up early to travel across the Harbour Bridge working at St Vincent’s, Prince of Wales and Prince Henry Hospitals. He introduced American short-stay urology, which was not routine at the time. Despite a busy operating schedule, Harold took time to pass on
his skills especially of prostatic resection to other urologists. Later he became the President of the Urological Society of Australia.

Harold Thomas had come a long way from his humble beginnings in Rakaunui in rural New Zealand. He had finished school at 14 and worked in a bank to pay for night school. He earned a Diploma in Agriculture. Then, seeing a limited ability to ever own a farm, he turned his sights on medicine and went to Otago University. To pay his way through medical school, Harold worked as a shearer bent over heavy sodden sheep pulling belt-driven clippers.

When Harold retired as a surgeon he moved to The Southern Highland of NSW, Australia where he spent his days in old green overalls and blue cloth hat on a tractor, in amongst his cattle, repairing fences and planting trees.

In his 85 years Harold had gone full circle. From a small farm, to Master Surgeon, then back on the land. It was a remarkable journey and an extraordinary life.

One of his colleagues and a friend remarked that Harold had a wonderful life and made no enemies. I hope all of us at the end of our lives can claim the same.

Philip Thomas (a son in Sydney) wrote this obituary.