

# Virtual support of a point of care testing network

Tirimacco R.<sup>1,2</sup>, Cowley P.<sup>1</sup>, St. John A.<sup>2</sup>, Siew L.<sup>1</sup>, Tideman P.<sup>1</sup>

<sup>1</sup> Integrated Cardiovascular Clinical Network CHSA, Bedford Park, SA, 5042, Australia

<sup>2</sup> Australian Point of Care Practitioners Network, Bedford Park, SA, 5042, Australia

## INTRODUCTION

Point of Care Testing (PoCT) continues to grow in hospital and general practice (GP) markets. PoCT has the opportunity to improve turnaround times for test results, increase patient satisfaction, improve the doctor to patient relationship and ultimately improve health outcomes for those involved.<sup>1</sup> However, these outcomes cannot occur in isolation. PoCT requires a coordinated approach involving all stakeholders and must occur in collaboration with a clinical team and be part of an integrated and innovative model to succeed.<sup>2</sup>

The PoCT model needs to take into consideration the environment in which it is to be implemented. In most cases, PoCT operators will be nurses and the PoCT will be an additional role for them to undertake, so this extra task must be regarded as a valuable use of their already stretched time. Nurses will be supportive of PoCT if it improves the efficiency of their patient care activities and where the clinical benefit clearly demonstrates that not performing PoCT would be detrimental to their patients.<sup>3</sup> If PoCT is regarded as just shifting work from laboratory to nursing staff, significant resistance will occur. This highlights the importance of appropriately assessing the clinical need for PoCT before it is implemented.

The model of centralised laboratory testing does not always meet the needs of health services in rural and remote areas and PoCT is regarded as a potential approach to overcoming this inequity.<sup>4</sup> For PoCT to be successfully implemented across all health sectors, information and communications technology (ICT) must play a vital role in supporting a PoCT service, particularly for widely dispersed networks covering rural and remote areas.

Hospital staff often face a resource and time poor environment with patient care justifiably requiring most if not all of their time. The issue of nurse staffing and funding continues to increase in the current economically constrained health environment.<sup>5</sup> These factors create time and funding barriers to staff attending training and education events. This is particularly evident in rural and remote sites whose training and education opportunities would require extensive travel to a bigger and more regional health centre. However the use of ICT to provide virtual support for PoCT can break down some of these traditional barriers, allowing PoCT to be used in an efficient and effective way.

A large randomised control trial of PoCT in general practice conducted in Australia in 2009 demonstrated that for most tests involved, central laboratory testing was more cost effective

than PoCT.<sup>6</sup> One of the leading factors that contributed to the excessive cost of PoCT was the considerable amount of resources devoted to face to face training PoCT users, many of whom were in remote locations. The utilisation of virtual support can significantly reduce this cost burden and provide a more cost effective and streamlined model for training of PoCT operators.

ICT can provide a virtual network to assist with training, education, certification, result management and decision support processes for PoCT operators within a cost effective network.

### **ONLINE TRAINING**

Online information and training provides an effective method of ensuring all staff involved with PoCT are appropriately trained, regardless of their location. Training videos create moving step by step instructions for users. Accessible at any time, users are able to brush up on their skills and have visual and verbal prompts to follow when performing the tests themselves.

Hard copy methods should be made available for PoCT users to access when needing a refresher on the test they are performing. This also allows the users to become responsible for their instruments and teaches them to investigate their processes and methods in order to gather a greater understanding, before reaching for the phone to call for assistance.

Troubleshooting documentation including a list of common error codes should also be made available online. Users can interrogate these documents to ascertain where their process may be going wrong and what they can do to fix it.

### **VIDEOCONFERENCING**

The use of videoconferencing facilities enables direct user training with visual and auditory influence. This system removes the traditional

barrier of distance and ensures all PoCT operators can be comprehensively trained in the use of each instrument. User training and instrument troubleshooting can all be performed via the videoconferencing network, with the trainers able to see exactly what is happening with the instruments at the user end.

### **ONLINE CLINICAL EDUCATION**

Clinical education traditionally shared at conference and face to face meetings can also be provided in a web based format accessible to staff from any location. Presentations can be recorded and loaded on to a central online education site for staff to view in their own time and from their own health facility. Innovative programs such as webinars and web conferencing can be an even more successful alternative, with users viewing the education live and being able to ask questions to the presenter while the presentation is occurring. These presentations can also be recorded and stored centrally for review.

### **ONLINE CERTIFICATION**

Competency assessment is vital in maintaining the skills of all those participating in a PoCT network. Assessments should be performed on all aspects of the PoCT system including operation of the equipment, sample collection, performing quality control testing, troubleshooting and clinical knowledge.

Continuing Professional Development (CPD) points are able to be allocated to the assessment processes and completion certificates should be made available for users to keep their own records of competency assessment. Competencies should be repeated at least yearly to ensure user's skills are maintained.

### **ELECTRONIC RESULTS DATABASE**

Patient PoCT results should be transferred to an electronic database for storage and review

at any time. Results should be made available to all health professionals involved in the patient's care and access should not be limited to strictly internally based networks. An electronic results database allows a quick and easy update of the patient's medical history without needing to source paper based notes which may be off site, thereby creating a more streamlined patient care environment.

### ONLINE QUALITY CONTROL MANAGEMENT

Quality Control (QC) results should also be transferred to an electronic database. Electronic QC systems allow for off site management of instrument performance, electronic monitoring of user compliance and enable early identification of instrument inaccuracy and off

site troubleshooting. These systems should be made available to all PoCT users in the network to promote engagement of all users in the quality management process.

### ONLINE PATIENT MANAGEMENT

Where possible, the use of online patient management systems should be accessible to aid health professionals in managing their patients. Medication and treatment management can incorporate evidence based guidelines to create an easy to follow protocol. These management systems are particularly useful for general practitioners who may not be exposed to these patient situations on a regular basis.

**Figure 1** An online multiple choice competency assessment, with questions pertaining to all aspects of the PoCT device

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**ICNet CHSA** Integrated Cardiovascular Clinical Network CHSA

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**Roche cobas h232 Troponin T**

1. What type of blood sample is required to perform a Troponin T test on the cobas h 232?

- a) Whole blood with no anticoagulant
- b) Lithium Heparinised whole blood, with no gel
- c) EDTA whole blood
- d) Any of the above

2. How soon is Troponin T detectable in the blood?

- a) Immediately post-chest pain
- b) 1 to 2 hours post-chest pain
- c) 4-6 hours post-chest pain
- d) 2-3 days post-chest pain

3. How often should External QC testing be performed?

- a) Once a month in addition to internal QC testing
- b) Every 2 months, alternating with an Internal QC test
- c) Once every 3 months
- d) Only when a new box of strips arrive

4. How do you fill the test strip?

- a) With the test strip inserted into the meter, apply the sample with a syringe or pipette to the sample application area, ensuring not to touch the application pad
- b) With the test strip inserted into the meter, apply the sample to the application area with a syringe or pipette piercing the application pad
- c) With the test strip out of the meter, apply the sample to the application area with a syringe or pipette piercing the application pad and insert the test strip into the meter
- d) With the test strip out of the meter apply the sample with a syringe or pipette to the sample application area, ensuring not to touch the application pad and insert the test strip into the meter

## iCCnet

The Integrated Cardiovascular Clinical Network Country Health SA (iCCnet CHSA) was developed in 2001 to support general practitioners and nurses in rural areas in delivering first grade evidence based cardiac care. A key pillar of this evidence based cardiac care was the utilisation of rapid point-of-care testing for Troponin, which was successfully introduced to all 66 CHSA rural hospitals by 2008.<sup>7</sup> The PoCT service has since expanded to cover a wide spectrum of pathology tests, all embedded into a quality framework involving instrument quality control and assurance, competency assessment and regular education of all users.

With the area of South Australia covered by iCCnet stretching to almost 1 million square kilometres<sup>2</sup>, implementation of a virtual support

service has become critical to the success of the network. Online training, clinical education and certification are all provided by the iCCnet website. Videoconferencing is now employed as a major form of user training and quality control & patient result management is now achieved through an online database to complete the virtual network.

The iCCnet CHSA website contains all information pertinent to the testing process for PoCT users. Use of the website is free and users are approved by the iCCnet team. Online training including training videos and certification are provided through the iCCnet website for all instruments. Competency assessment is through multiple choice questionnaires randomly selected from a pool of test questions and a 100% pass rate is required (Figure 1). Certificates are

**Figure 2** PoCT Pathology Database showing the PoCT patient record

The screenshot shows the iCCnet CHSA Point of Care Pathology Request System interface. At the top, there is a navigation bar with options like 'New Request', 'Search', 'Outstanding Requests', 'Print', 'Tools', 'Admin', and 'Help'. Below this, a 'View Patient Test Results' button is visible. The patient information section displays details for John Smith, including his name, date of birth (01/02/1956), gender (Male), site (iCCnet), and address (Street, Town, SA, UR # 12345). There are buttons for 'Edit Details', 'New Request', and 'Back'.

The 'Test Results' section features a date range selector (Start Date, End Date) and a 'Load Results' button. Below this is a table with tabs for 'General', 'Cardiac', '1', 'Coagulation', 'Glucose', 'Blood Gases', 'Electrolyte', 'Haematology', 'Lipids', and 'Other'. The table displays various test results for the patient, including Chloride, Creatinine, Glucose, Ionised Calcium, Potassium, Sodium, Urea, Troponin T, and INR, along with their respective values and reference ranges.

General	Cardiac	1	Coagulation	Glucose	Blood Gases	Electrolyte	Haematology	Lipids	Other		
					Reading Date	07/07/2014	07/07/2014	07/07/2014	05/07/2014	15/06/2014	
					Reading Time	12:40	12:10	09:20	09:35	09:25	
					Request Date	07/07/2014	07/07/2014	07/07/2014	05/07/2014	15/06/2014	
				Test Type	Ref Ranges	Request #	<a href="#">073003699</a>	<a href="#">073003696</a>	<a href="#">073003698</a>	<a href="#">073003697</a>	<a href="#">073003700</a>
<a href="#">View Chart</a>	Chloride	98 - 109				110 mmol/L					
<a href="#">View Chart</a>	Creatinine	53 - 115				56 umol/L					
<a href="#">View Chart</a>	Glucose	4.1 - 5.5				4.6 mmol/L					
<a href="#">View Chart</a>	Ionised Calcium	1.15 - 1.33				1.04 mmol/L					
<a href="#">View Chart</a>	Potassium	3.5 - 4.5				3.5 mmol/L					
<a href="#">View Chart</a>	Sodium	138 - 146				138 mmol/L					
<a href="#">View Chart</a>	Urea	2.9 - 9.4				4.8 mmol/L					
<a href="#">View Chart</a>	Troponin T	<50					125 ng/L				
<a href="#">View Chart</a>	INR	2.0 - 3.0						2.4	2.1	2.3	

generated with a 12 month expiry, with users notified when their competency has lapsed.

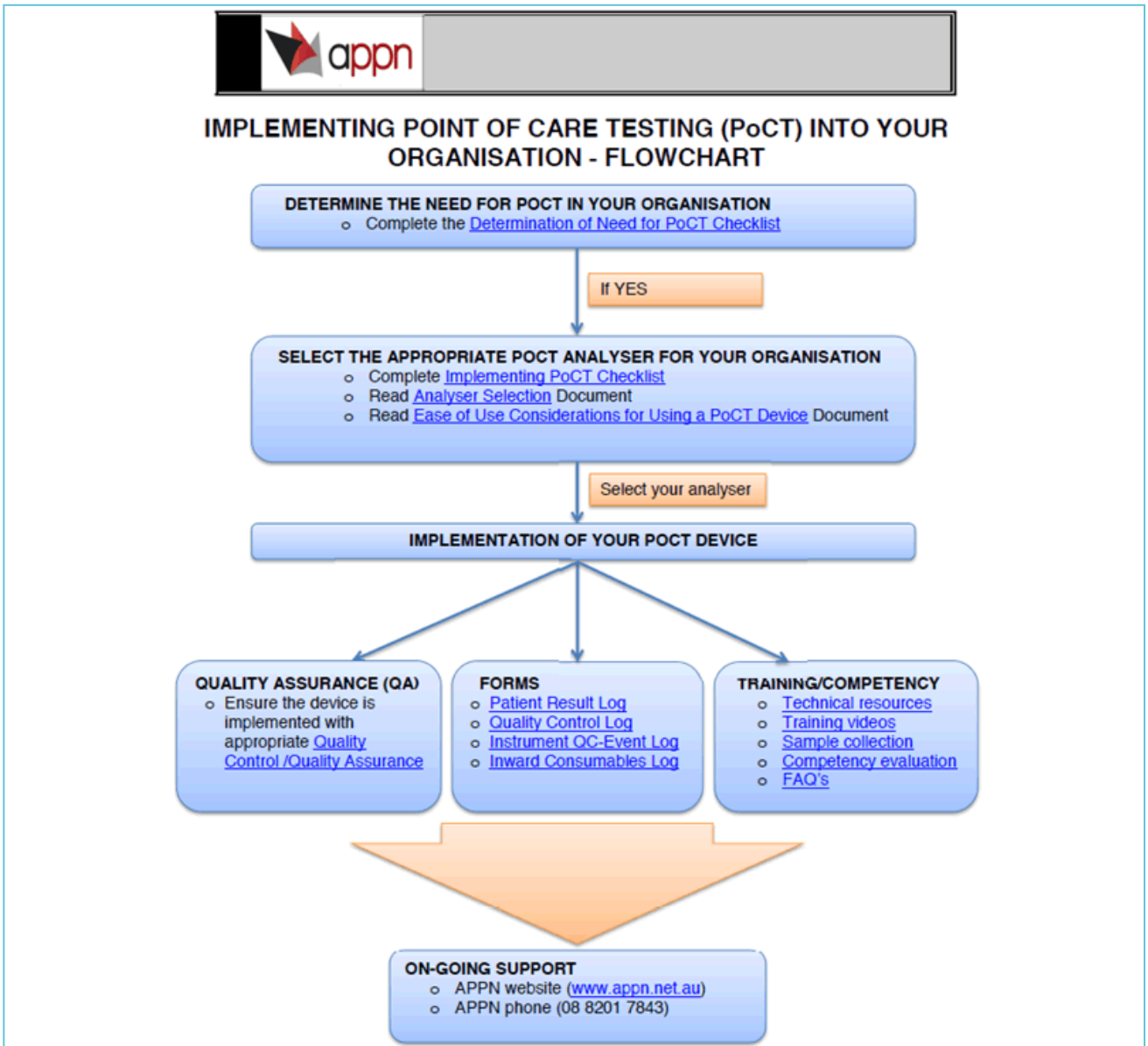
The majority of user training is conducted via videoconferencing. The upgrade of videoconferencing facilities in all hospitals throughout South Australia (SA) in 2013 enabled clear images and high sound quality for all sites including those connecting from as far as 1400 kilometres away. These facilities provide a cost effective

method for training PoCT users without the need for travel.

The upgrade of instrument software and tracking of instruments is all controlled over the iCCnet network, with two way communication from the network to the instruments.

The newest addition to the virtual iCCnet suite has been the PoCT Pathology Database for collection and storage of all patient PoCT results (Figure 2). Instruments from any manufacturer

Figure 3 APPN guidelines for implementing PoCT



are able to be connected to the Pathology Database, with 9 instrument types from 5 different manufacturers totalling 305 individual instruments currently connected.

Test results are transferred directly from the instrument to the database over a secure network and stored in the individual patient record. Pathology reports are generated for storage in hard copy notes or for emailing to doctors. PoCT consumables are able to be ordered through the system and an inventory log of all consumables on site is automatically updated with each order received and each test performed. Positive patient results are tracked daily and sent to system managers, allowing auditing of these patients to ensure protocols are followed and desired outcomes are met.

Quality Control results are also transferred directly into the system and compliance is monitored with emails automatically sent when a QC rule has been exceeded. Instrument serial numbers are tracked and out of range results are alerted allowing instrument specific troubleshooting. The system is available through a secure login on the internet, with any authorised health professional able to review PoCT results for all tests performed in Country SA hospitals.

### **APPN**

The Australian Point of Care Practitioners Network (APPN) is a web based program funded by the Australian government to provide a comprehensive resource for all PoCT operators, including professional development.<sup>8</sup> The APPN provides clinical and technical information based on clinical disease appropriate for all health professionals.

APPN registrants numbered almost 2000 in 2014, comprising both domestic and international members.<sup>8</sup> Online training, clinical education and certification are all provided through the APPN website including a personally controlled

CPD record. The PoCT process is covered from start to finish, including guidelines for implementing PoCT in your practice (Figure 3). Quality controls are managed through the website and online patient management systems are being developed through the APPN service to complete the virtual network.

The APPN website contains education around all PoCT equipment available in Australia. This includes methods, troubleshooting and clinical information. Webinars are regularly broadcast on multiple topics requested by users. Competency assessment is available for all modules and CPD points are able to be self-allocated for nursing and medical professionals. An electronic CPD record is available for all users, containing completed modules, completion certificates and alerts for assessments needing refreshing (Figure 4). Results of the quality control performance of APPN PoCT operators receiving online training and PoCT operators receiving to face-to-face training suggests that web-based training is an adequate training method for PoCT users.<sup>8</sup>

An online Quality Management Program is also available for general practice on the APPN website. This system allows the management of QC results and consumables online. Results are entered on to the system by each practice and are flagged as a pass or fail. Results flagged as a fail must have a reason identified and a corrective action must be performed to enable the safe and accurate use of that instrument. Results are able to be entered on a generic practice login, ensuring all PoCT users are involved in the quality management process.

The APPN has designed an online protocol to guide the initiation and monitoring of warfarin treatment in patients with AF. The age adjusted warfarin initiation protocol was implanted as the background algorithm to determine

**Figure 4** A user's CPD Record, demonstrating available, in progress and completed APPN online modules

Note: Tasks marked with an asterisk (\*) are mandatory

Start Date	Provider	Method of Learning	Topic and Description	Reflection (Outcome)	Evidence (Certificate)	Evaluation Completed	CPD Hour (s)
<b>In Progress</b>							
07/07/2014	APPN	Online	Diabetes Glucose Module [Nova StatStrip Glucose Connectivity]				3 hours
07/07/2014	APPN	Online	Diabetes Glucose Module [Nova StatStrip Glucose Xpress]				3 hours
<b>Available Modules</b>							
Not Started	APPN	Online	Anticoagulation INR Module				3 hours
The following tasks all need to be completed to attain 4 CPD points. The evaluation can only be completed once all other tasks are completed.							
Select Training Stream: <input type="text" value="Roche CoaguChek XS Pro"/> <input type="button" value="Apply"/>							
CPD Assessment Task	Task	Time Allocated	Date Completed				
Clinical Resources	<a href="#">Monitoring Anticoagulation Presentation</a> *	25 minutes	<input type="checkbox"/>				
	<a href="#">INR Clinical Competency</a> *	15 minutes	<input checked="" type="checkbox"/>				
	<a href="#">Warfarin Overanticoagulation Presentation</a> *	10 minutes	<input type="checkbox"/>				
	<a href="#">INR Over- Anticoagulation Competency</a> *	15 minutes	<input checked="" type="checkbox"/>				
	<a href="#">Tips on Using PoCT INR Methods</a> *	10 minutes	<input type="checkbox"/>				
	<a href="#">FAQ's for patients with fluctuating INR's</a> *	15 minutes	<input type="checkbox"/>				
	<a href="#">Age Adjusted Warfarin Initiation Protocol Document</a> *	15 minutes	<input type="checkbox"/>				
	<a href="#">Management of Overanticoagulation and Preoperative Management of Warfarin Dose</a> *	25 minutes	<input type="checkbox"/>				

warfarin dosing and PoCT embedded as the clinical contributor (Figure 5).

Through input of date of birth and PoCT INR result, the background algorithm derives the recommended warfarin dose. The recommended follow up date is listed and a printable calendar showing warfarin dose and time of next INR test is displayed along with a graph plotting all INR results. The time in therapeutic range (TTR) is calculated for each patient and for the practice overall to determine effectiveness of treatment.

## CONCLUSION

There is a need for better access to pathology testing in rural and remote Australia and this can only be provided by PoCT. To be provided in a cost effective manner, virtual support through information and communications technology must be employed. Such support can train and educate users, provide online databases to track and report patient and quality control results and incorporate online decision support to aid health professionals in treating their patients effectively.

Figure 5 The APPN warfarin online protocol for warfarin initiation

**Warfarin Online Protocol**

Start About

**Day 2.**

Daily INRs must be performed for 5 days

**Next INR test is due 13/03/2014 (Daily).**

**Please perform PoCT INR between 9am-midday (16 hours after dosing).**

Age	58
Date/Time of INR	12/03/2014 00:00
INR result	2.3
Recommended Day 2 loading dose:	0.5
Prescribed warfarin dose:*	<input type="text" value="0.5"/>

Administer warfarin at 4pm during loading phase

It holds the key to streamlining PoCT implementation and integrating it into clinical management of patients and professional development of operators.

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