Practical Examples of Point-of-Care Testing Technology Use in Rural and Remote Australia

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CRANA Conference, Broome
19 October 2017

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Introduction

Laboratory Pathology Services:

- Situated in large urban or metropolitan centres
- Result turnaround time to rural or remote health services = 12 hours up to 2 weeks
- Issues with loss-to-follow-up particularly for patients with chronic and infectious disease management
- Patients requiring regular testing sometimes forced to move closer to pathology services

Point-of-Care Testing (POCT):

- Provides immediate pathology results at the time of patient consultation
- Small, portable and small sample size
- Leads to improved outcome for patient as immediate result(s) enable ‘on the spot’ decisions for clinical management

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WHO Collaborating Centre

ICPOCT Programs

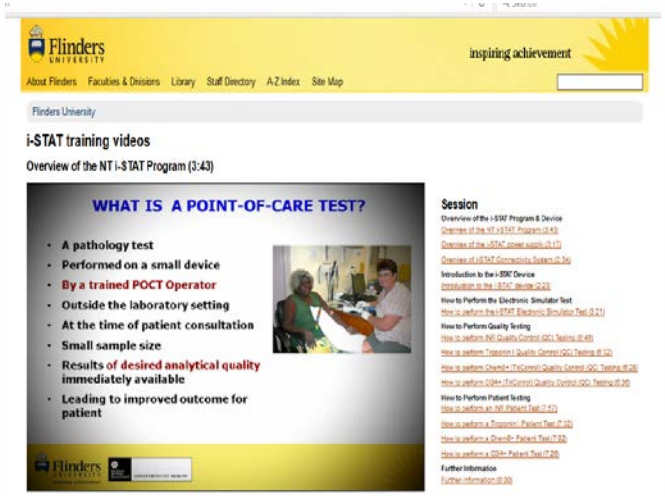
PROGRAM	DISEASE	POC TESTS	NUMBER PARTICIPATING SERVICES	REGION
INTERNATIONAL				
ACE	Diabetes	HbA1c and urine ACR	21 Rural and remote Indigenous health services across Canada (16), South Africa (1) and PNG (4)	International (rural and remote)
NATIONAL				
QAAMS	Diabetes	HbA1c and urine ACR	200 sites at Indigenous medical services	National (urban, rural and remote)
STATE/TERRITORY				
NT POCT PROGRAM	Acute clinical care and chronic disease	Electrolytes, Urea, Creatinine, Glucose, Haemoglobin, Blood Gases, Troponin, INR	72 Remote health centres	Territory-wide (remote)
TTANGO 2 **(with Kirby Institute)**	Infectious Disease (STI)	Chlamydia and gonorrhoea (and Trichomonas)	28 Indigenous medical services	WA, QLD, SA and NT (rural and remote)
HemoCue WBC DIFF TRIAL	Infectious Disease	Total White cell count, Lymphocytes, Neutrophils, monocytes, eosinophils, basophils	13 Remote Health Services	Northern Territory (remote)

ICPOCT Programs

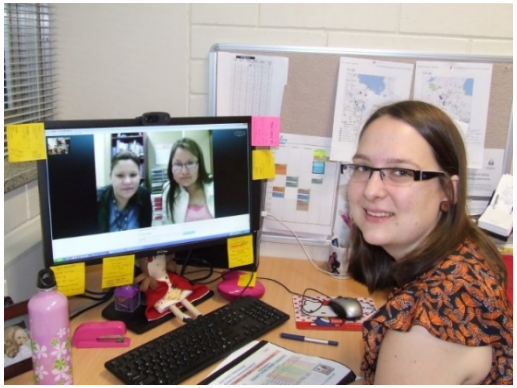
Common elements for all programs managed by ICPOCT:

- ✓ Training
- ✓ Quality Management
- ✓ Support Services
- ✓ Research Effectiveness

All Programs - Flexible Training Methods

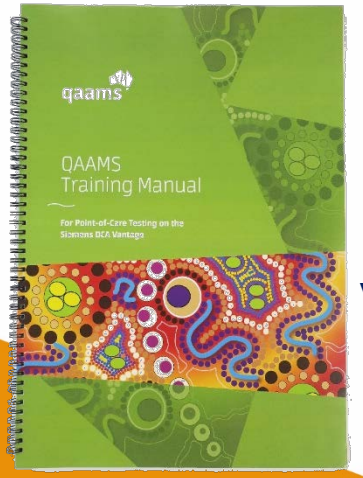


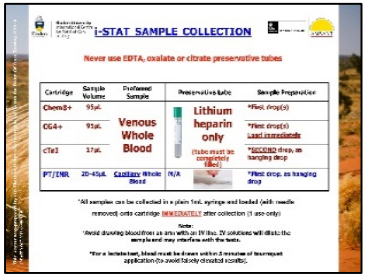
Online 24/7 Training



Videoconference + GoToMeeting Training

On-site group training





Variety of training resources

Large training workshops

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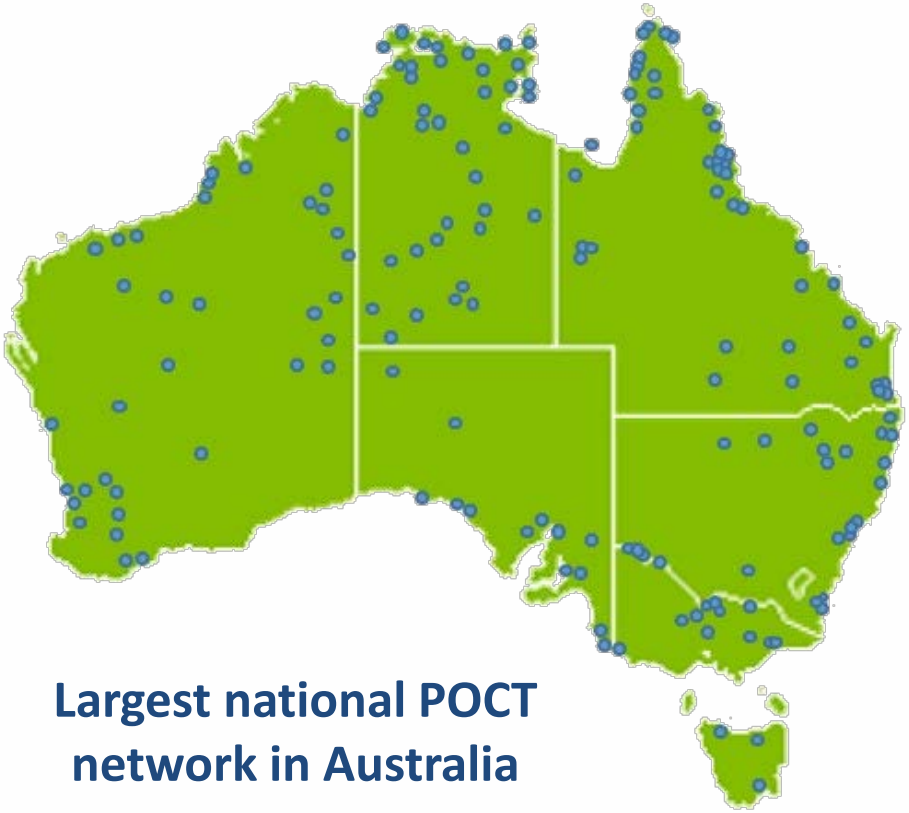
Quality Assurance for Aboriginal and Torres Strait Islander Medical Services



Largest national POCT network in Australia

- **Diabetes diagnosis and management**
- **200 enrolled devices (majority rural or remote)**
- **Funded for past 18 years by the Australian Government (1999-2021 ongoing)**
- **2013 FAIMER awarded "Projects that Work"**

Website:
www.qaams.org.au

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qaams

- Siemens DCA Vantage POCT device
- Diabetes management & diagnosis
- Haemoglobin A1c (HbA1c)
- Urine albumin creatinine ratio (ACR)
- Results in 7 minutes or less
- Aboriginal Health Practitioners/Workers trained as POCT operators
- Medicare Rebate for tests

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Clinical Effectiveness

QAAMS: Clinical and Operational Efficiency

Parameter	15 months before POCT, (using the lab)	15 months after POCT introduced
Mean change in HbA1c; first to most recent	9.5% to 9.8%	10.6% to 7.9%*
Mean TAT for HbA1c result	42 hours	6 minutes
Mean TAT for patient follow-up	24 days	<15 minutes
Mean number of HbA1c tests per patient	2.7 tests	4.2 tests^

TAT = Turn-around-time, n= 40 patients

* = Statistically significant (p <0.05, paired t-test)

^ = Recommendation is 1 HbA1c test every 3 months = 5 tests in 15 months

Reference: Spaeth, B, Shephard, M & Schatz, S 2014, 'Point-of-care testing for haemoglobin A1c in remote Australian Indigenous communities improves timeliness of diabetes care', *Rural and Remote Health*, vol. 14, no. 4, p. 2849.

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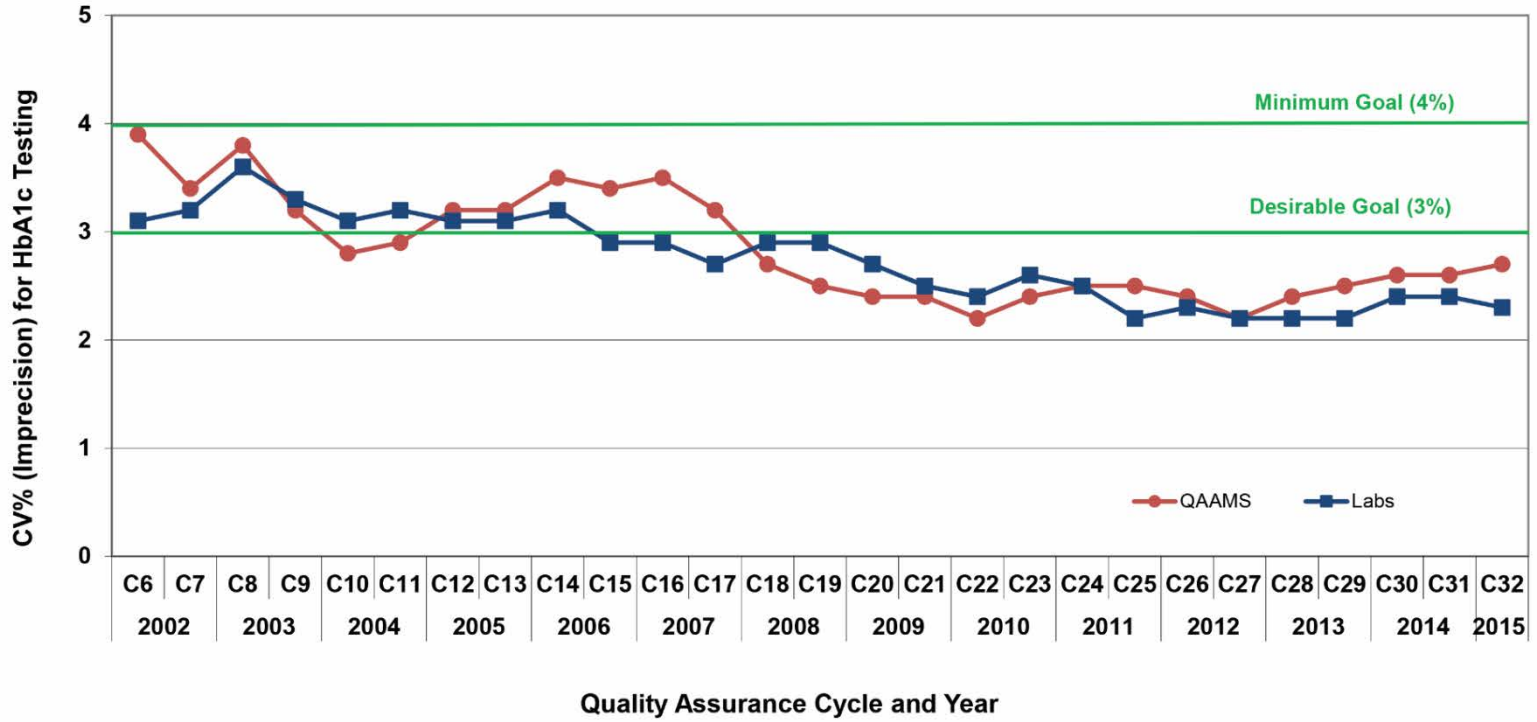
Analytical Quality: QAAMS

Imprecision for HbA1c QA testing



The lower the CV%,
the better the quality of the test

Reference: Shephard M et al. 2017, Results from 15 years of quality surveillance for a National Indigenous Point-of-Care Testing Program for diabetes, *Clinical Biochemistry*, In press.

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Cultural Effectiveness

QAAMS: Stakeholder Satisfaction Survey

Indigenous Stakeholder	Satisfaction	% Unsatisfied	% Unsure	% Satisfied	Number of responses
Operators	Before POCT	30	28	42	57
	After POCT	3	7	90	
Patients	Before POCT	11	28	61	159
	After POCT	3	6	91	

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Reference: Shephard MDS 2006, *Clinical Biochemist Reviews*, vol. 27, pp. 161-70.

Cultural Effectiveness

"All sources of evidence suggest that QAAMS is meeting best practice standards in the areas of Indigenous healthcare, chronic disease management and Point of Care testing."[1]

"QAAMS is one of the few programs to successfully navigate the cultural complexities and potential pitfalls of chronic disease management in Indigenous communities."[2]

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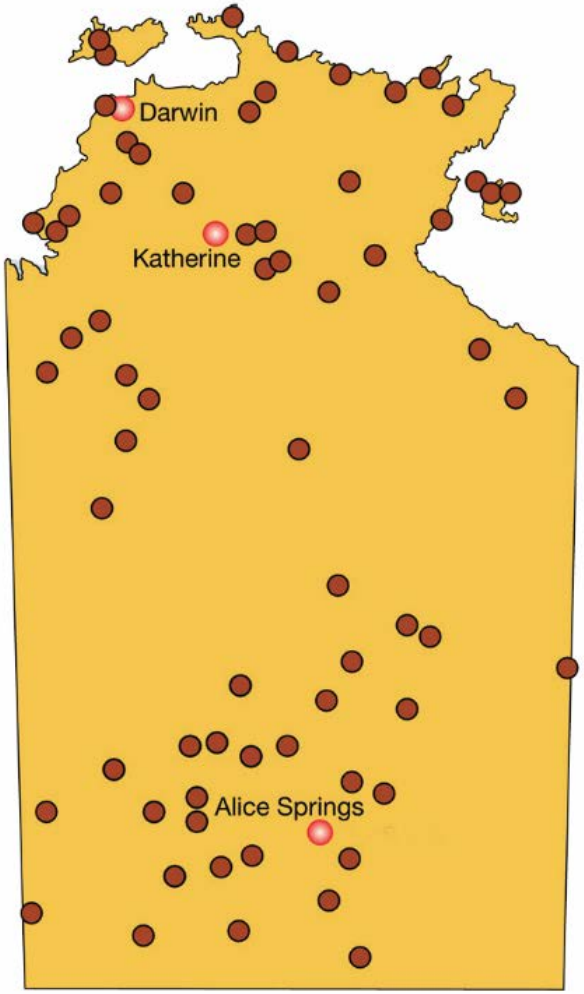
1. Independent evaluation: Campbell Research and Consulting, 2008.
2. Final Report to Australian Government, 2008.

NT POCT Program



- Commenced in 2008
- Now total 71 Remote Health Services (49 DoH and 22 ACCHS)
- i-STAT POCT device
- Acute care and chronic disease
- >1200 operators trained since 2008
- >2500 tests per month (2017)

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Website: http://www.flinders.edu.au/medicine/sites/point-of-care/

NT POCT Program - i-STAT POCT device

Clinical Condition	i-STAT Test	Time to Result	Clinical Application
Acute disease	Troponin I	10 mins	Early risk stratification for acute coronary syndrome
	Electrolytes	2 mins	Assessment of hydration status
	Blood gases	2 mins	Assessment of fluid and water balance, respiratory disorders and acid base status
Chronic disease	INR	< 5 mins	Monitoring of patients on anticoagulation therapy
Both acute and chronic disease	Creatinine and Urea	2 mins	Assessment of acute renal failure/chronic renal disease
	Haemoglobin	2 mins	Assessment of acute blood loss/monitoring of anaemia
	Glucose	2 mins	Monitoring glycaemic status

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Results – Analytical Quality

Table – Representative example of Quality Control testing results for the i-STAT.

Analyte	n	Target	i-STAT Mean	i-STAT CV%	Laboratory Median CV%
Sodium	233	122.0	121.5	0.6%	0.9%^
Potassium	233	2.9	2.9	0.8%	1.4%^
Chloride	235	72	73	1.2%	1.2%^
Glucose	231	15.0	15.1	1.0%	2.1%^
Urea	233	19.3	19.3	2.6%	2.5%^
Creatinine	234	335.5	336.8	2.9%	2.7%^
pH	230	7.04	7.05	0.2%	1.4%*
Lactate	229	7.1	6.9	2.4%	4.6%*
Troponin I	196	0.34	0.31	7.0%	7.7%^

The lower the imprecision (CV%) the better the quality of result

CV% = Coefficient of Variation percentage

^ Median imprecision achieved by laboratories in the Royal College of Pathologists of Australasia's (RCPA) General Chemistry and Therapeutic Drugs, Cycle 103, 2016.

* Median imprecision achieved by laboratories in the Royal College of Pathologists of Australasia's (RCPA) Blood Gas and Co-Oximetry, Cycle 57, 2016.

Results – Cost Effectiveness

Title: 'Point-of-Care Testing for Better Management of Acutely Ill Remote Patients' (funded by Emergency Medicine Foundation Grant)

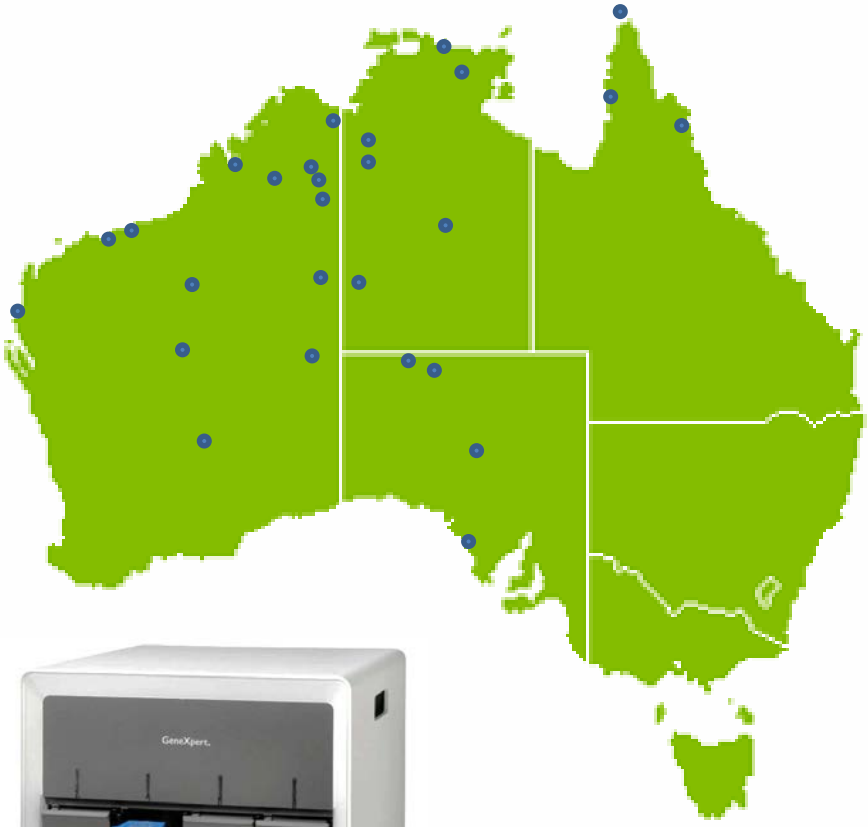
- Investigated clinical and cost effectiveness of using the i-STAT as a decision support tool for triaging acutely ill patients
- Three common acute clinical presentations in 200 patients (chest pain [n=147], missed dialysis [n=28] and acute diarrhoea [n=25]) at 6 remote health centres (small, medium, large)
- POCT enabled early diagnosis and treatment for those appropriately evacuated (n=21)
- POCT resulted in the prevention of 60 medical evacuations
- Health Economist extrapolated results to provide Territory-wide estimates of cost savings
- Territory-wide **cost saving of $20.93 million per annum for NT health system** through prevention of unnecessary medical evacuations for just these 3 presentations.
- Demonstrated that POCT also delivered **improved clinical outcomes for acutely ill patients** in remote communities.

Reference: Spaeth B, Kaambwa B, Shephard MDS, Omond R, '**Economic Assessment** of Point-of-Care Testing in the Remote Primary Health Care Setting', submitted to *BMC Health Services Research* 2017.

Infectious Disease POCT Network – TTANGO 2

TTANGO2
(Test, Treat ANd GO 2)

- GeneXpert POCT device
- Tests for chlamydia (CT) and gonorrhoea (NG)
- CQI component to increase testing and improve the management of STIs
- 28 remote Indigenous communities across WA, SA and QLD soon to start in NT
- Collaboration between the Kirby Institute, FUICPOCT and a range of other stakeholders



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TTANGO2 - Partnerships and Collaborations

- TTANGO2 Investigators and their institutions (Kirby Institute UNSW, Flinders University International Centre for Point-of-Care Testing, Royal Women's Hospital, Burnet Institute, University of QLD Centre for Clinical Research, Deakin University, South Australian Health and Medical Research Institute, WA Department of Health, Cepheid, Apunipima Cape York Health Council, Ngaanyatjarra Health Service, PathWest Laboratory Medicine)
- In partnership with and support from
  - WA: WA Health, AHCWA, NHS, KAMSC
  - NT: AMSANT, NT Health
  - SA: AHCSA, SA Health
  - QLD: QAIHC, QLD Health, Apunipima
  - Pathology providers: PathWest, CliniPath, Westerns, Pathology QLD, SA Pathology, SNP
- National Serology Reference Laboratory
- Monash University
- Medical Communications Associates

Infectious Disease POCT Network – TTANGO 2

- Molecular-based POCT device for chlamydia and gonorrhoea
- Reduced TAT for results (90 minutes)
- Treatment on same day
- Currently for CT / NG
- Trich (Trichomonas vaginalis) test in 2018

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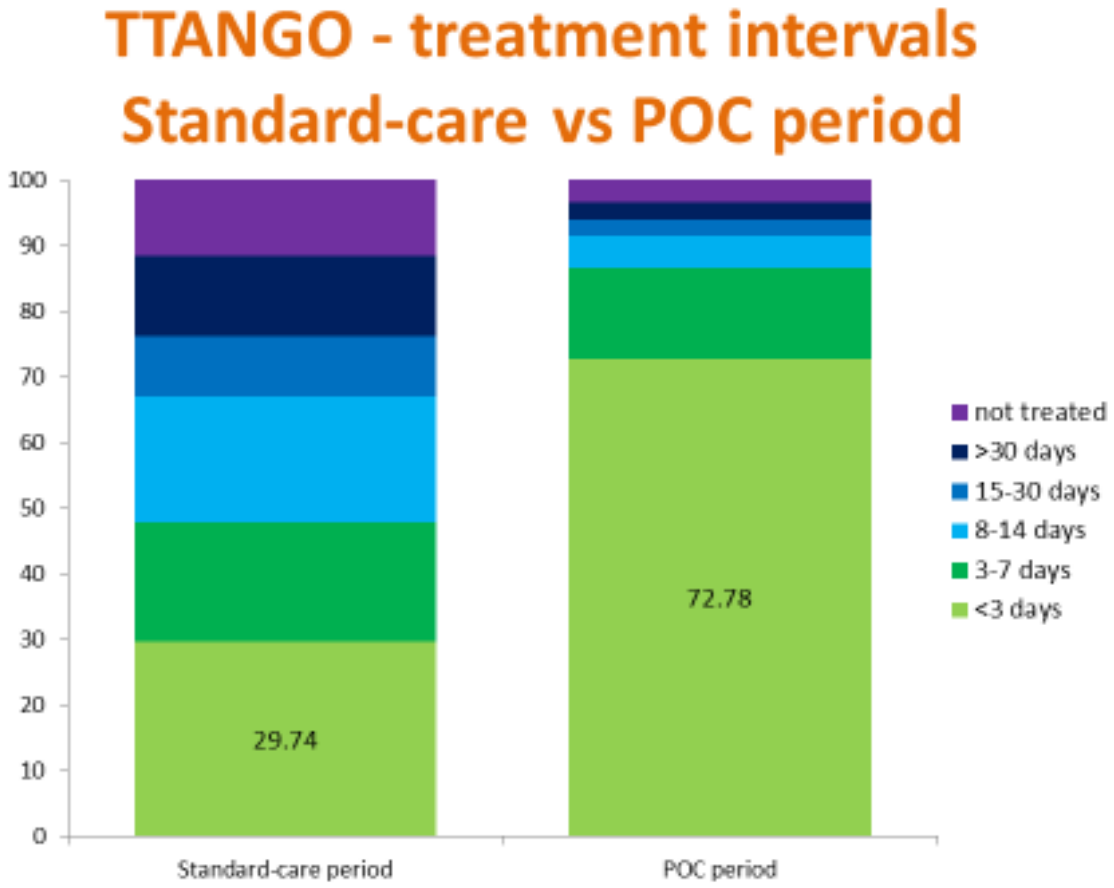
Reference: Causer, LM, Hengel, B, Natoli, L et al. 2015, 'A field evaluation of a new molecular-based point-of-care test for chlamydia and gonorrhoea in remote Aboriginal health services in Australia', *Sexual Health*, vol. 12, no. 1, pp. 27-33.

Results from TTANGO Trial



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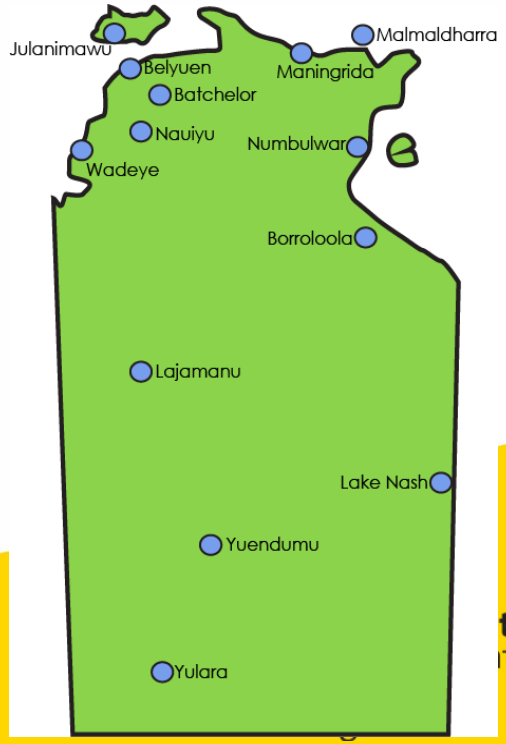
HemoCue WBC DIFF Trial

- HemoCue WBC DIFF POCT device
- WBC DIFF device provides a total and 5-part differential white cell count result in < 5mins
  - Total white cell count
  - Lymphocytes
  - Neutrophils
  - Monocytes
  - Basophils
  - Eosinophils
- Analytically sound in remote environment*
- Trial in 13 remote health services in NT to research clinical, operational and cost effectiveness



Reference: Spaeth BA, Shephard MDS, McCormack B, Sinclair G, 'Evaluation of HemoCue white blood cell differential counter at a remote health centre in Australia's Northern Territory', Pathology, 2015; 47(1): 91-95.

HemoCue WBC DIFF Trial

Clinical Effectiveness:

- Sepsis
- Respiratory infections
- Fever
- Appendicitis
- Parasitic infection

Operational benefit:

- High satisfaction / ease of use
- 37% of FBE pathology reports returned with WCC not reliable / not reported as sample did not reach laboratory with 72 hours

Cost benefit:

- Cost savings through prevented evacuations

Quote from Rural Medical Practitioner:
"[The HemoCue WBC DIFF] is a piece of equipment that should be in every remote community."

Conclusion

Point-of-Care Testing:

- Brings diagnostic test closer to the site of patient care
- Improving patient management for acute, chronic and infectious diseases
- More convenient for patients
- Can produce significant cost savings

Any questions?