Design, implementation and initial assessment of the Northern Territory Point-of-Care Testing Program

Mark D.S. Shephard, Brooke Spaeth, Beryl C. Mazzachi, Malcolm Auld, Steven Schatz, John Loudon, Janet Rigby and Vinod Daniel

Community Point-of-Care Services, Flinders University, Bedford Park, South Australia, Northern Territory Department of Health, Remote Health Branch, Alice Springs, and Northern Territory Department of Health, Quality and Safety Unit, Casuarina Plaza Casuarina, Northern Territory, Australia

Abstract

Objective: The objective of the study was to improve pathology services in selected remote health centres from the Northern Territory (NT) through the implementation of a quality managed point-of-care pathology testing (POCT) service.

Design: Study of the efficacy of the POCT service after 1 year and qualitative survey of POCT device operators.

Setting: The study was set in thirty-three remote health centres in the NT administered by the NT Department of Health.

Participants: Remote health centre staff at participating remote health centres participated in the study.

Interventions: The introduction of the i-STAT device to perform on-site POCT.

Main outcome measures: The main outcome measures used in the study were the number of remote staff trained, volume of testing performed and satisfaction of POCT device operators.

Results: One hundred and sixty-four health professional staff were trained to perform i-STAT POCT during the first year of the program. A total of 2290 POCT tests were performed on the i-STAT. The volume of testing consistently increased across the year. Tests for international normalised ratio were the most frequently performed (averaging 70 tests per month). Stakeholder satisfaction with the i-STAT device was high, with a statistically significant improvement in satisfaction levels with pathology service provision being reported after the introduction of POCT. Greater than 80% of respondents stated POCT was more convenient than the laboratory service and assisted in the stabilisation of acutely ill patients.

Conclusions: The NT POCT Program has been operationally effective and well received by staff working as i-STAT POCT operators in remote health centres. Retention of remote health centre staff is the most significant challenge to ensuring the program’s long-term viability.

KEY WORDS: governance, i-STAT, point-of-care, remote, satisfaction.

Introduction

Access to general laboratory services for remote health centres in the Northern Territory (NT) is often difficult because of the extreme geographic isolation of many of its communities and the extensive distances to the nearest hospital. This remoteness causes resultant issues with the coordination and appropriate transport of pathology samples from these health centres to laboratories in Alice Springs and Darwin, and the turnaround time for return of results. These problems were exacerbated in 2007 by the collapse of regional air services, which were the primary means of transporting pathology samples.

As a result, the NT Department of Health (known at the time as Department of Health and Families) decided to consider using point-of-care pathology testing (POCT) as an alternative and practical solution for the provision of pathology services for remote health centres in the NT.

In July 2008, the NT Department of Health contracted the Community Point-of-Care Services (CPS) unit at Flinders University to develop a collaborative framework by which POCT for acute and chronic care tests could be conducted safely on the i-STAT 300 point-of-care analyser (Abbott Point of Care, Abbott...
Diagnostics, Doncaster, Australia) within selected rural and remote communities in the NT. The Flinders CPS unit has had wide experience in the delivery of community-based POCT models in Aboriginal medical services and general practices across Australia for the past 15 years.3–6

The NT POCT Program commenced in August 2008, following the implementation of a training program for health professional staff, a competency assessment process, a quality management program and selected support services, which are essential elements to a sustainable POCT program.7 This report briefly discusses the implementation of the program and describes the results of a stakeholder satisfaction survey conducted at the end of the program’s first year.

Methods

Governance

The NT POCT Management Committee was established to oversee and manage the program. The committee comprised three members of the Flinders CPS unit (including the chairperson) and six members of the NT Remote Health Branch. The Flinders CPS unit prepared training resources comprising a training manual, posters and a DVD, conducted an initial training workshop series for POCT device operators, maintained a competency register of trained operators and a device asset register of all POCT devices in field use, managed the central data station for the i-STAT through which de-identified patient data and quality data were captured electronically from the field devices and monthly summary reports on field usage were prepared, and implemented a quality management framework to track the analytical performance of the i-STAT devices. The NT Remote Health Branch team ordered and dispatched i-STAT reagents and consumables to each health centre and coordinated the delivery of mobile field training and competency assessment.

Heath services enrolled in NT POCT Program

Thirty-three remote health centres managed by the NT Department of Health and three Aboriginal Community Controlled Health Services overseen by Aboriginal Medical Services Alliance of the NT were enrolled in the NT POCT Program during its first year (Fig. 1).

POCT devices

The i-STAT 300 analyser (Abbott Diagnostics) is a handheld, portable, battery-powered POCT device weighing 520 g. Single-use, disposable cartridges are inserted into a slot at the base of the device where the test is measured by the generation of electrical signals (voltage, current and resistance). Four cartridge types that measure different pathology test profiles on the i-STAT were selected for use in the program. The Chem8+ cartridge measures electrolytes, total CO2, urea, creatinine, glucose, ionised calcium and haemoglobin on 95 mL of venous whole blood in 2 min. The prothrombin time/international normalised ratio (INR) cartridge measures INR, a marker of clotting time for patients on warfarin therapy on 20–45 μL of capillary whole blood in 5 min. The CG4+ cartridge measures blood gases and lactate on 95 μL of venous whole blood in 2 min. The Troponin cartridge measures cardiac troponin I (cTnI) on 17 μL of venous whole blood in 10 min.

What is already known on this subject:

• Access to pathology testing in remote Australia is limited.
• There is a high burden of morbidity and mortality among Indigenous Australians in remote locations.
• Point-of-care testing has proven useful in assisting the management of patients with chronic disease.

What does this study add:

• This study is the first demonstration of the effectiveness of point-of-care testing in some of the most remote Indigenous communities in Australia.
• This program provides a model for the successful implementation of point-of-care testing in other remote and challenging clinical settings.
• Remote health professionals reported a significantly high level of satisfaction with point-of-care testing for servicing acutely ill patients.
• This program highlights the innovative capabilities of a connected point-of-care testing network and its usefulness in providing surveillance of pathology testing in very remote locations, allowing all aspects of on-location testing to be closely monitored as well as the generation of network-wide statistics for management purposes.

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Monitoring of operational effectiveness

At the completion of each month, the Flinders CPS unit prepared management summaries for the NT POCT Management Committee from data extracted from the central data station, which included the number of valid tests performed (patient, quality and total, split by location and operator), the number of test errors (by location, type of error and operator), and a summary of participation in quality management processes (by location and device).

Assessment of satisfaction with POCT using the i-STAT

In July 2009, a questionnaire was distributed to all remote health centre staff using the internet-based software program SurveyMonkey (SurveyMonkey, Palo Alto, CA, USA; Available from URL: http://www.surveymonkey.com). The questionnaire was designed to determine satisfaction levels among device operators from the NT POCT Program, with the results used to assess the viability of the POCT program and inform government policy in this area. The questionnaire contained a series of short statements or questions, with respondents rating their level of agreement or disagreement with the statement or question according to a 5-point Likert scale. Participants were given equal opportunity to agree or disagree with each statement or question. All respondents completed the questionnaires anonymously. Results of the questionnaire was automatically calculated by Survey Monkey and analysed. Before and after results were analysed using the Stata 9.0 software program (StataCorp, College Station, Texas, USA).

Results

Governance

The NT POCT Management Committee met 12 times during the first year of the program's operation. One hundred and sixty four (164) health professional staff were trained and received competency certificates during its first year. Seventy-five (75) staff (comprising 54 nurses/Aboriginal health workers), 12 chronic disease coordinators, one doctor and eight remote health branch staff) were trained during initial training workshops. Eighty-nine (89) personnel (comprising 76 nurses/Aboriginal health workers, three chronic disease coordinators, four doctors and six remote health branch staff) were trained during 46 opportunistic field visits to remote health centres and/or sessions held in Darwin or Alice Springs by remote health branch staff. During the first year of the program, 54 (33%) remote health centre staff either left the NT or moved internally to a health centre not in the program.

Operational effectiveness

A total of 2290 POCT tests (1754 patient and 536 quality control) were performed on the i-STAT during the first year of the program. The volume of testing consistently increased across the first 12 months as operators became more confident with the device and its clinical use (Fig. 2). INR tests were most frequently performed (representing 48.6% of all tests conducted and averaging 70 tests per month), followed by Chem8+ tests (30.7%, 45 tests per month), cTnI (13.5%, 20 tests per month) and CG4+ (7.1%, 10 tests per month). For trained operators in the program, the cartridge error rate observed in the first year of the program was 7.3%.

i-STAT satisfaction questionnaire

A total of 39 respondents completed the i-STAT questionnaire (representing a 31% response rate from the...
127 operators who were sent the questionnaire). This low response rate is largely explained by the high rate of remote health staff attrition during the first year, with many of the operators being unable to be contacted or located because of their movements interstate.

Table 1 summarises the satisfaction with pathology services before and after POCT was introduced to the remote health centres. There was a statistically significant increase in satisfaction levels post POCT for all i-STAT tests and for the timeliness of acute care POCT results ($P < 0.001$, Fishers exact $\chi^2$ test).

Table 2 summarises responses relating to the general use of the i-STAT.

Of the respondents, 72% agreed that POCT on the i-STAT had improved the pathology service available to their patients. When asked in what ways this improvement had occurred at their health centre, greater than 80% of replies stated that POCT was more convenient than the laboratory service, and assisted in the stabilisation of acutely ill patients. Twenty-one percent believed POCT had assisted in improving compliance with taking medication (Fig. 3).

**Discussion**

POCT has come of age in Australia over the past 5 years, with the continued expansion and growth in the national Quality Assurance for Aboriginal and Torres Strait Islander Medical Service POCT Program for diabetes management,$^{3-6}$ the undertaking of a national trial of POCT in general practice,$^{9,12}$ and the development of state-wide POCT models in South Australia and Queensland.$^{13-16}$ POCT has a particular niche in rural and remote Australia, where the provision of laboratory services is often limited by difficulties with transport of pathology samples and satisfactory turnaround around
time for results. In an Indigenous setting, POCT confers the additional advantages of convenience, immediacy of result and the negation of a follow-up visit, which is often difficult because of other social and cultural priorities.

The NT POCT Program arose as a result of the recent collapse of the NT regional air service and a pressing need to improve access to pathology services for its remote health centres, which cater for an almost exclusive Indigenous clientele. The partnership between the NT Department of Health and the Flinders University CPS unit was seeded in early 2008 and the NT POCT Program commenced in August that year.

The evidence base accumulated during the first year of operation has shown that the NT POCT Program has been operationally effective and generally well received by health professional staff working as POCT operators of the i-STAT device in remote health centres. A pool of over 160 health professional staff were trained and received competency certificates as qualified POCT operators, thereby building significant POCT workforce capacity in the NT. The volume of i-STAT testing increased steadily across the first year. The low cartridge error rate was within the anticipated error rate of less than 10% and indicated that trained operator competency levels were sound. Stakeholder satisfaction with

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### TABLE 2: Responses to questions relating to general aspects of the i-STAT program

<table>
<thead>
<tr>
<th>Focus of topic or question</th>
<th>Response</th>
<th>Disagree†</th>
<th>Unsure</th>
<th>Agree‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic: program management and training and support services</td>
<td>Management providing appropriate level of support for i-STAT</td>
<td>1</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Management providing appropriate level of training for i-STAT</td>
<td>1</td>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>i-STAT manual has been instructive and appropriate</td>
<td>0</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>i-STAT poster set has been instructive and appropriate</td>
<td>2</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>i-STAT DVD has been instructive and appropriate</td>
<td>2</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Topic: quality management</td>
<td>Understand the need to perform QC testing on i-STAT</td>
<td>2</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Topic: Overall community acceptance</td>
<td>Clients are satisfied with i-STAT POCT</td>
<td>1</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Topic: personal comments on i-STAT</td>
<td>Comfortable and confident with i-STAT</td>
<td>1</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Confidence in accuracy of i-STAT test results</td>
<td>0</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>i-STAT POCT acceptable alternative to lab</td>
<td>0</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Enjoyed responsibility for i-STAT testing</td>
<td>1</td>
<td>3</td>
<td>24</td>
</tr>
</tbody>
</table>

†Disagree = sum of ‘strongly disagree’ and ‘disagree’ responses. ‡Agree = sum of ‘agree’ and ‘strongly agree’ responses.

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![Figure 3](image-url) Responses to open questions on the i-STAT device. (☐) not applicable; (□) unsure; (■) no; (●) yes.

More convenient than laboratory service (%)
Assisted in stabilising acutely ill clients on-site (%)
Assisted in reducing the need for medical retrievals (%)
Improved compliance with taking medication (%)
Helped motivate your clients to want to improve their own health (%)

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the i-STAT device was high, with a statistically significant improvement in satisfaction levels with pathology service provision being reported post the introduction of the i-STAT. Its clinical utility in assisting with the stabilisation of acutely ill patients was verified. Evidence for its clinical effectiveness and quality of testing will be the subject of further papers.

Staff turnover in remote health services is a constant problem, making health programs difficult to sustain.\(^1^7,\(^1^8\) Of the staff responding to the i-STAT questionnaire, 80% also indicated that they believed staff turnover was the principal factor in impeding sustainability of the program. This is supported by the finding that 33% of operators trained left the NT or moved internally to a different health centre outside of the program during the first year. A particular challenge for the program has been to maintain levels of training and competency, analytical quality and participation in quality testing in the face of such staff turnover. At the commencement of the program, a pool of chronic disease Coordinators from both Central Australia and the Top End were trained with the aim of acting as a mobile POCT team to assist site operators with training, quality management procedures and general support. This strategy did not have the desired result because of competing time commitments of this highly skilled group. Since that time, we have deployed a mobile team of POCT trainers under the direction of the Professional Practice Team within the NT remote health branch. We are also delivering face-to-face training sessions for primary health centre managers and Aboriginal health workers working in these centres. Training is now available through the NT Department of Health Intranet site to enable training and competency assessment to be undertaken 24 hours a day, 7 days per week. We are also providing monthly feedback reports to the primary health centre managers to assist in the closer surveillance of volume and quality of i-STAT testing in each service. Collectively, these measures have addressed many of the early challenges faced by the program.

Acknowledgements

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References