Chapter

Patient-Centred Point-of-Care Testing: A Life-Changing Technology for Remote Primary Care

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Abstract

Point-of-care (POC) testing has proven to be a life-changing and transformational technology for patients with acute, chronic, and infectious diseases who live in regional and remote Australia. This technology facilitates patient-centred test results, of equivalent laboratory quality, that are rapidly available to inform clinical and public health decisions with immediate impact on case management. Traditionally, POC testing in high-middle income countries has been most widely used in tertiary or acute care settings to provide rapid diagnostic results for emergency departments, intensive care units, operating theatres and outpatient clinics. However, in low-middle income countries, POC tests are commonly used during antenatal and perinatal care for infectious disease detection, such as Human immunodeficiency virus (HIV) or syphilis, where laboratory services are too expensive, inaccessible, or non-existent. Similarly, the application of POC testing in primary care settings in Australia offers improved healthcare benefits to geographically isolated regional and remote communities, where access to laboratory-based pathology testing is poor and the burden of disease is high. Evidence-based data from research in established primary care POC testing networks for acute chronic, and infectious disease is used to describe the clinical, cultural, and economic effectiveness of POC technologies. Innovative solutions to address current barriers to the uptake of POC testing in primary care settings, which include clinical and cultural governance, high staff turnover, operator training and competency, device connectivity, quality testing, sustainable funding strategies, and the need for regulatory requirements are also discussed. POC testing can provide practical and resourceful opportunities to revolutionise the delivery of pathology services in rural and remote primary care sectors, where the clinical and community need for this technology is greatest. However, several barriers to the scale-up and sustainability of POC testing networks in these settings still exist, and the full potential of POC testing cannot be realised until these limitations are addressed and resolved.

Keywords: Primary health care, point-of-care testing, patient-centred care, remote, Australia

1. Introduction

Primary health care describes the first contact an individual with a health concern has with the health system that is not related to a hospital visit. This may include health promotion, prevention, early intervention, treatment of acute conditions, and management of chronic conditions or infectious disease [1].

In 2015–2016, the proportion of the Australian health budget spent on primary health care (approximately 35%, representing approximately $AUS 59 billion) was similar to that of country's hospital services (39%, representing approximately $AUS 66 billion), reflecting the vast and diverse geographical and cultural requirements for health care services in the country [2]. In rural and remote Australia, healthcare services in primary care differ to that in urban or metropolitan areas. Primary healthcare facilities are generally small, with less infrastructure to provide a broad range of health services to a wide geographically distributed population [3]. In addition to a lack of resources, the health of those living in rural and remote Australian locations is also poorer, with the life expectancy for both males and females decreasing with increasing remoteness [3]. The workforce of Australian rural and remote primary health care relies more on general practitioners (GPs) to provide health care services, either on-site, or more recently via telehealth consultations [4, 5]. The remote primary healthcare sector is also largely supported by nurses and Aboriginal Health Practitioners [6]. Due to the high proportion of Aboriginal and Torres Strait Islander people living in remote Australia, health services in these regions are provided by either: (i) Aboriginal Community Controlled Health Services (ACCHOS), which are funded by the Australian Government and administered by a Board comprising Aboriginal and Torres Strait Islander representatives from the respective community or (ii) State or Territory funded health services [7]. With the burden of acute, chronic, and infectious diseases amongst Aboriginal and Torres Strait Islander people higher than that of the non-Indigenous population and the highest Indigenous disease rates correlating with degree of geographic remoteness [3], the overarching Indigenous governance of ACCHOs assists in the delivery of culturally safe health services to address health inequity in Australia [7].

Point-of-care (POC) testing refers to pathology testing performed in a clinical setting at the time of patient consultation, generating a rapid test result that enables timely clinical decision making for patient care [8]. POC testing has proven to be a transformative and life-changing technology for health services and patients in remote Australian communities. From the patient perspective, POC testing provides a convenient and accessible 'one-stop' health service. In this context, POC testing empowers the patient to be accountable for their own health, eliminating the need for multiple follow-up visits to the health services to access diagnostic test results and commence treatment or other interventions. It is also assumed that POC testing reduces patient anxiety associated with waiting for pathology results as test results can be obtained quickly and discussion with the treating clinician can commence immediately. From a clinical perspective, POC test results allow the health practitioner to make immediate and informed decisions for patient management, including the rapid initiation of treatment and/or alternative health intervention strategies. From a cultural perspective, POC testing has enabled Aboriginal and Torres Strait Islander people without life-threatening conditions to be safety monitored and/or treated in their own community [9]. Thus, POC testing not only averts costly medical evacuations, but also allows First Nation people to remain on 'Country' with community and cultural support during the recovery period. Additionally, POC testing assists remote communities by building local health workforce capacity and facilitating an extended scope of practice for Aboriginal Health Practitioners, who can be trained to conduct POC testing. In qualitative surveys, Aboriginal Health Practitioners reported being trained and competent in POC testing as "empowering them to care for patients in their local communities" [10].

DOI: http://dx.doi.org/10.5772/intechopen.100375

2. Examples of primary care POC testing networks in Australia

The Flinders University International Centre for Point-of-Care Testing (ICPOCT) is a specialist POC test provider, with over 20 years of experience in the establishment, management, and evaluation of best-practice POC testing to improve access to routine pathology services. At present, the ICPOCT independently manages five POC testing networks and is a collaborating partner with the Kirby Institute at the University of New South Wales (UNSW) on a further two POC testing networks. **Table 1** summarises the ICPOCT and collaborative partnership POC testing programs indicating the POC test device used, the POC test/s performed, the time taken to generate the POC test result, and the number of participating health clinics. The complexity of the POC methodologies and device types used across these POC testing programs ranges from simple, lateral flow rapid antibody tests with qualitative results (e.g. used to detect *Treponema pallidum* (Syphilis) infection) to complex, gold-standard, nucleic acid amplification tests (NAATs) which utilise safe, closed cartridge test systems for the qualitative detection of infectious disease RNA (e.g. used to diagnose SARS-CoV-2 (COVID-19) infection) or DNA (e.g. used to detect *Chlamydia trachomatis* (Chlamydia), *Neisseria gonorrhoeae* (Gonorrhoea) and *Trichomonas vaginalis* (Trichomonas) infections) or the quantitative detection of infectious disease RNA viral load (e.g. used for diagnosis and monitoring of Hepatitis C (HCV) infection).

POC testing program name	POC device used	POC test/s performed	Time for POC test result/s (mins)	No. of clinics
QAAMS	Siemens DCA	HbA1c^	7 min	238
	Vantage	Urine ACR#	6 min	
NT i-STAT	Abbott i-STAT	Electrolytes (sodium and potassium), glucose, Hb~, urea, creatinine, Cardiac troponin I Blood gases – pH, pO2, pCO2, base excess; lactate INR*	2 min 10 min 2 min 5 min	86
COVID-19**	Cepheid GeneXpert	SARS-CoV-2+	45 min	83
TTANGO (Test, Treat and Go)**	Cepheid GeneXpert	Chlamydia, Gonorrhoea and Trichomonas	60–90 min	55
ESR	Abbott Syphilis TP	Syphilis	15 min	84
Syphilis WA	Abbott Syphilis TP	Syphilis	15 min	41
NT WBC DIFF	Radiometer (HemoCue) WBC DIFF	Total WBC count plus five-part differential	5 min	20

*^Haemoglobin A1c, #albumin:creatinine ratio, ~Haemoglobin, *International Normalised Ratio, +Severe Acute Respiratory Syndrome Coronavirus 2, **Partnership POC testing program with the Kirby Institute, University of New South Wales.*

Table 1.
Summary of primary care POC testing networks managed by the ICPOCT (Flinders University) alone, or in collaborative partnership with the Kirby Institute (UNSW).

The POC testing programs described in **Table 1** are primarily focussed in rural and remote Australian primary care settings, with the general location of health services participating in the seven networks represented in the series of maps in **Figure 1(A–F)**. Indicative of the clinical need for diagnostic test provision by POC testing, it is notable that over 50% of the health services participating in the Aboriginal and Torres Strait Islander COVID-19 POC testing program are located more than 10 hours' drive from a laboratory testing facility and thus complement laboratory services [11]. In addition, primary health care services particularly in the most remote parts of Australia (notably the Northern Territory and north-west and central Western Australia) actively participate concurrently in up to six POC testing networks so that they can facilitate a broad range of on-site diagnostic tests for patient centred-care (**Figure 2**).

The Quality Assurance in Aboriginal Medical Services (QAAMS) POC testing program for diagnosis and management of diabetes and renal disease, the Aboriginal and Torres Strait Islander COVID-19 (COVID-19) POC testing program, the Test, Treat ANd GO (TTANGO) POC testing program for sexually transmitted disease

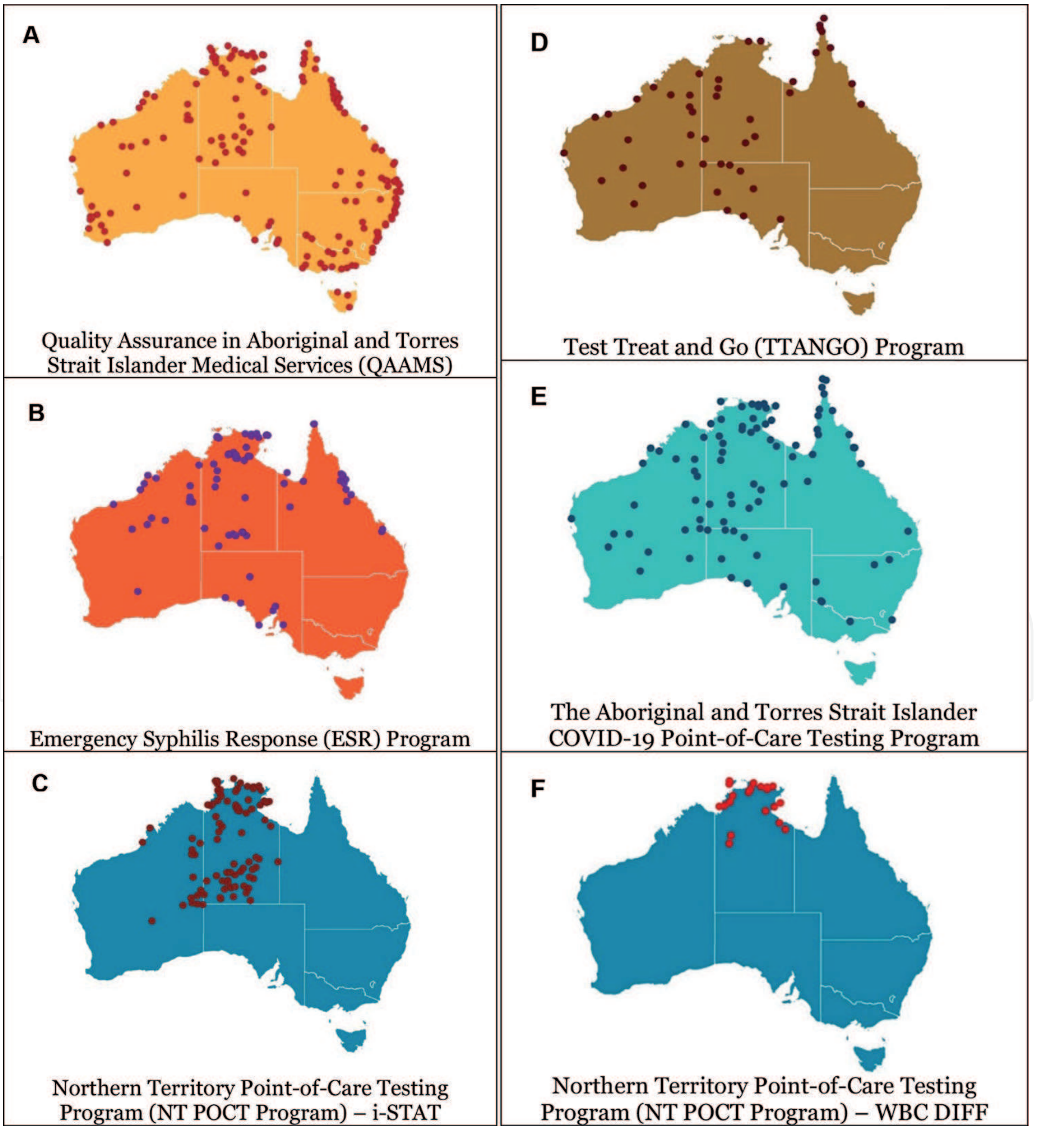

Figure 1.
(A–C). *Point-of-care testing network maps under the jurisdiction of the ICPOCT.* **(D–F)**. *Point-of-care testing network maps under the jurisdiction of the ICPOCT.*

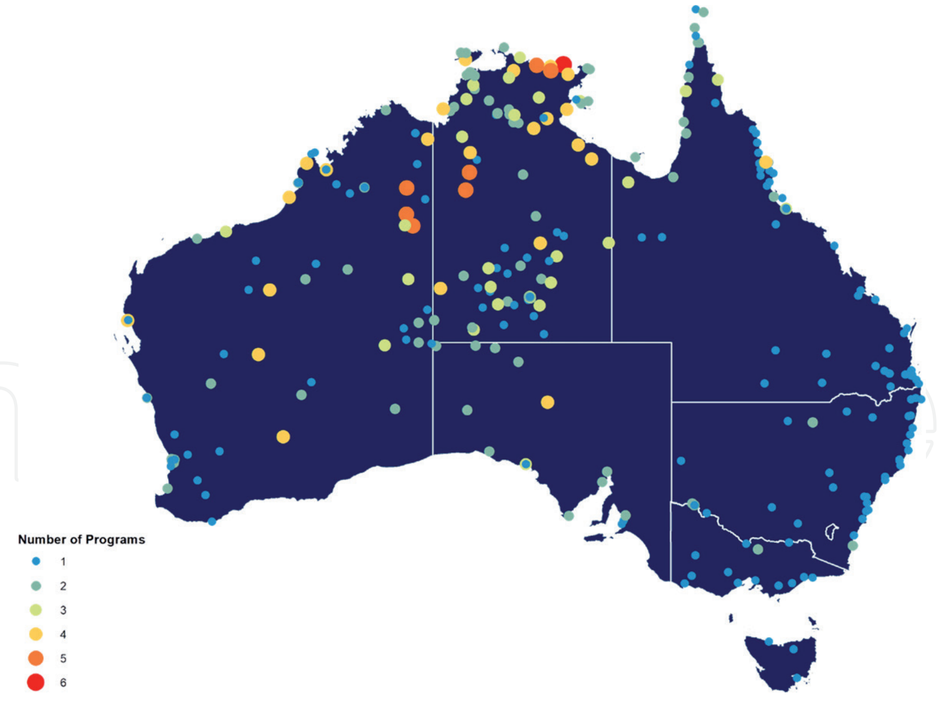

Figure 2.
Merged ICPOCT point-of-care network maps.

diagnosis and monitoring and the Enhanced Syphilis Response (ESR) POC testing program are all funded by the Australian Government and thus include site selection criteria for national testing coverage, complementary to regional and urban laboratories. The COVID-19 and ESR POC testing programs were both established as 'emergency response' initiatives under the directive of the Australian Government [12]. The Northern Territory (NT) i-STAT POC testing program for acute disease management (blood gas, urea/electrolytes and cardiac troponin I), and Prothrombin (PT)/International Normalised Ratio (INR) monitoring and the White Blood Cell (WBC) Differential (DIFF) POC testing program for sepsis diagnosis are both funded by the NT Government Department of Health and include site selection criteria and enrolled health services specific to the remote Central and Top End regions of the NT. Similar to the NT funded POC program, the Western Australian (WA) Syphilis POC testing program is a state-based network funded by the WA Government Department of Health, facilitating syphilis POC testing in broad range of decentralised setting including: remote, regional, and urban community services, hospital maternity wards, peer harm reduction outreach services, homeless health care services and prisons.

The QAAMS Program has been operational for 22 years [13], and is economically sustainable at the health service level due to the availability of specific public health (Medicare Benefits Schedule (MBS)) rebates for: (i) glycated haemoglobin A1c (HbA1c) POC testing for diabetes diagnosis or management and (ii) urine albumin to creatinine ratio (UACR) POC testing for monitoring of renal disease, when the quality management is compliant under the auspices of the QAAMS program. At present, the QAAMS program supports the only POC testing performed outside of an accredited laboratory facility within Australia to have approved MBS item numbers. Dependant on regulatory system development to facilitate accreditation processes, an equivalent MBS rebate may soon expand to HbA1c POC testing performed independently within GP clinics in Australia.

Like the QAAMS program, the NT i-STAT POC testing also has significant longevity, with 13 years of continuous operation and government funding [14]. The sustainability of the NT i-STAT POC testing program is largely associated with the demonstrated economic benefits of POC testing in acute clinical management in remote primary health care, due to averted medical evacuations [15]. The NT government has also recently expanded the NT POC testing network to facilitate twenty total white blood cell (WBC) count POC devices (HemoCue, Radiometer) with 5-part WBC differential for sepsis management in the Top End NT sites.

The COVID-19 and TTANGO POC testing programs, and more broadly a National Health and Medical Research Council (NHMRC) Centre for Research Excellence for Infectious Disease POC Testing in the Asia-Pacific, are representative of a long-term, collaborative partnership between the ICPOCT and the Kirby Institute (UNSW). The COVID-19 and TTANGO POC networks use gold-standard NAATs within a safe, closed cartridge testing system to detect the respective infectious disease RNA or DNA, using the Cepheid GeneXpert POC device [11]. Some POC devices, including the GeneXpert (Cepheid), offer broad clinical application with extensive test menus as well as the rapid development of newer *in vitro* diagnostic tests utilising the same test cartridge design and device infrastructure. Utilising this capability, a new collaborative POC testing network (with the Kirby Institute) for capillary (fingerstick) hepatitis C viral load using the GeneXpert will be established in late 2021 to early 2022. Funded by the Australian Government, the National Hepatitis C (HCV) POC testing program, will focus on the application of a Class IV *in vitro* diagnostic POC test in a broader range of primary care settings. Justice health services, safe drug injection rooms, community needle and syringe programs and homeless health services will be eligible as high prevalence, decentralised test sites for enrolment into the National HCV POC testing program. The overall aim of the National HCV POC testing program is to support Australia's contribution to the World Health Organization's global goal to eliminate hepatitis as a public health threat by 2030 [16]. In addition, future infectious disease research to investigate the potential advantages of using multiplexed POC test cartridges, such as respiratory panel, including Influenza A, Influenza B (Flu A/B), COVID-19 and Respiratory Syncytial Virus (RSV) in primary care settings using the GeneXpert in Australia may also be warranted.

3. Clinical outcomes

In the Australian primary care POC testing programs described above, the evidence-based clinical outcomes that benefit patient care following the introduction of POC testing as summarised in **Table 2**.

POC network	Clinical focus	POC test	Outcome measure
QAAMS	Chronic	HbA1c^	Improvement in glycaemic control
NT i-STAT	Acute	Cardiac Troponin I	Early risk stratification for acute coronary syndrome
		Potassium	Stabilisation of patients with severe vomiting or diarrhoea
	Chronic	INR*	Improved time in therapeutic range
NT WBC DIFF	Acute	White blood cell count	Assisted with patient triage
TTANGO	Infectious	Chlamydia and Gonorrhoea	Reduction in time to treat
COVID-19	Infectious	SARS-CoV-2+	Early detection/reduced time to treat

^*Haemoglobin A1c,* **International Normalised Ratio,* +*Severe Acute Respiratory Syndrome Coronavirus 2.*

Table 2.
Summary of key clinical outcome measures from Australian primary care POC testing networks.

Briefly, some of these benefits include: (i) improved glycaemic control in patients with type 2 diabetes [17], (ii) improved time in therapeutic range for warfarin-treated patients [18], (iii) early risk stratification for acute coronary syndrome [19], (iv) assisted triaging and determination of need for medical evacuation in septic patients with four different medical presentations and [20] (v) reduced time to treat sexually transmitted disease [21, 22]. These positive clinical outcomes associated with the introduction of POC testing in remote primary health care services highlight some of the life-changing impact that this type of technology can offer in decentralised patient care settings.

4. Patient-centred outcomes

POC testing enables the patient to be at the centre of healthcare processes. Diagnostic POC test results are rapidly available within the initial on-site consultation, inform prompt patient management decisions and even may fast-track additional clinical investigations, as required. For the patient, this eliminates the need to attend separate phlebotomy collection services and return for a follow-up visit to discuss laboratory test results, thus making POC testing patient-centric and linkage to care convenient. Other cited patient benefits for POC testing include: (i) increased adherence to diabetes medication [23], (ii) reduced pain and/or anxiety associated with capillary, rather than venous blood collection, particularly for elderly or paediatric patients, and (iii) an increased likelihood of patients consenting to diagnostic testing [24]. Furthermore, the wait for the return of diagnostic test results is a reported cause of anxiety [25, 26], so in this context, POC testing may also reduce overall patient anxiety or stress related to waiting for laboratory test results [27].

In acute care settings, POC testing changes lives, with rapid results informing prompt diagnosis and rapid initiation of patient stabilisation and/or treatment. An example is the use of i-STAT cardiac troponin I POC testing within the NT POCT Program for the immediate diagnosis of non-ST elevation myocardial infarction (non-STEMI) in remote patients [19]. In this scenario, if cardiac troponin I POC testing was not available, non-STEMI events may not be quickly diagnosed and treated [19]. Without POC testing, remote patients who often miss scheduled dialysis due to cultural and community obligations may also become acutely ill. In these cases, the i-STAT POC device can be used to detect critical levels of hyperkalaemia, so that immediate treatment with calcium gluconate to lower cardiac risk can be initiated [19]. In dehydrated patients, with acute vomiting or diarrhoea, i-STAT POC testing facilitates frequent monitoring of the patient's electrolyte levels during stabilisation with IV or oral fluid administration [19]. In these remote primary care settings, POC testing facilitates information to avert the time, inconvenience and cost of unnecessary transfer to a tertiary medical facility. Averting unnecessary medical evacuations can be particularly significant for Aboriginal and Torres Strait Islander people who live in remote communities, where the dislocation from community and Country can cause significant mental distress [28, 29]. Though brief, these examples illustrate how POC testing can be a life-changing technology at the individual patient level, particularly for those who would not otherwise be able to access timely pathology results.

5. Public health outcomes

Beyond the individual patient level, POC testing programs have the capability to facilitate broader public health benefits. For example, one of the site selection criteria for the COVID-19 POC Program was that primary health care services were located a minimum of 2 hours' drive from an existing COVID-19 testing laboratory facility and serviced predominately Aboriginal and Torres Strait Islander communities of greater than 500 people. Indicative of the clinical need of the COVID-19 POC testing program for remote, priority communities, by the completion of site enrolment, approximately half of the participating health services were located more than 10 hours' drive from a laboratory testing facility and included several health services located on remote islands requiring dedicated flights to reach mainland COVID-19 testing services [11]. To provide wider COVID-19 testing access, a hub and spoke model was established, whereby nasopharyngeal swab samples were collected from patients in neighbouring spoke communities, placed into virus inactivating molecular transport media and transported to the hub testing sites. The hub and spoke POC testing model expanded total testing capability to approximately one hundred and fifty at-risk communities (from eighty-eight hub testing sites). With over 32,000 patient COVID-19 POC tests performed nationally to date, the Aboriginal and Torres Strait Islander COVID-19 POC testing program has significantly reduced the time required for isolation/quarantining for vulnerable individuals who test negative as the turn-around time for COVID-19 results is reduced from an average three-day turn-around time for laboratory testing to less than one hour per test for POC testing. Applying similar assumptions of community size, remoteness and access to laboratory test facilities as those reflected in the site selection criteria for the COVID-19 POC testing program, mathematical modelling used to inform the Australian Government, indicated that by reducing the time for COVID-19 case identification and isolation from ten days, the COVID-19 transmission rate changed from that associated with an uncontrolled outbreak to a either a significant surge or controlled condition, for reductions of five or three days, respectively [30]. The ability to reduce isolation and quarantining duration for negative COVID-19 cases is particularly relevant to remote communities within Australia, where self-isolation may be difficult due to a lack of suitable housing and/or over-crowding, or impacted by other social and cultural determinants [31]. Most recently, the Aboriginal and Torres Strait Islander COVID-19 POC testing program rapidly scaled-up the number of GeneXpert devices, competent staff and test cartridges available to deliver COVID-19 results required for case identification, contact tracing and public health response in emergency outbreak local government areas of New South Wales (NSW), as opposed to waiting several days for laboratory results [32]. In addition, in outbreak response areas and other under-resourced remote communities, the COVID-19 POC testing program has enabled mobile employees to be rapidly screened using molecular-based COVID-19 testing. In these circumstances, POC testing has assisted with crisis workforce capacity, whilst also providing a level of protection to the local communities by minimising COVID-19 infection transmission risk.

For the TTANGO Program, a significantly improved "time to treat" sexually transmitted Chlamydia and Gonorrhoea infections in comparison to regular test processes was demonstrated by the application of rapid POC molecular-based test results in remote Australian communities [22]. For sexually transmitted diseases, prompt diagnosis and public health notification, patient education and treatment hasten STI contact tracing aiming to decrease the onward and/or vertical transmission of STIs in the community.

For chronic diseases, such as type 2 diabetes and the associated renal complications, the availability of POC testing provides extended scope for consented screening tests of at-risk populations. In these patients, POC testing facilitates linkage to early education of the disease and lifestyle interventions that can afford the patient improved long-term monitoring and improvement of their long-term health outcomes, without a loss to follow-up [33]. Early identification and treatment of chronic disease, such as type 2 diabetes, that slows the progression of disease complications, may in turn may lead to reduced burden on tertiary care facilities.

6. Economic outcomes

Data which demonstrates the cost effectiveness of POC testing, comparative to laboratory testing, is essential for ensuring the initial feasibility and sustainability of POC testing models worldwide. Previously, our research demonstrated savings of over $21 million per annum for the NT Government through averted unnecessary medical retrievals as a result of acute i-STAT POC test results in the remote communities within the NT POCT program [15]. Similarly, economic savings have been reported in rural New Zealand hospitals, where an annual cost reduction of more than $NZ 450,000 was realised from POC testing through a decreased number of hospital transfers and an increase in the hospital discharge rates [34]. In the United Kingdom, a primary care study also reported that POC testing was cost effective, in comparison to laboratory testing, when used to perform routine health checks as the results were available at the first consultation [33]. A review of POC testing health economics in remote primary health care settings also provided general support for POC testing benefits to health services outweighing the associated costs [35]. In Australia, the Medical Services Advisory Committee (MSAC), is an independent, non-statutory committee established by the Minister for Health, that is responsible for the appraisal of new medical services proposed for public funding, including POC testing. MSAC provides advice to the Australian Government on whether a new medical service should be publicly funded, based on an assessment of its comparative safety, clinical effectiveness, cost-effectiveness, and total cost, using the best available evidence. Amendments and reviews of existing Medical Benefits Schedule (MBS) services, including POC tests, are also considered by MSAC. In this regard, evidence-based Australian economic cost-effectiveness data that supports the application of POC testing in primary care is paramount to ensure the economic sustainability of POC testing through public funding models.

7. Key elements of POC testing networks

Best-practice POC testing models are underpinned by a common set of core elements as illustrated in **Figure 3**. These include: (a) a defined clinical or public health need for POC testing, (b) appropriate site selection, targeting priority populations with high disease prevalence or risk, (c) clinical and cultural governance of the POC testing procedures and patient test results, (d) engagement with the community to ensure patients are educated in understanding the health benefits of POC testing and can be easily linked to appropriate models of healthcare, (e) robust training and competency assessment processes for health professionals conducting POC testing to minimise patient harm, (f) continuous surveillance of analytical quality using internal quality control and external quality assurance programs, with prompt and appropriate actioning to maintain satisfactory analytical quality standards, (g) provision of an intensive level of technical and scientific troubleshooting support to maximise device operation and result quality, (h) connectivity and real-time reporting systems to ensure rapid patient result transmission, complete patient result audit trails and allow appropriate public health notification of required patient infectious diseases (noting that POC connectivity systems can be complex to integrate and sustain in primary care settings and are not always cost-effective) and (i) supply and logistical management of equipment, reagents and consumables, often to remote locations with sub-tropical or tropical climates. Once established, ongoing evaluation of the clinical effectiveness and utility, cultural effectiveness, benefits to patient and community, cost-effectiveness, risk management assessments and limitations of each POC testing program is integral to ensure

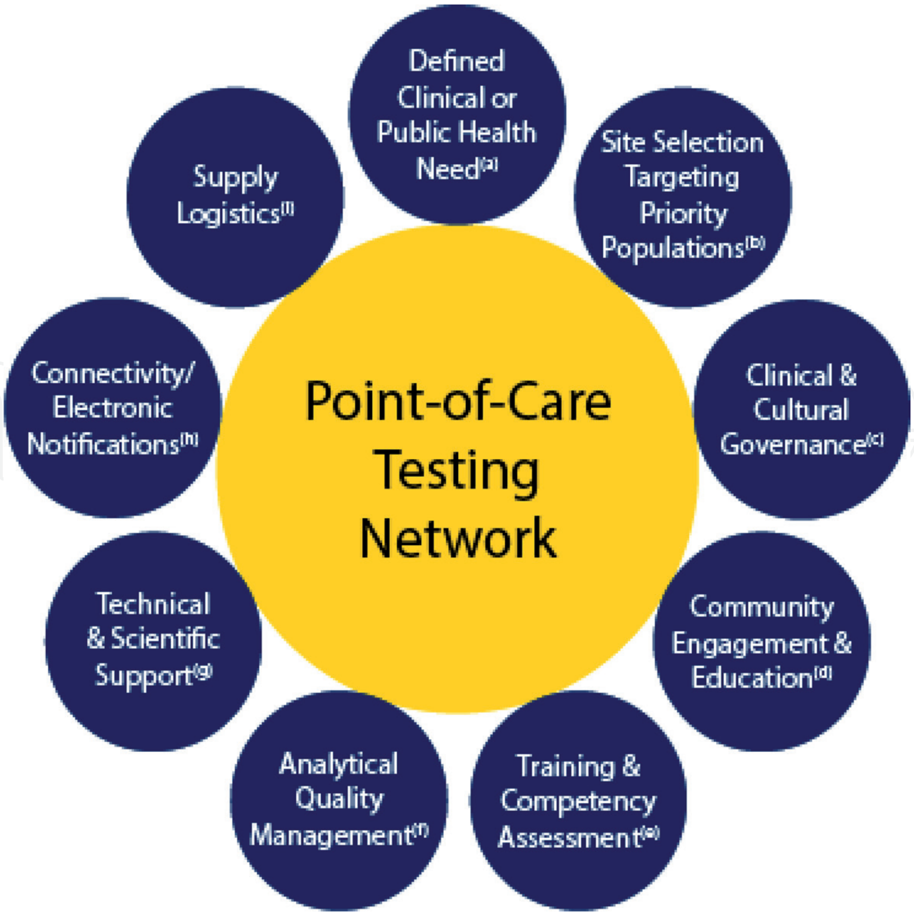

Figure 3.
Key elements of a best-practice point-of-care testing network.

continual quality process improvement. The sustainability of best-practice POC testing is reliant on the continual development of national and international of POC testing implementation and management policies and robust guidelines that arise from translational research of best-practice POC testing networks [36].

Whilst the POC testing models described have been implemented with financial support from Australian Commonwealth and/or State Governments, several challenges currently exist when considering the sustainability and viability of POC testing in remote locations. These are summarised in **Table 3**. At a local community level, there can be saturation of health services with POC testing network requirements regarding staff capacity. This is particularly evident when individual health services enrol in multiple POC testing programs and experience rapid staff turnover. For ACCHOS, Commonwealth support for targeted POC testing remote staff, to be managed through the national leadership body for Aboriginal Community Controlled Health Organisations (NACCHO) may assist in alleviating future workforce shortages. More broadly, feasibility studies and predictive modelling can be applied to remote primary care scenarios prior to implementation to ensure POC testing networks are scaled to maximise reach and outcome benefits. At a national level, the existing regulatory framework for POC testing performed outside a clinical laboratory setting is somewhat rudimentary, with newer POC technologies superseding the 2015 National Pathology Accreditation Advisory Council (NPAAC) Guidelines for POC testing. Broader clinical acceptance and public health funding of POC test results performed in decentralised Australian primary care settings is reliant of the development and evaluation of a formal regulatory system for best-practice POC testing performed outside that of an accredited laboratory framework. In addition, further integration of patient POC test results from primary

Challenge	Comment
Governance	A multidisciplinary management committee, with representatives from clinical, scientific, nursing, Indigenous, industry, collaborative research partners and Government stakeholder groups, provides maximum support for the POC testing model
Staff Turnover	There is a requirement for flexible options for training delivery to ensure operator competency standards are maintained in the face of high staff turnover
Devices and Consumables	There needs to be commitment from industry for continuity of cold-chain supply of cartridges and QC material to remote health services
Connectivity	A cost-efficient solution for the electronic capture and transfer of pathology results to a patient management system is critical for network sustainability
Government funding/ support	Government support for POC testing and a reimbursement (rebate) mechanism for cartridge costs is essential for long-term viability of a POC testing network
Accreditation	Accreditation frameworks for POC testing networks need to be flexible and adaptable to the many different clinical settings in which POC testing is undertaken
Saturation of POC testing uptake	When a service is engaged in multiple POC testing networks, the imposition of training needs and different quality management testing materials and regimes can impede the uptake and acceptability of POC testing, even in settings where significant clinical needs exist
Scalability of POC testing networks	Prior to implementation of POC testing, the capacity for scalability of the POC testing model needs to consider not just analytical quality and clinical benefits of POC testing but also factors such as acceptability and cost effectiveness

Table 3.
Summary of key challenges for POC testing in the primary care setting.

care settings into patient management systems and/or electronic medical records is required to overcome the current lack of accessibility of historical POC test results which may be useful for patient management (e.g. past history of sexually transmitted diseases). It is only when the current challenges POC testing are overcome that the full benefits of POC testing in decentralised primary care settings can be widely recognised, accepted, and sustained [37].

In summary, POC testing in Australia can be considered a life-changing technology as it can: a) provide equity of access to pathology services in remote and under-resourced locations, b) support prompt medical evacuation and public health decisions c) be cost-effective, in comparison to laboratory testing or overall health service savings, if the network scale-up is optimised prior to implementation, and d) has capacity to deliver individualised patient-centred care. If the current challenges and barriers to POC testing sustainability can be further addressed, a wider range of clinical, public health and economic benefits could be realised through new and/or additional POC testing initiatives for high priority, at-risk populations, especially in rural and remote Australian communities.

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