

Introducing point-of-care testing into a rural hospital setting: thematic analysis of interviews with providers

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ABSTRACT

INTRODUCTION: Hauora Hokianga Enterprises Trust, an integrated Primary Health Organisation (PHO), which provides primary and intermediate/secondary care to a remote rural community, introduced point-of-care (POC) testing at Rawene Hospital in June 2008. Previously, all laboratory tests were undertaken in Whangarei, with a one to three day turn-around for results. This study aimed to identify the perceived impact of POC testing on clinicians and the community.

METHOD: Face-to-face interviews were conducted with 13 health professionals working at Rawene Hospital. The qualitative data analysis computer programme ATLAS.ti v5.2 was used to assist the thematic analysis.

FINDINGS: Three overall themes captured the main issues with introducing POC testing: (1) POC testing increased clinicians' confidence, certainty and assurance in their daily practice; (2) POC testing improved diagnostic certainty and this impacted on patients and their families/whanau; (3) the challenges associated with POC testing included increased workload, pressure to up-skill, over-testing, and continuing professional education gaps.

CONCLUSION: POC testing is an invaluable technological adjunct for improving clinical decisions and culturally safe care provided to a remote rural community, but it brings challenges to care providers in managing higher workloads and pressures to up-skill. POC testing can improve the acute medical care (access and quality) provided to an economically-deprived, predominantly Maori, rural community.

KEYWORDS: Hospitals, rural; point-of-care systems; rural health

Introduction

The concept of primary health care described in the Declaration of Alma-Ata¹ encompasses the activity of health care providers who are the first point of health system contact for patients and who are based in a community, rather than in an institution.² In rural New Zealand, as in rural areas throughout the world, primary health care must address the myriad health care needs of geographically-isolated communities, crossing the primary-secondary interface. Australian research has shown that the proportion of general practitioners providing complex services increases with increasing rurality or remoteness.³

Rawene Hospital is an integrated part of Hauora Hokianga Enterprise Trust Primary Health Organisation (PHO). It serves one of the most socioeconomically deprived populations in New Zealand (Deprivation Index 10—most deprived decile⁴). The community is mainly Maori (70%) and the population of 6500 is spread over an area of 1521 km². The Hokianga road network is well behind the standard seen elsewhere in Northland and New Zealand⁵ and many roads in the area remain unsealed, as shown in Figure 1. The harbour, which was well suited as a medium for water transport in earlier years, has become a physical barrier for access between north and

J PRIMARY HEALTH CARE
2010;2(1):54–60.

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south Hokianga, with a vehicle ferry maintaining the cross-harbour link.

Rawene Hospital is the sole emergency service in the area, providing 24-hour emergency and accident service for the Hokianga region. The hospital has 10 acute beds. Seven salaried general practitioners provide all local medical services at Rawene and also visit nine peripheral clinics located across the Hokianga. In contrast to GPs working in urban settings, both acute and after-hours care are part of their work which covers the whole scope of primary, secondary and emergency care. Diagnostic services are limited, for example plain x-rays are only available during normal working hours. The nearest base hospital is in Whangarei, two hours away by road. Rawene itself is an hour's drive in addition to a 15-minute ferry crossing from the farthest reaches of the Rawene Hospital catchment area. There is no public transport system in the Hokianga. There are about 750 acute admissions to Rawene Hospital annually: about 20% are transferred, the majority to Whangarei with some transfers directly to tertiary services in Auckland.

There is considerable variation between different rural communities around New Zealand in access to laboratory services.⁶ In Rawene there are no on-site laboratory services. Laboratory specimens are couriered to Whangarei on working days only, so the turn-around time for a test result is up to three days.

Prior to 2008, clinicians had access to limited point-of-care (POC) tests on site, similar to that of many general practices: urinary dipstick, urinary β HCG, blood glucose, INR and qualitative troponin.

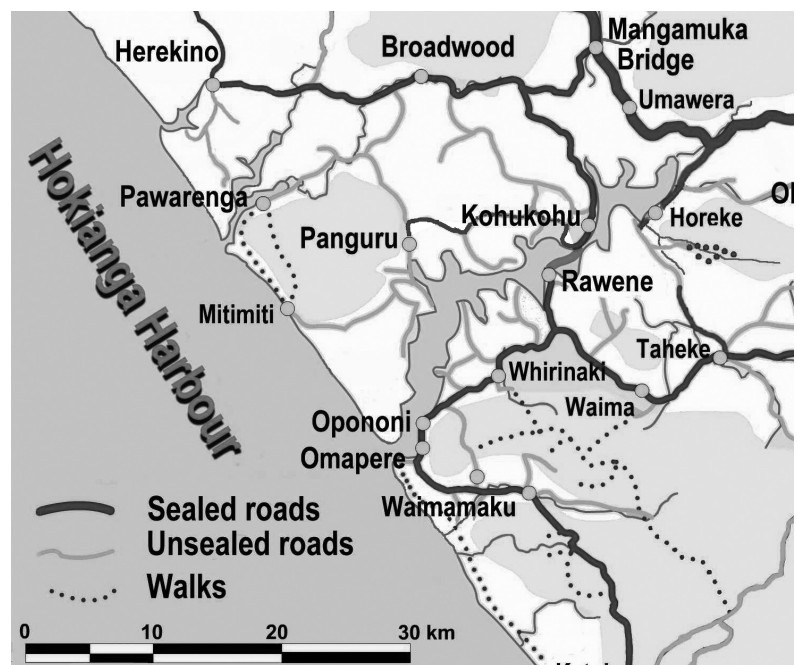
Blood tests have become essential to acute clinical medicine and consistently good patient care is impossible without them. Doctors in rural hospitals in New Zealand are often faced with complex acute medical problems without immediate or even intermediate access to basic laboratory tests to help guide management, including decisions about patient transfer to specialist care services. POC analytical systems enable a range of laboratory tests to be done quickly with portable equipment. The key object of POC testing

WHAT GAP THIS FILLS

What we already know: Point-of-care (POC) testing technology has become increasingly sophisticated over the last decade and, in theory, should be of most use to health care providers without close access to central laboratory services. Most research about the use of POC testing in rural settings has been conducted in Australia, the United States, or on the African continent.

What this study adds: This study provides the first research relating to POC test use in rural New Zealand (and is one of the few examples of qualitative research in this area). POC testing is readily accepted by rural doctors and results in substantial changes to their practice, principally by improving diagnostic certainty.

Figure 1. Roads in the Hokianga



is to generate a result quickly so that appropriate management decisions can be made leading to an improved clinical or economic outcome. POC testing is now widely available, but still used mainly in settings with a full on-site laboratory.^{7,8} There is surprisingly little research into the role of POC testing in small rural hospitals. It is likely that the benefits in rural settings, where the turn-around time for conventional laboratory tests is extended, will be far greater than in hospital settings where results can be more immediately available. Some rural hospitals

in New Zealand are already using POC testing, but no research has yet investigated the impact of introducing this service to a rural hospital with no pre-existing on-site laboratory facilities.

In 2008 a POC test analyser was installed at Rawene Hospital to enable clinicians to perform on-site tests in acutely unwell patients and thereby to improve diagnostic self-sufficiency and patient care. The tests this system performs are shown in Table 1. A Rural Innovation Fund grant was

used for a wider project about the introduction of POC testing at Rawene, including a quantitative study designed to measure changes in diagnostic certainty, patient disposition and costs. This is to be reported elsewhere.⁹ The qualitative study reported here aimed to provide in-depth understanding of the effects of introducing POC testing to a small rural hospital from the viewpoint of the clinicians involved.

Methods

Participants comprised all of the seven doctors, three lead nursing staff, one manager, and two community health workers employed by the Hokianga Health Enterprise Trust and based at Rawene Hospital. While it was originally envisioned that interviews with all the doctors would provide sufficient data, this decision was reviewed to include nursing, community and management staff in order to provide broader perspectives on the impact of POC testing at Rawene hospital. The length of respondents' employment at Rawene Hospital ranged from 18 months at the time of the interviews to 30 years. Written informed consent was obtained from all participants.

GN and CJ interviewed all but one participant at Rawene Hospital over a two-day period early in 2009. One person not present at that time was interviewed by GN later. Most interviews were completed within 30–45 minutes.

The interview schedule (Figure 2) included questions about the ways POC testing affected practice and patient care and about setting up and maintaining the POC test service. The interviews were semi-structured as the interviewers asked for clarification and followed participants' responses. Interviews were digitally recorded and transcribed prior to analysis.

Transcriptions were entered in the computer-assisted qualitative data analysis software package ATLAS.ti and analysed in accordance with the general inductive approach described by Thomas.¹⁰ Specifically, the interview schedule offered a working template for coding the data in a way that was consistent with the objectives of the study, while ATLAS' memo facility was used for more engaged interpretation to gain insights from the

Table 1. POC tests, Rawene 2008

POC test	Tests performed
CHEM8	Sodium, potassium, chloride, glucose, creatinine, ionised calcium, urea, haematocrit, haemoglobin
CG8	Blood gas, sodium, potassium, glucose, haematocrit, haemoglobin
Tnl	Troponin I
BNP	B-natriuretic peptide
INR	International normalised ratio

Figure 2. Interview schedule

- What was the procedure prior to having POC testing?
- What do you do now?
- How has the introduction of POC testing affected your practice?
- Have you had to learn or relearn new things?
 - How did you find this?
- How have you found the technical aspects of doing POC tests?
- Has finding time to do the tests been a problem?
- What positive impacts has POC testing had on patient care?
- What negative impacts has POC testing had on patient care?
- Has POC testing altered diagnostic certainty?
- Has POC testing changed patient management, including treatment or transfer/discharge/admission decisions?
- In which kinds of cases have you found POC testing to be most helpful?
- What are the most useful tests and least useful tests?
 - Why?
- At which time (regular or after-hours) have you found POC testing most useful?
- Has POC testing had any impact on your job satisfaction?
- Do you think performing the tests should be a medical or nursing role?
- What do you think is needed for a small hospital to set up and sustain this service?

data. The result was a thematic analysis which also incorporated unanticipated and emergent findings.

The Northern Regional X Ethics Committee reviewed and approved the study protocol.

Findings

The findings are presented in three primary themes:

1. Impact on clinical decision-making and clinician confidence

Despite some initial scepticism, respondents found the availability of POC testing to be reassuring, and its use increased diagnostic certainty and improved their confidence in their clinical decision-making. Respondents reported relief from the negative impact of a lack of diagnostic certainty, and concern they had not previously offered the best possible care at times when they risked missing important patient problems.

A lot of what we admit here and what we... see here is acute exacerbations on top of chronic disease so... having those tests... made you feel much more confident in managing them here or transferring them, or discussing them with a consultant. It really should be part of the routine management when they present acutely and I guess we hadn't been doing that before. (Doctor)

The capacity for POC testing in acute presentations sometimes resulted in unexpected and sometimes life- and organ-saving consequences. 'Things' were less likely to be missed, for example:

[A]... young woman... came in one weekend just looking a bit sick and nothing very much except... she had quite a nasty external ear infection... She... mentioned after a few hours that she hadn't peed for a while and we... did some point-of-care testing and showed that she was in acute renal failure ... her creatinine was up around a thousand. That was in the beginning, the very start when we got the machine. So the first thing we did was went back and re-checked the whole thing to make sure we had done it properly, but there it was over a thousand... she got to Whangarei 24 hours before she would have otherwise, more than 24 hours probably. (Doctor)

All respondents gave examples of being able to manage conditions at Rawene Hospital that would previously have required transfer to Whangarei. Examples included chronic respiratory disorders and renal disease. Some respondents commented that, prior to POC testing, the 'crunch point' was Thursday night when a decision would have to be made either to keep the patient over the weekend or to transfer.

...[Y]ou are not trying to fly by the seat of your pants for several days at a time watching somebody who may be getting worse, may be getting better, maybe not, and you don't know... (Doctor)

Being able to do these tests at Rawene Hospital gave clinicians the confidence to manage patients who would otherwise have been transferred, just to be on the safe side.

... I had a fairly low threshold there for transferring. If I was going to sit and worry about someone through the night I probably would have transferred them, whereas others wouldn't have done, but certainly it has helped me keep people here. I am more comfortable doing that. (Doctor)

POC testing has enabled transfer decisions to be made earlier than they otherwise would have been and has often meant that treatment can begin immediately, e.g. while waiting for a helicopter to arrive. Having POC test results also facilitated the transfer process to Whangarei and Auckland hospitals—sometimes resulting in a decision to transfer directly to Auckland rather than routing the patient through Whangarei base hospital. 'Knowing the numbers' when talking to admitting specialists at the receiving hospital after doing POC testing streamlines the process for patients when they arrive.

[I]f you have got a... test to go with them... that gives you a more definite reason to transfer someone... So you already know that they are in acute renal failure and that their potassium is 'up the wok' and they need to be seen by the renal team so you can liaise with the renal physician rather than a medical registrar. So that they are already a little bit in the system by the time they get to Whangarei it is already one step ahead, rather than join the queue at the end of the ED department. (Doctor)

Clinicians also expressed simply feeling less worried:

[Interviewer: Do you ever think you worry less about some patients because of it?]

Oh yes, yes. It just gives you that peace of mind.
(Doctor)

2. Impact on the ability to provide health services to a disadvantaged and remote community

POC testing reduced the need for inter-hospital transfer and increased the discharge rate, while hospital admissions were unchanged.⁹ Most respondents mentioned the benefits of this for patients and their families who find being transferred to a distant urban hospital difficult and disorientating. Transferred elderly Maori patients, particularly, may become increasingly disheartened as they have to tell their story repeatedly to unfamiliar clinicians.

They don't have to tell their story a hundred times... it is just that non-familiarity with the whole place, new faces, inevitably always a new house surgeon, registrar and consultant if they even see the consultant. It is at least, three or four doctors they are going to see... By the time they get [there] they almost feel challenged that they are even sick and they often just clam up and say nothing or they will say there is nothing wrong with them because they want to just come back home. (Doctor)

Several participants reported that some elderly Maori patients simply refuse to transfer because they are worried that they will die away from home, which causes spiritual difficulties for their whanau and for themselves.

If they [elderly Maori] have got to go to Whangarei, it is probably one of the last options because the scary thing is, if they are sick, they go and they pass away in transition or pass away there or they have got to be transferred somewhere else. People want to pass away back home in their own building... Take them to a new environment and they are lost and they become spiritually weaker. (Community health worker)

3. Challenges associated with POC testing

Increased workload

While respondents were overwhelmingly positive about the impact of POC tests on clinical practice, it had also created challenges. One participant reported that the ward was busier because they were managing patients who would have previously been transferred and who now required more care as a consequence.

...our ability to manage more and more people here increases workload... Anything new that you can do just changes the boundaries in what we do... We do very long weekends when we are covering a ward that can have some quite sick people plus we are doing outpatients and A&Es and things at the same time. So it is a bit of a challenge that, and I think it is a creeping extension of the role that will go on.
(Doctor)

Another suggested that although fewer patients were transferred, this was balanced by the numbers of patients who were discharged home earlier because POC test results gave clinicians the confidence to make this decision.

Higher standards of practice

POC testing has extended clinicians' management roles and skill base. 'Flying by the seat of the pants' prior to the acquisition of the i-STAT was contrasted with the need to respond appropriately to POC test results which often required more competencies of clinicians. This was sometimes set against the context of already challenging scopes of practice in rural hospital practice.

Continuing Professional Education (CPE)

Several respondents mentioned that refresher training had been organised on interpreting the results of tests such as B-type natriuretic peptide (BNP) and arterial blood gases. Arterial blood gases were cited as the least used POC test although there was agreement that it was a very useful test. Respondents pointed out that this test's underuse was partly because most doctors would not have done this procedure for many years, but also because of the up-skilling required to interpret the result.

Having the ability to do the test means that you then need to go on a step further in management than I would have done previously and that's probably a good thing in the long run but it is a challenge for the GPs who are using it... (Doctor)

The confidence that CPE can make on clinicians' use of tests is illustrated in the following quotation regarding BNP test:

...[those of] us who are using it [BNP] are the ones who have had some more formal recent... cardiology teaching because it [BNP] is a new thing since most of us graduated. (Doctor)

Time-consuming

Several respondents commented that doing POC testing could be time-consuming, particularly in an emergency situation.

Time consuming. Not so bad during the day when there are a lot of people around but in the middle of the night when it is just me and the nurse and a really sick person...

Overtesting

There was concern that over-testing could become a problem. It was suggested that clinicians needed to be clear about why they were doing or ordering a particular test, should not go on general 'fishing expeditions', and should avoid testing that would not make a difference clinically.

...[Y]ou have got the younger doctors, especially the trainees who come in and... do tests on everyone... They just don't function without the blood tests whereas some of the experienced doctors here have learnt to function without them and there is something good about that as well. (Doctor)

Discussion

Providing acute care for a remote, economically-deprived community with limited access to diagnostic investigations can be difficult. Faced with uncertainty, clinicians worry that the care they provide is substandard and their patients suffer. Our findings suggest that POC testing can help rural clinicians feel more certain

about their diagnoses and make better patient management decisions. Patients receive more timely and appropriate care. For some patients this means earlier transfer. Clinicians also gain the confidence to continue to manage locally other patients they would previously have transferred. This may be particularly beneficial to many patients who find admission to a distant hospital difficult for themselves and their families.

At the same time, POC testing demands higher levels of clinical competence. Clinicians have to learn new skills so they can continue providing care for patients with more complex problems. This can challenge already stretched rural doctors, caught between wanting to practise a higher standard of medicine and managing a constantly increasing associated workload. These findings support previous research from Australia showing that rural clinicians are often faced with complex acute medical problems with no access to basic laboratory tests³ and show that in this New Zealand rural setting POC testing had important benefits.

All doctors and a selection of others working at Rawene Hospital participated in this study, so a wide range of perspectives is represented. We report in the study the important effects of the introduction of POC testing that simply could not be adequately captured using other than qualitative research methods. These results add a depth of understanding about the impact of introducing POC testing that would be missed if we relied on our quantitative results alone. Whereas in cities the general practice scope may have shrunk, in rural areas it remains comprehensive and keeping up-to-date across this entire scope is hard work, intellectually challenging, but also very professionally rewarding. This study is important for clinicians because it shows that, with access to diagnostic tests, rural clinicians have better diagnostic certainty and are likely to find more satisfaction in their work. This could have downstream positive effects on recruitment of clinicians into rural areas.

However, the study is geographically specific. Translation of these findings to other parts of the country needs to take into account the

remoteness of the Hokianga, the high deprivation status and high morbidity of the catchment population, and the restricted availability of diagnostic services.

Some of the difficulty for Rawene Hospital in securing access to timely laboratory testing has been its model of funding: it is a non-government organisation (NGO) and an integrated PHO providing both primary and intermediate/secondary care services. Most acute hospital and emergency department services in New Zealand are provided by District Health Board (DHB)-managed secondary care services. It therefore does not fit neatly into the dominant New Zealand model of health care funding, which can act as a barrier to securing funding for secondary care. A recent Australian review of rural health service provision cautioned against underestimating the importance of macro-scale health policies and funding paradigms that support sustainable integrated local solutions for rural and remote communities.¹¹

The study also has implications for rural communities. Since the release of *The Primary Health Care Strategy* in 2001¹² the emphasis in primary care has been on public health services, with focus and funding prioritised for health promotion and illness prevention in the absence of illness expression. In rural areas the primary-secondary interface is blurred. All New Zealanders still need access to acute and urgent health services. Lack of timely access to diagnostics, even basic laboratory services, is currently a barrier to meeting the urgent health care needs of some rural communities and a reason for continued inequalities in health status and outcomes.

We conclude that POC testing aids the provision of higher quality care to our remote rural community and therefore contributes to a reduction in inequalities in health services and outcomes. This is particularly important in view of the well-documented health disparities between Maori and non-Maori.¹³

Initial emergency and acute care in the Hokianga, as in many other rural areas, is provided by the rural hospital, staffed by generalist doc-

tors, and not an emergency department. Unlike their urban specialist colleagues, these doctors, as generalists, do not have access to a full range of investigations on- or off-site. This situation can be and should be partly ameliorated in the 21st century by improving access to clinical supports such as POC tests. Other research into the availability of laboratory services in New Zealand rural hospitals⁶ showed that bigger hospitals were more likely to have both an on-site laboratory and near patient testing, suggesting that decisions about testing facilities are determined more by hospital size and budget than by clinical need and potential health and social gains from reducing base hospital admissions and travel. Such decisions accentuate inequalities for some of the most deprived New Zealand communities.

This research provides good grounds for concluding that New Zealand rural clinicians providing acute care, regardless of the size or funding model of their hospital, should have easy and uniform access to basic laboratory tests.

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ACKNOWLEDGEMENTS

The authors would like to thank the staff at Hokianga Health, in particular Dr Clare Ward, Dr Paul Bowker, Christine Dorsey, Marara Rogers and John Wigglesworth for their assistance with, and support of, this project. Thanks also to Geoff Herd, Dr Scott Cameron and Dr Brandon Wong at Whangarei Hospital for their assistance.

FUNDING

This study was funded by a Rural Innovation Grant from the New Zealand Ministry of Health.

COMPETING INTERESTS

None declared.