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Impact of policy support on uptake of evidence-based continuous quality improvement activities and the quality of care for Indigenous Australians: a comparative case study

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Key Words: Continuous Quality Improvement; primary health care; health policy; Aboriginal and Torres Strait Islander health

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ABSTRACT

Objectives: To examine the impact of state/territory policy support on 1) uptake of evidence-based continuous quality improvement (CQI) activities, and 2) quality of care for Indigenous Australians.

Design: Mixed-method comparative case study methodology, drawing on quality of care audit data, documentary evidence of policies and strategies, and the experience and insights of stakeholders involved in relevant CQI programs. We use multilevel linear regression to analyse jurisdictional differences in quality of care.

Setting: Indigenous primary health care services across five states/territories of Australia.

Participants: 175 Indigenous primary health care services.

Interventions: A range of national and state/territory policy and infrastructure initiatives to support CQI, including support for applied research.

Primary and secondary outcome measures:

i) trends in the consistent uptake of evidence-based CQI tools available through a research-based CQI initiative (the Audit and Best Practice in Chronic Disease (ABCD) Program; and

ii) quality of care (as reflected in adherence to best practice guidelines)

Results: Progressive uptake of evidence-based CQI activities and steady improvements or maintenance of high-quality care occurred where there was long-term policy and infrastructure support for CQI. Where support was provided but not sustained there was a rapid rise and subsequent fall in relevant CQI activities.

Conclusions: Health authorities should ensure consistent and sustained policy and infrastructure support for CQI to enable wide-scale and ongoing improvement in quality of care and, subsequently, health outcomes. It is not sufficient for improvement initiatives to rely on local service managers and clinicians, as their efforts are strongly mediated by higher system level influences.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- Using a mixed-method comparative case study methodology and drawing on data from 175 Indigenous primary health care services across Australia, we examine the impact of state/territory policy support and strategies on 1) uptake of CQI activities, and 2) quality of care for Indigenous Australians.

- Our analysis of several years of data from the largest and most comprehensive CQI program in Australia shows that consistent and sustained policy and infrastructure support for CQI enables wide-scale and ongoing improvement in quality of care and, subsequently, health outcomes.

- Our study adds to the accumulating evidence on the conditions that enable CQI efforts to be most effective.

- The authors of this paper have all had longstanding involvement with a national CQI program as researchers, service providers, managers or policy makers/advisors.

- A limitation of our study is that it is not possible to clearly attribute the extent to which trends in data on quality of care have been influenced by various concurrent policy and other initiatives.

INTRODUCTION

Internationally there is wide variation in adherence to best practice clinical guidelines between health services and between health professionals.[1] There is a growing body of evidence about the effectiveness of continuous quality improvement (CQI) in increasing adherence to guidelines and on the factors that contribute to this.[2] Variation in quality of care between health services has been demonstrated, including in populations with poorer health status, such as Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) peoples in Australia.[3,4]

Indigenous people's health, and access to primary health care

Australia is a high-income country with gross disparities in health outcomes between Indigenous and non-Indigenous people. This inequity has complex causes, including historical trauma and dispossession as a result of colonisation, social and economic conditions, and persistent racism. While the Indigenous population is about 730,000 (3% of the Australian total), the numbers and proportion of the population varies widely between jurisdictions.[5]

Indigenous people access primary health care (PHC) through services specifically established to meet their needs - both community-controlled and government-managed – and private general practice.

Positive policy environment

A recently proposed four-level framework to describe the causes of the 'evidence–practice gap'[6] backs up previous work that has called for change at multiple levels of the health system to support wide-scale improvement in the quality of care.[7] While system-wide approaches to CQI have been associated with achieving large-scale improvements in health outcomes, there is limited evidence of the effectiveness of CQI over an extended period.[2] A positive policy environment is widely recognised as vital for effective development and implementation of programs to prevent and manage chronic disease,[8] with previous cross-regional analyses identifying the importance of regional level policies in enhancing clinical performance in Indigenous PHC in Australia.[4] However, there is limited evidence as to the effect of government policy on the uptake and impact of CQI over time.

This paper examines the influence of health policy decisions at the Australian state/territory level and how these may have influenced:

i) trends in the consistent uptake of evidence-based CQI tools available through a research-based CQI initiative (the Audit and Best Practice in Chronic Disease (ABCD) Program; and

ii) quality of care (as reflected in adherence to best practice guidelines) in Indigenous PHC services.

National policy context - CQI in Indigenous PHC

The rapid growth since 2002 in CQI initiatives in Indigenous PHC has been supported to varying extents by several large-scale CQI programs operating across a number of Australian states/territories, for example, the Australian Primary Care Collaborative (APCC), Healthy for Life, and the ABCD Program.[9-11] As a program of applied research, ABCD is the longest running and most extensively documented of these initiatives (Table 1). To some extent, the Healthy for Life program encouraged use of ABCD tools and processes by commissioning and promoting some of the audit tools in the program. Similarly, engagement with the APCC may have been a stimulus for services to explore the use of ABCD tools and processes, and vice versa. In 2015, the Australian Government Department of Health provided funding for the development and implementation of a National CQI Framework for Aboriginal and Torres Strait Islander PHC,[9] which outlines roles and responsibilities for CQI at various levels of the system.

[INSERT Table 1]

Table 1: The ABCD Program and CQI tools

The ABCD Program is a CQI action research project that has employed a systems approach to enhancing care delivered through Indigenous PHC services across Australia.[3] Commencing in 2002, ABCD has brought together service providers, policy makers and researchers in a collaborative program of applied research, with the aims of developing and enhancing the feasibility of CQI tools and processes on a wide scale, examining factors associated with variation in quality of care and strategies that have been effective in improving quality of care, and to work together to enhance the implementation of effective strategies. We have previously reported on factors that influence variation in quality of care

between health services [10] and are engaged in an ongoing program of research on priorities and strategies for improvement.[24] Supported by a national CQI support entity (One21seventy), since 2010, more than 270 Indigenous PHC services have used standardised evidence-based best-practice clinical audit and system assessment tools to assess and reflect on health service system performance, typically on an annual basis. The tools have been used to varying extent in all Australian states/territories.

Distribution and use ABCD Program CQI tools in health services, over time, as at 2007, 2011 and 2015

CQI tools developed through the ABCD Program cover priority aspects of PHC (including preventive care, diabetes, child health, and maternal health). The clinical audit tools were developed by expert working groups, with participation of specialists in relevant aspects of care and health service staff.[3] The tools were designed to enable services to assess their work against best practice standards as reflected in widely accepted evidence-based guidelines; each tool is accompanied by an audit protocol. The ABCD audit tools are ideally used in a system-oriented collaborative and supportive CQI approach, together with an assessment of health service system performance conducted by health service staff in a facilitated group discussion using a standardized systems assessment tool.[25] The evidence of effectiveness of the ABCD CQI process [12] is consistent with international evidence of effectiveness of quality improvement strategies. [2]

The ABCD Program

For the duration of its operation the ABCD program has had a strong focus on both developing the evidence base for CQI in Indigenous PHC as well as supporting implementation of evidence based CQI practices. The ABCD program, and its associated service support arm One21seventy, has been used most extensively in the Northern Territory (NT) and Queensland by both government and community-controlled Indigenous PHC services, and to a lesser extent in New South Wales (NSW), South Australia (SA) and Western Australia (WA). The timing and nature of policy and funding support for ABCD and other CQI programs has varied between jurisdictions. The most substantial support was available in the NT and Queensland, and was generally of smaller scale and more fragmented in NSW, SA and WA.[9](Table 1).

METHODS

We use a comparative case study design to relate state/territory level policy support for CQI to trends in its uptake and in quality of care. The five states/territories provide the 'cases' for comparison as they all have some consistent CQI data available through participation by services in the ABCD Program.

Information on the use of CQI processes and tools, and on policy and infrastructure support for CQI initiatives is drawn from publicly available sources. Information from these documentary sources is supplemented by the experience and insights of the authors, all of whom have been closely involved (including as service providers, managers, policy makers and advisors, CQI coordinators, and researchers) over an extended period in relevant CQI programs.

Data on CQI activity and on adherence to clinical best practice guidelines were available through ABCD. This paper focuses on four priority aspects of care: preventive, Type 2 diabetes, maternal care and child health. The CQI and clinical record audit processes through which data are collected and reported at health service level are summarized in Table 1 and Additional File 1, and described in more detail elsewhere.[3,12]

Outcome measures

For the purpose of assessing extent of CQI activity using ABCD standard tools we sum the number of different audit tools used in each health service in each year for each jurisdiction.

We use a composite Quality of Care Index (QCI) to measure overall adherence to evidence based clinical best practice guidelines in the delivery of care for each audit tool over successive years. The QCIs provide a measure of adherence to a package of evidence based practices within each area of care. They therefore provide a more holistic measure of quality of clinical care (for example overall delivery of type 2 diabetes care) than specific items of care (for example monitoring or control of HbA1c). We report on these QCIs for only the NT and Queensland, as these jurisdictions had data available from a large number of health services. QCIs were calculated by dividing the number of client service delivery items documented as delivered for each client by the total number of service delivery items included in the QCI as reported previously.[12] We use box plots to report QCIs for participating health services by jurisdiction for consecutive years, and for consecutive audit cycles for health services that completed audits for at least three cycles (Additional File 2). Data on additional cycles are reported where there were data from at least half of the health services that completed audits in at least three cycles.

Statistical analysis

As the data have a hierarchical structure (patients within health services), mixed multi-level linear regressions were run to test the effect of jurisdictional location (Northern Territory and Queensland) on service delivery (as measured by the QCI). Up to four audit cycles were included in the analysis where there were sufficient numbers of health services to enable cross-jurisdictional comparison. The level of service delivery to individual clients (continuous variable: percentage of QCI delivered) was modelled with health service as an additional level random effect. Each model included adjustments for year of audit and number of audit cycles completed. Jurisdictional location (categorical) was included as a fixed effect. Variance Partition Coefficients were calculated to measure how much variability in adherence to best practice guidelines between health services was attributable to jurisdictional location. Inspection of residual plots showed no obvious deviations from normality or homoscedasticity. P-values were obtained by likelihood ratio tests of the model with jurisdictional location against the empty model without this effect. A p-value ≥ 0.05 was considered statistically non-significant. Statistical analyses were conducted with STATA software, V.14.

Ethics approval

Ethical approval for the ABCD National Research Partnership was obtained from research ethics committees in each relevant Australian jurisdiction.[3]

FINDINGS

Policy initiatives that may have influenced uptake of the ABCD Program CQI, by state and territory

A number of national CQI initiatives may have influenced uptake of ABCD along with those being implemented simultaneously by the states/territories.[9,11] An overview of CQI policy initiatives, by jurisdiction, showing the greatest uptake of the ABCD CQI tools is presented in summary form in Table 2 and in more detail in Additional File 3.

[INSERT Table 2]

Table 2: Key policy and resourcing developments for CQI initiatives including ABCD 2005-2015

National initiatives that supported CQI across multiple jurisdictions
• Continuous Improvement Projects (2002-2006) • Australian Primary Care Collaborative (2005–ongoing) • Healthy for Life Program– while not specifically a CQI Program, it did have a CQI component (2005–ongoing) • One21seventy – National Centre for Quality Improvement in Indigenous Primary Health Care (2010–2016)
State and Territory programs
Northern Territory • Government and ACCHO sectors supported CQI research through the original ABCD Project (2002-2005) and the ABCD Extension Project (2005-2009) • NT CQI Strategy endorsed by the Aboriginal Health Forum (2009) • By 2012, wide-scale employment of CQI Coordinators and Facilitators to support PHC services across the NT • External evaluation of the NT CQI investment (2013)
Queensland • Review commissioned to identify best options for improving Indigenous health

identifies CQI as a priority (2005 - 2006) • Development and implementation of CQI program endorsed at senior government level (2007) • Employment of CQI Coordinators and Facilitators to support PHC services across Qld in 2008, with another major investment in CQI support in 2010 – including contract with One21seventy to provide CQI support to services • North Queensland Steering committee established in 2008 with key stakeholders, including Royal Flying Doctor Service, Apunipima Cape York Health Council and Queensland Health • Peak community-controlled organisation implemented 'collaborative style' CQI processes using electronic data extraction (2010) • State-wide CQI steering committee established in 2011
New South Wales • NSW Health provided funding to the peak community-controlled organisation AH&MRC to support CQI among NSW ACHHS through building infrastructure, skills and data collection systems, and to share models of good practice (2006) • Several NSW Indigenous PHCs commenced use ABCD CQI tools through contracts with One21seventy in 2010 on their own initiative • AH&MRC published CQI Success Stories from ten ACCHSs (2015)
Western Australia • WA Health provided funds for a CQI project officer to support ABCD Program in WA (2005-9) • Peak community-controlled organisation, AHCWA conducted a pilot of the Australian Primary Care Collaborative in several ACCHSs (2006-7) • AHCWA Research Partnership on CQI (2012-15) • Holman review recommended implementation of a state-wide CQI program, with reference to One21seventy (2014) • AHCWA reported actively promoting CQI to all member services (2014-15)
South Australia • Review of the evidence (2008-2009) • SA Health and Lowitja Institute provided funds for a CQI project officer to support ABCD Program in SA (2010-14)

• SA Quality Improvement Officer based at peak community-controlled organisation ACHSA supporting analysis and feedback to community-controlled health services in SA.
Engagement with ABCD Research in each State and Territory
Northern Territory • ABCD Program originated in 12 health services in the NT (2002), building on prior work on chronic disease, best-practice guidelines, clinical information systems in Indigenous PHC • ABCD Extension phase supported development of a CQI hub in Central Australia and Top End (2005) • All NT Government Health services and many ACCHS participated in the ABCD National Research Partnership 2011-14, with NT ABCD Project officer supported by funding from NT Health
Queensland • ABCD Extension phase supported development of a CQI hub in Qld (2007/8) • All Qld Health services and several ACCHS participated in the ABCD National Research Partnership 2011-14, with Qld ABCD Project officer supported by funding from the Lowitja Institute
New South Wales • Maari Ma Health Aboriginal Corporation in far west NSW commenced with ABCD Program (2005) • Maari Ma Health Aboriginal Corporation participates in the ABCD National Research Partnership 2011-14
Western Australia • ABCD Extension phase supported development of a CQI hub in Western Australia (2005) • Several ACCHS and WA Health services participated in the ABCD National Research Partnership 2011-14, with WA ABCD Project officer supported by funding from the Lowitja Institute
South Australia • A few Aboriginal community-controlled health services commenced using ABCD tools on their own initiative (2006) • 10 ACCHS & 5 SA Health services participated in the ABCD National Research

Partnership 2011-14, with SA ABCD Project officer supported by funding from the Lowitja Institute and SA Health

Notes: CQI – continuous quality improvement; ABCD – Audit and Best Practice for Chronic Disease; PHC – primary health care; QAIHC – Queensland Aboriginal and Islander Health Council; AH&MRC – Aboriginal Health and Medical Research Council; AHCWA – Aboriginal Health Council of Western Australia; ACHSA – Aboriginal Health Council of South Australia; ACCHS – Aboriginal Community-Controlled Health Service; ACCHO - Aboriginal Community-Controlled Health Organisation.

A total of 286 Indigenous PHC services used ABCD standard tools and reported data through the One21seventy web-based information system between 2005 and 2014. Of these health services, 175 voluntarily provided de-identified clinical audit data for analysis and reporting.

Northern Territory

The most substantial early uptake of the CQI tools was in the NT (Table 2; Figure 1; Additional File 3) where they were implemented in 12 health services following the first evidence of their success.[3] There was a decline in the use of the tools in the NT in 2010, the final year of the extension phase of the ABCD research project, followed by a large increase in use the following year. This increase coincided both with the establishment of One21seventy as a service support agency for using ABCD CQI tools and processes, and with the commencement of the NT CQI Strategy and corresponding funding support. The use of ABCD CQI tools plateaued over the period 2012-2014. An external evaluation commissioned by the NT Government supported sustainability and embedding of processes.[13]

Queensland

In Queensland, use of the ABCD CQI tools commenced in 2007/8, with the engagement of Queensland Health and some community-controlled PHC services (largely in the north of the state) in the ABCD Program (Table 2; Figure 1; Additional file 3). This followed an internal review of evidence on improving health care delivery, and subsequent recommendations to increase investment in CQI in 2008 and again in 2010. There was a rapid increase in the use of the tools to a peak in 2011 and 2012, following the second investment by Queensland Health in CQI coordinators and facilitators and in supporting health services to access ABCD tools and the One21seventy web-based information system. There was a marked decline in

the use of the ABCD CQI tools in 2013 and 2014, following the change in Government in 2012, a lack of policy support and cuts in funding.

New South Wales

Use of the ABCD CQI tools in NSW peaked in 2008 and 2009, but declined as the state's early leading exponent of CQI, Maari Ma Health Aboriginal Corporation in Broken Hill, shifted attention to using the ABCD audit tools in selected aspects of clinical care and applying CQI techniques to the management of various organizational systems and processes (Table 2; Figure 1; Additional file 3). There was some continuing use of ABCD CQI tools in Maari Ma Health and in other NSW services despite the absence of direct support for the use of these tools from NSW health authorities.

Western Australia

In WA, use of the ABCD CQI tools increased from 2005 to a peak in 2008 and 2009 across several health services (Table 2; Figure 1; Additional file 3). The decline in usage coincided with the end of ABCD's extension phase, but a number of health services continued to use the tools despite relatively limited engagement with ongoing research and no direct support from WA health authorities.

South Australia

A small number of services used the ABCD CQI tools in SA between 2006 and 2010, and slightly more between 2011 and 2014 – the increase coinciding with provision of limited funding and policy support from research and SA health (Table 2; Figure 1; Additional file 3). This policy support occurred after an internal review (similar to Queensland) on the evidence and best options to improving delivery of care.

Trends in quality of care

The QCIs of adherence to best practice guidelines for health services in the NT generally show improvement over audit cycles and over successive years. More specifically, between cycles 1 and 4 the median % of services delivered for participating health centres increased by more than 25% for overall preventive care, and by about 10% for overall type 2 diabetes care and overall child health care (Additional file 2, Table 3). There was also improvement in the median % of services delivered in successive years for all four areas of care. The improvement in the NT is accompanied by a reduction in variation between health services

for preventive care and child health QCIs, due to improvement among poorer performing health services.

[INSERT Table 3]

Table 3: Summary of care quality trends over years and CQI cycles in Northern Territory and Queensland.

	Trend over time		Trend over CQI cycles		Variation over CQI cycles	
Area of Care	NT	Qld	NT	Qld	NT	Qld
Diabetes	↑	~	↑	~	*	~
Preventive	↑	~	↑	~	~	~
Child	↑	↓	↑	~	~	~
Maternal	↑	↑	↑	↑	*	~
Legend: ↑ Improvement ~ No change ↓ Decrease * Reduced variation						

Notes: NT – Northern Territory; Qld – Queensland; CQI –continuous quality improvement

In Queensland, the QCIs of adherence to best practice guidelines show a mixed picture. There was improvement in the median % of services delivered for participating health centres between audit cycles 1 and 4 of about 15% for overall antenatal care. For overall type 2 diabetes care and overall preventive care there was an increase in the median % of services delivered of about 10% and 5% respectively between audit cycles 1 and 3, followed by a decline at audit cycle 4 (Additional file 2, Table 3). There was no clear trend for diabetes care over successive years or over audit cycles, or for preventive care over time. There was a declining trend over successive years and no clear increasing or decreasing trend over audit cycles for child health. Nor was there a clear reduction in variation between health services in any of the four areas of care over time or over audit cycles.

The multi-level linear regression analyses showed that there was a significant difference between the two jurisdictions for preventive and diabetes care. After adjusting for year of audit and number of cycles completed, the predicted increase in adherence to best practice for NT compared to Queensland health services was 12% (95%CI: 5.61-17.70; $p<0.0001$) and 16% (95%CI: 11.87-19.58; $p<0.0001$) for preventive and diabetes care respectively.

Jurisdictional location accounted for 17% and 18.2% of the explained variability in adherence to best practice guidelines for both. There was no significant difference between jurisdictions in relation to child or maternal care (Additional file 4).

DISCUSSION

Progressive and sustained uptake of ABCD tools occurred in the NT in the context of consistent long-term policy and infrastructure support for CQI. This contrasted with a) a rapid rise and subsequent fall in uptake of these tools in Queensland where the initial high-level policy and infrastructure support was not sustained following a change of government in 2012; and b) low levels of uptake in jurisdictions with relatively less policy and infrastructure support (NSW, WA, SA). The consistent long-term policy and infrastructure support for CQI in the NT was also associated with steady improvements or maintenance of high-quality care (as reflected in clinical best practice guidelines) for the four aspects of care that were the major focus of ABCD CQI efforts, and reduction in variation between health services for two of these. This contrasted with the situation in Queensland where there was a relatively limited effect on adherence to best practice guidelines and on variation between health services.

While this study does not provide an in-depth examination of the complex processes that might explain different trends in the uptake of tools, or how CQI processes have impacted on quality of care in different jurisdictions, some insight has been provided by previous studies of the ABCD CQI program [10,12, 14-19] and the evaluation of the NT CQI Strategy. [13] Gardner highlighted the complexity of the process of uptake of CQI, and the critical role of alignment of policies and incentives; a systems approach; organization-wide commitment; leadership at all levels; and resources to support implementation.[14] Our findings of relatively low uptake of CQI in jurisdictions with limited policy and infrastructure support, and the rapid drop in use of CQI tools when policy, infrastructure and funding support was withdrawn in Queensland, highlights the critical role these play in supporting its uptake. In other states, the lack of clear and consistent policy direction, resourcing and sustained high-level leadership and management support for CQI, and relative lack of engagement in wide-scale CQI research has led to a diversity of locally driven initiatives with an associated lack of systematic analysis and reporting of data for CQI purposes. This appears to have been a

barrier to demonstrably effective uptake of CQI in many Indigenous PHC services between 2005 and 2014.

The limited availability of data for systematic analysis and reporting of relevant data, other than in Queensland and NT, has precluded meaningful analysis of adherence to best practice guidelines for most states/territories. The first report on national Key Performance Indicators (nKPIs) from Indigenous PHC organizations showed that in 2012-13 those in Queensland and the NT performed better against almost all process-of-care indicators,[20] attributing this to the relatively well-established CQI programs in these jurisdictions. The third and most recent nKPI report, which includes data up to December 2014,[21] shows improvements for 17 of the 19 process-of-care measures for all jurisdictions combined, with continued relatively high performance in the NT and Queensland and most marked recent improvement in WA. The analysis presented in this paper points to the importance of high-level policy support and resourcing for implementation of systematic CQI processes to enhance quality of care. The relatively high performance, and the greater ability to report nKPI data, in the NT and Queensland demonstrate the benefits of systematic CQI processes for reporting of data on KPIs as well as for enhancing quality of care.

The independent evaluation of the NT CQI Strategy provides important insights into the relative success of CQI initiatives in the NT. There has been no comparable publicly available independent evaluation in Queensland, NSW, WA or SA, and it may be that an external evaluation such as that of the Strategy plays a role in ensuring sustainability and momentum. The formalized collaborative engagement of the community-controlled and government sectors in the NT through the Aboriginal Health Forum, and the shared commitment and enthusiasm for a territory-wide CQI Strategy, have also contributed to the achievements in the NT. Given the importance of working effectively together to respond to the complex care needs of Indigenous patients, it appears that a partnership approach adopted across service sectors is a critical component underpinning efforts in improving quality of care.

Another important component has been the adaptation of collaborative methods to sustain the engagement of experienced front-line service providers and managers, such as bringing them together to share learnings. Together with sustained investment, the shared commitment and

enthusiastic engagement in CQI in the NT is likely to have engendered the sense of collective efficacy and collective valuing of CQI data that has led to the effectiveness of CQI.[10]

An important limitation of our study is that it is not possible to determine clearly the extent to which trends in data on quality of care have been influenced by policy support for the ABCD CQI program or to other initiatives (e.g. funding, workforce or infrastructure developments). The difficulty of demonstrating causality is common to much policy research,[22] however we argue here for contribution rather than attribution. Improvements to the quality of care in NT built on substantial earlier initiatives, including electronic patient information record systems, the development and implementation of a Chronic Disease Strategy and sustained commitment to workforce development. The ABCD data are not representative of all Indigenous PHC services. There was variable participation in different jurisdictions and by government-operated and community-controlled health services. For example, in the NT there were substantial numbers of both service types participating in ABCD, but relatively low numbers of community-controlled services in Queensland. The ABCD data need to be interpreted in relation to a range of other CQI activities in Indigenous PHC services over the period for which data has been reported[9,11]. While there were some substantial initiatives, particularly in the NT and Queensland, most CQI initiatives were small scale, narrow in scope and without the capability to analyze and report consistent data to the extent possible through ABCD. Nor has it been possible to assess systematically these CQI activities or their impact on quality of care. In addition, there were a range of non-CQI initiatives at the national [e.g. Indigenous Chronic Disease Package [23] and local levels, which may have impacted on quality of care over the period for which we have reported data.

The authors of this paper have all had longstanding involvement with the ABCD Program as researchers, service providers, managers or policy makers/advisors. While our interest in ABCD may have influenced our interpretation of the data, the diversity of roles, insights and perspectives that we bring allows for critical reflection in the interpretation of the data, and brings rigor to this type of research.[22]

The ABCD experience, as reflected in this paper, has important implications for practice, policy and further research, including the implementation of the National CQI Framework for Aboriginal and Torres Strait Islander PHC.[9] For clinical staff and management of health services, the benefits of participating in this type of collaborative program include access to a

CQI system that provides data on recent performance and trend data across the broad scope of primary care, and the ability to benchmark against other services at the regional, state/territory and national level. For policy professionals, benefits include the ability to monitor adherence to best practice guidelines at all levels, and to target improvements to specific aspects or modes of care, [19] population groups (e.g. children or the elderly) or geographic locations. An important challenge for ongoing and new CQI initiatives is to enhance local ownership and engagement, while ensuring the use of standard tools and supporting the analytical capability that enables the use of consistent good quality data for CQI purposes at multiple levels of the system. Sustaining efforts to deliver the best care according to changing evidence over time remains important and warrants further attention.

CONCLUSION

Our study adds to the accumulating evidence on the conditions that enable CQI efforts to be most effective. The findings show the potential contribution that systematic and sustained policy and infrastructure support can make to wide-scale uptake and to the effectiveness of CQI methods in improving the quality of care. It is now about 10 years since our first published paper on the potential for CQI to enhance the quality of health care for Indigenous Australians. With the development of a National CQI Framework in 2015 [9] it appears we may be at the dawn of a new era of wide-scale and systematic use of CQI methods. While local efforts are vital to the effective use of CQI methods, state/territory-level policy and resources will be critical to building capability and a supportive environment.

List of abbreviations

ABCD: Audit and Best Practice in Chronic Disease

CQI: Continuous Quality Improvement

PHC: Primary Health Care

nKPI: National Key Performance Indicators

NSW: New South Wales

NT: Northern Territory

QCI: Quality of Care Index

SA: South Australia

WA: Western Australia

Consent for publication

Not applicable

Availability of data and material

The ABCD dataset analyzed during the current study is not publicly available due to health centre confidentiality, but is available from the corresponding author on reasonable request and if consistent with the project's ethics approvals.

Authors' contributions

RB conceived and had the primary role in drafting of the manuscript. VM undertook the quantitative data analysis and had a major role in drafting and review. All other authors (SL, ST, CP, TW, JB, FC, RK, LC) played substantial roles in providing information on QI initiatives in various states and territories, in analysis and interpretation of data, and review of successive drafts of the manuscript. All authors read and approved the final manuscript.

Competing interests

RB was the Scientific Director of One21seventy, a not-for-profit entity within Menzies School of Health Research that provided CQI support on a fee for service basis to primary healthcare services across Australia. RB is also the lead investigator on the ABCD Research Program, and other authors are co-investigators. None of the authors received financial support from One21seventy, and One21seventy did not provide any financial support for the preparation of this manuscript. The authors have no other competing interests in the preparation of this manuscript.

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Ethics

Ethics approval was obtained from human research ethics committees (HRECs) in each jurisdiction: Northern Territory HREC-EC00153 & HREC-12-53; New South Wales HREC/11/GWAHS/23; Queensland HREC/11/QTDD/47; South Australia Aboriginal Health Research Ethics Committee 04-10-319; Western Australia Curtin University HR140/2008; WA Country Health Services 2011/27;WA Aboriginal Health Information and Ethics Committee 111-8/05; University of Western Australia RA/4/1/5051.

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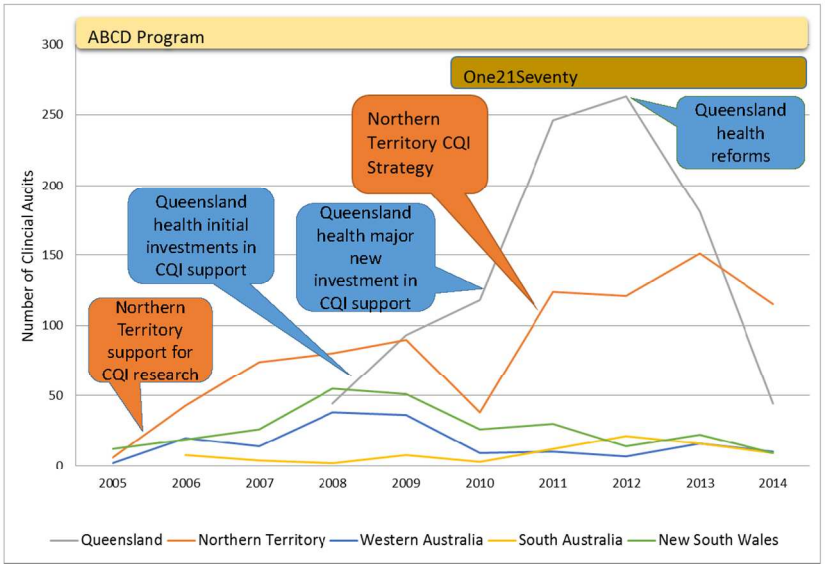


Uptake of ABCD CQI and major policy influences on trends in Northern Territory and Queensland

338x190mm (111 x 111 DPI)

Additional File 1: Clinical audit process, sample size and audit inclusion criteria

Conduct and reporting of clinical audits – audits were generally done by health service staff, trained in the use of standard tools and supported by quality improvement facilitators and continuous quality improvement (CQI) program staff. Where appropriate health service staff were not available, the audits were done by trained CQI facilitators working in state/territory CQI support roles. Data were collected using standardised CQI tools, entered into a web-based information system, and analysed through an automated process, with reports made available to health services in real time for use in local quality improvement processes. Reports of aggregated data for clusters of health services, by region or state, were also available through the web-based information system to support regional or state/territory level CQI efforts.

Sampling and sample size for Preventive care, Diabetes, Maternal and Child health audits. Where the eligible population was 30 clients or less, the audit protocol recommended including all records. Where the eligible population was greater than 30, the protocol provided guidance on the random selection of records, with the number depending on the precision of estimates required by health service staff. A new sample was used for each audit period. For Preventive care and Child health, the samples were stratified by age and gender; for Diabetes care samples were stratified by gender.

Preventive care	*Diabetes*	*Child health*	*Maternal health*
Included clients must: be between 15 and up to 55 years; have no diagnosis of diabetes, hypertension, coronary heart disease, chronic heart failure, rheumatic heart disease or chronic kidney disease; not be pregnant or less than 6 weeks postpartum; and have been resident in the community for 6 months or more in the last 12 months.	Included clients must: have a clear, documented diagnosis of Type 2 Diabetes; be 15 years or older; and have been a resident in the community for 6 months or more in the last 12 months. Clients are excluded if they have Type 1 diabetes, gestational diabetes or autoimmune nephropathy.	Included children must: have been resident in the community for 6 months or more of the past 12 months (or if the child is <12 months, resident in the community for at least half of the time since birth); and have no major health anomaly such as Down Syndrome, cerebral palsy, heart defects or inherited disorders.	Included women must: have an infant between 2 and 14 months; have been resident in the community for 6 months of the infant's gestation; and have used the health service as the usual source of primary health care.

Additional File 2 – Quality of Care Index for preventive care, diabetes care, child health and maternal health care, 2005–2014

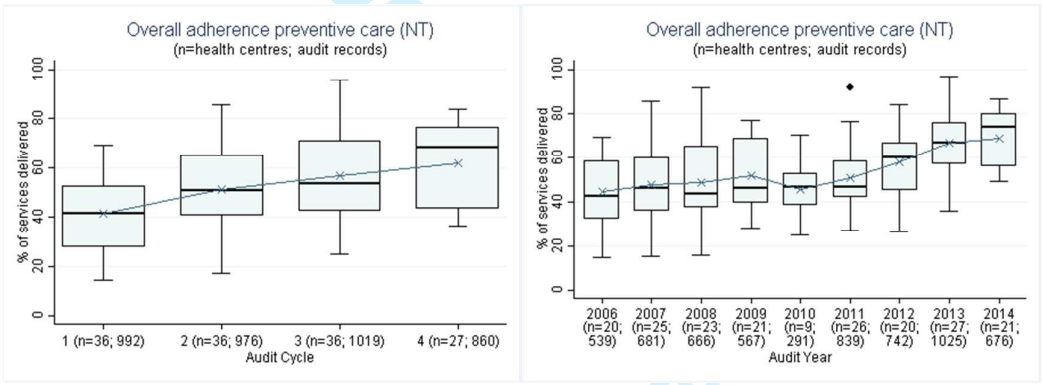
Reading the box plots

The box plots show the median, mean, 25th and 75th centile and range between health services for each jurisdiction, year and audit cycle. They also show outliers, defined as health services where the value for the indicator is more than 1.5 times the difference between the 25th and 75th centile from the median.

Preventive care (2005–2014)

QCI includes (up to 15 service items): weight, waist circumference, blood pressure, urinalysis, blood glucose levels, oral health check, nutrition & physical activity brief intervention, smoking & alcohol use recorded and brief interventions where required, sexually transmitted infection check (gonorrhea, chlamydia & syphilis) and pap smear.

Northern Territory



Queensland

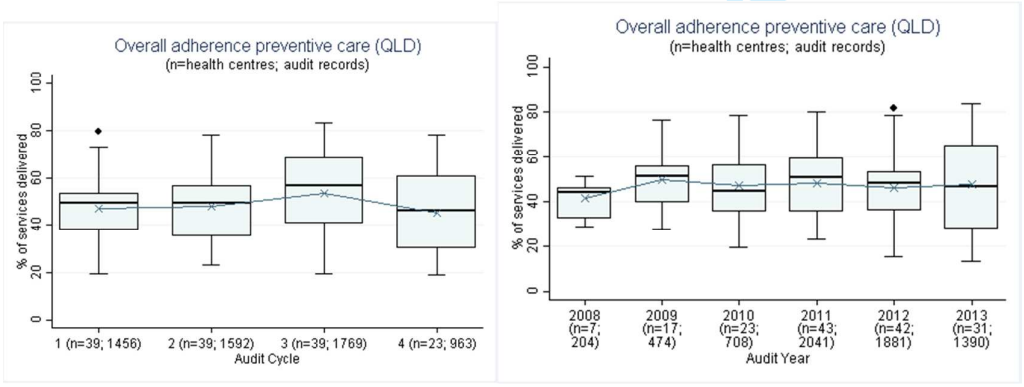
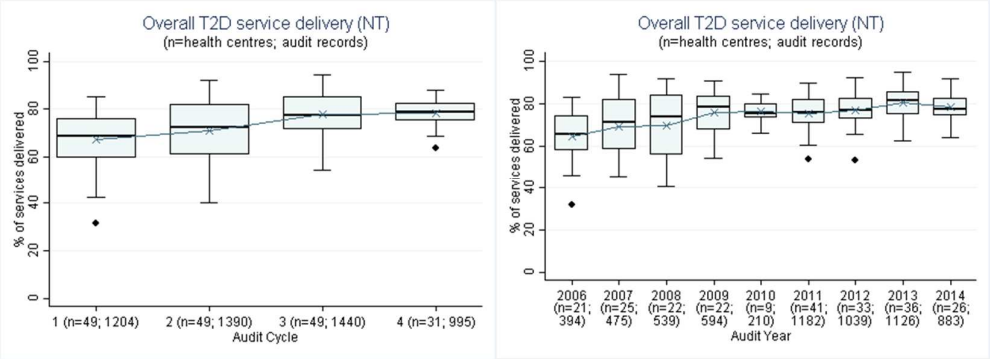


Figure 2.1: Mean percent QCI services delivered to well clients per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services), NT and Qld (n=number of health services; number of client records audited who attended in previous 24 months)

Diabetes care (2005–2014)

QCI includes (up to 22 service items): GP Management Plan, record of discussion on chronic disease management & medications, influenza & pneumococcal vaccination, blood pressure, smoking & alcohol use recorded and brief intervention where required, weight, waist circumference, nutrition & physical activity brief intervention, ACR, lipids, cholesterol, eGFR, body mass index, visual acuity, dilated eye check, feet check, HbA1c.

Northern Territory



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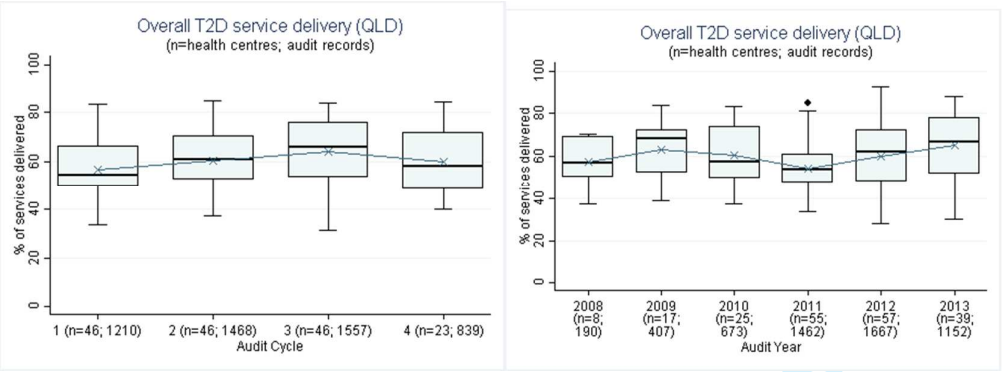
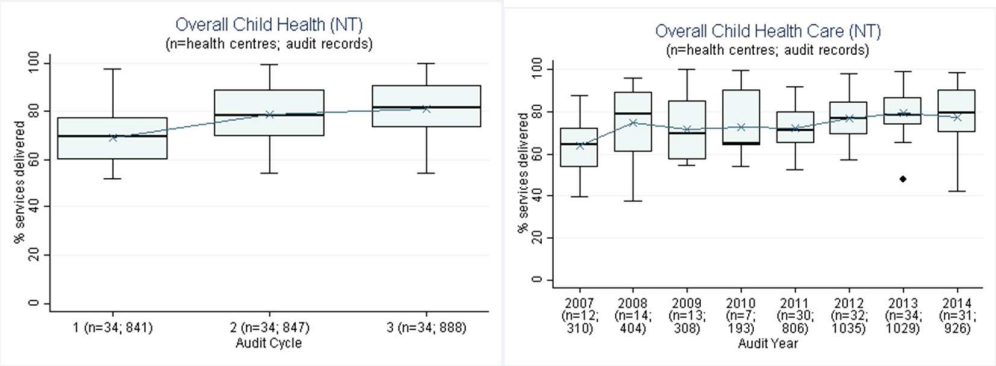


Figure 2.2: Mean percent QCI services delivered to patients with Type 2 diabetes per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services) , NT and Qld (n=number of health services; number of client records audited who attended in previous 12 months)

Child health (2007–2014)

QCI includes up to 10 service items: weight, height, ear exam, nutrition, head circumference, hip exam, sudden infant death syndrome prevention advice, breastfeeding advice, developmental check, testes check.

Northern Territory



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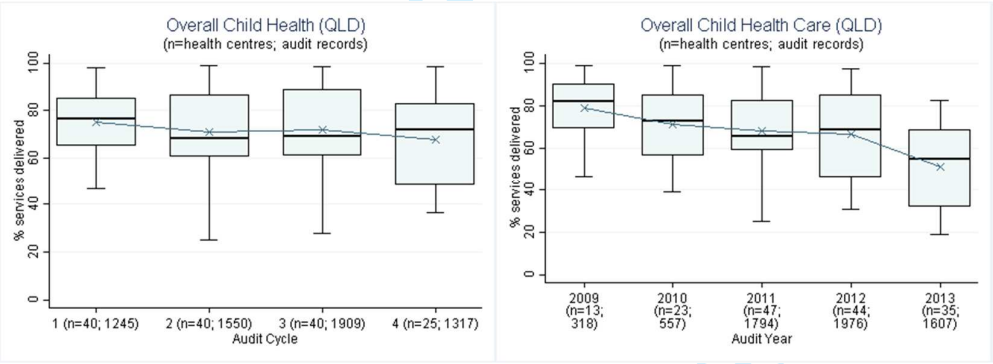
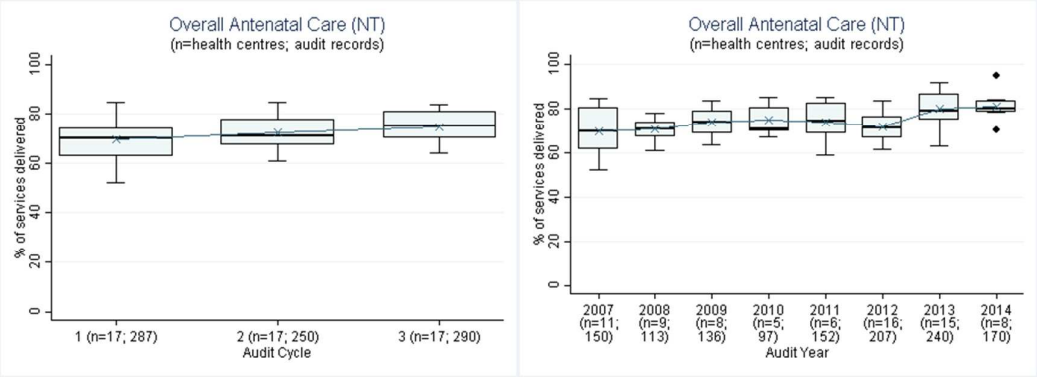


Figure 2.3: Mean percent QCI services delivered to children per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services) , NT and Qld (n=number of health services; number of child records audited who attended in previous 12 months)

Maternal health (2007–2014)

The antenatal QCI includes 26 best practice service items present in the maternal health audit tool: ≥7 antenatal visits, estimated gestational age ≤13 weeks at first antenatal visit, blood pressure (1st, 2nd & 3rd trimester), urinalysis (1st & 2nd trimester), BMI (1st trimester), fundal height (2nd & 3rd trimester), fetal movements (3rd trimester), blood glucose (2nd trimester), documentation of blood group, antibody status, rubella, Hepatitis B status, mid-stream urine, full blood examination, Syphilis serology, HIV, PCR test, smoking and alcohol use status recorded (1st & 3rd trimester), social risk and emotional wellbeing assessments, planning for care and birthing, nutrition, breastfeeding, domestic and social environment, and cultural considerations.

Northern Territory



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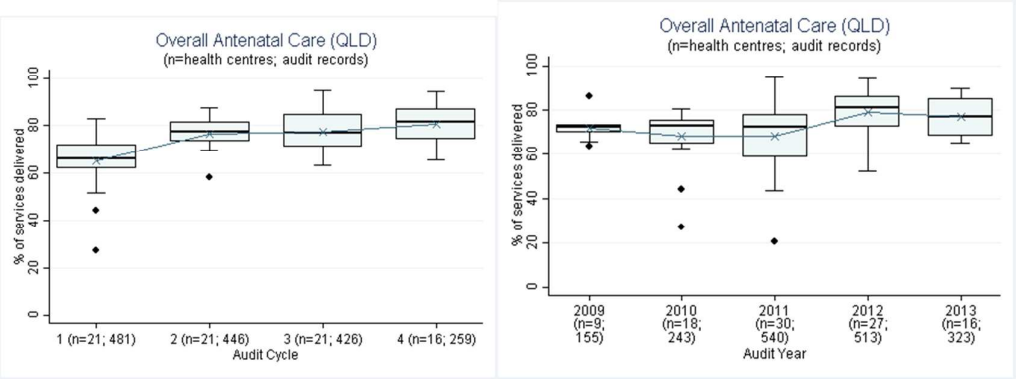

Figure 2.4: Mean percent QCI services delivered to pregnant women per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services) , NT and Qld (n=number of health services; number of client records audited)

Additional File 3 – Detailed description of policy context by state and territory

Northern Territory

In early 2009, a Continuous Quality Improvement (CQI) Strategy was endorsed by the Northern Territory (NT) Aboriginal Health Forum – comprising the Commonwealth Department of Health and Ageing (now Department of Health); the NT Department of Health; and the Aboriginal Medical Service Alliance of the Northern Territory (or AMSANT, the peak community-controlled health service body in the NT) – with the goal of building a consistent approach to CQI across the NT Indigenous primary health care (PHC) sector. The NT CQI Strategy was part of a broader Indigenous PHC reform agenda that incorporated the Expanded Health Service Delivery Initiative (EHSDI),[1] which included a substantial increase in funding and an expansion of remote PHC services, a program of regionalization, and the development of key performance indicators (KPIs). The Strategy built on a history of leadership and innovation in Indigenous PHC, including in relation to community control of PHC services, the development and implementation of a Chronic Disease Strategy, guideline development, electronic information systems, and chronic disease management, as well as on the Audit and Best Practice in Chronic Disease (ABCD) CQI work which originated in the NT in 2002.[1,2]

The CQI Strategy included: i) establishment of a Steering Committee (made up of representatives from each of the three organizations' in the Aboriginal Health Forum); ii) engagement of two CQI Coordinators to provide leadership, advice and training; iii) funding to support CQI Facilitators in each Health Service Delivery Area of the NT; and iv) support for regular CQI Collaborative meetings. By the end of 2012 there were 16 facilitator positions across the NT, and more than 200 health professionals, including 25 Aboriginal Health Workers, had been trained in the use of CQI tools and processes.[3] The CQI Strategy was allocated around $2.79m per year, with the intention that CQI should be a core PHC activity.[1]

The independent evaluation of the NT CQI Strategy [1] found that it 'had been successful in establishing the practice of quality improvement across the NT Aboriginal PHC system… to build the beginnings of a system-wide culture of quality improvement'. The Strategy was found to have resulted in an increase in 'overall CQI capability and capacity', 'enthusiasm and fervor among health workers for quality improvement', 'wide engagement of health service managers and clinicians in CQI activities' and had contributed to 'staff becoming adept at using ePIRS (electronic Patient Information Record Systems) and the data in these systems being improved'. The evaluation highlighted the ABCD CQI tools as providing a 'solid technical basis for CQI' and 'technical rigor behind the approach', and developing routine clinical information systems to generate and regularly report on agreed Indigenous health KPIs to NT Government-operated services. Under the guidance of the CQI Steering Committee, the NT provided national leadership in developing specialized infrastructure support and workforce capacity for wide-scale implementation of CQI.[3]

Queensland

In 2005–2006, the Queensland Government undertook a review both of the readiness of services to commence CQI and of the evidence as to its effectiveness in improving health care delivery. This provided a foundation for subsequent investment.

Following the lead of the NT, in 2007–2008 Queensland Health appointed a CQI Coordinator and regional facilitators to support the implementation of CQI processes in Indigenous PHC services as part of ABCD. A restructure in 2008 provided a key leverage point, and change through reform, as the funding for CQI was expanded from north Queensland specific to state-wide. A North Queensland CQI Steering committee was established in 2008 with key stakeholders, including Royal Flying Doctor Service, Apunipima Cape York Health Council and Queensland Health. There was a further investment in CQI in 2010, including a contract with One21seventy to provide CQI support to Indigenous health services.

In 2011, Queensland Health established a state-wide Primary Health Care CQI Steering Committee and a team with responsibility for CQI in Indigenous health services.[3] The team included two coordinators and 12 locally based facilitators, whose task was to develop and implement a coordinated CQI approach using One21seventy tools and processes with a focus on supporting Queensland Health services, although this support and access to One21seventy was available to Aboriginal Community Controlled Health Services (ACCHSs) as well. CQI was included in the Queensland Chronic Disease Guidelines, and the section on CQI was strengthened in 2008. This CQI initiative was part of the Queensland Chronic Disease Strategy and was supported by the Making Tracks Policy and Accountability Framework for improving health outcomes for Indigenous people (funded through Australian Government 'Closing the Gap' funding.[4]

By late 2012, the CQI team established by the Queensland Health initiative was supporting 75 services across the state to conduct CQI, with engagement of other service organizations in addition to those managed by Queensland Health. This work aligned with the development of evidence-based clinical guidelines, and orientation and training packages.[3] The infrastructure and policy support for CQI provided by Queensland Health was adversely affected by changes in the policy environment, with budget cuts and health reforms following the implementation of regionalization through the *Queensland Health and Hospitals Network Act 2011* and the change of government in Queensland in 2012. Contracts for CQI support and tools through One21seventy were discontinued and there was a loss of dedicated CQI support positions throughout the state.

Other significant CQI work in Queensland included a partnership between the state's peak Indigenous health body, Queensland Aboriginal and Islander Health Council, and a state-based general practice organization that used collaborative-style methods, supported by implementation of an electronic clinical information system. A report for 2009-2010 showed high performance on a number of indicators, with wide variation between services on others.[5] In 2011 it was reported that 13 of the 21 Aboriginal Community Controlled Health Services were participating.[3]

Other Indigenous health organizations' have used CQI methods for clinical governance purposes at a regional level in recent years, for example Apunipima Cape York Health Council and Institute of Urban Indigenous Health.

New South Wales

In New South Wales (NSW), participation in ABCD commenced in 2005, driven primarily by the initiative and resources of a regional ACCHS, Maari Ma Health Aboriginal Corporation, which used the CQI process to support and evaluate implementation of its Chronic Disease Strategy. This organization has gone on to integrate a systems-oriented CQI approach into the ongoing management of its service.[6]

While NSW Health showed some interest in supporting engagement with ABCD more widely, there was no specific policy or funding support provided to services for their participation. However, several NSW-based ACCHSs and other PHC organizations' (such as Divisions of General Practice) used the ABCD tools through engaging with One21seventy. NSW Health funded the state's peak Indigenous health body, the Aboriginal Health and Medical Research Council (AHMRC), to support its member services with CQI activities through building infrastructure, skills and data collection systems, and to share models of good practice in CQI in the Indigenous PHC context. In 2015 the AHMRC produced web-based resources and a DVD describing success stories in 10 NSW ACCHSs, reflecting the use of a variety of tools, processes and approaches to CQI. Other than for those services participating in the ABCD program, or for a relatively small number of selected indicators available through national KPIs reporting, there appears to be no publicly available reports on clinical performance for Indigenous PHC services in NSW.

Western Australia

In Western Australia (WA), the state government provided some funding for a project officer to work with the ABCD program between 2005 and 2009, but there was no clear policy or infrastructure to encourage engagement by PHC services. Continued engagement with the ABCD Program over 2010-2014 was supported by a project officer funded through the Lowitja Institute. Participation was heavily reliant on the initiative of individual services and the support of a small research team based with one of ABCD's academic partner organizations' and on the national ABCD project network. While some services were encouraged to use ABCD tools and processes through their participation in the national Healthy for Life program, there were inadequate resources to support the use of CQI tools and processes among services distributed across the vast distances of WA.

Concurrent with the early implementation of ABCD in WA, the Aboriginal Health Council of WA (AHCWA) in 2006 implemented the Australian Primary Care Collaboratives program (referred to then as the National Primary Care Collaborative or NPCC) in seven selected sites. An evaluation of this initiative in mid-2007 reported that 'the central notions of quality improvement had been introduced' and that 'systems were in place to varying degrees', which created 'the potential to improve the way in which chronic health needs are addressed'.

However, the evaluation also noted that 'it was clear that there was a need for the NPCC Program to be more responsive to the needs and desires of specific ACCHSs'. While participating services were reported to be satisfied with the NPCC program, they were 'less enthusiastic about the program continuing', or its roll-out to other ACCHSs.[7]

Between 2012 and 2015, AHCWA engaged in a research partnership that had an initial focus on conducting a systematic review of the effectiveness of CQI programs in PHC settings in Indigenous and ethnic minority populations, and identifying common elements among programs with improved outcomes.[8]. There appear to be no publicly available reports on subsequent work arising from the AHCWA-Australian National University research partnership.

A review of WA Health Programs in 2014 argued for the implementation of a state-wide system for CQI with 'transparent measurements, accountable comparisons and resultant action plans', with specific reference to the evidence base developed by the ABCD Program and the benefits of adopting the One21seventy system.[9] In 2014–15, AHCWA

acknowledged the generally low capacity for CQI in the state, and reported the organization had begun actively promoting CQI to all member services.[10]

Five member services were reported to be engaged in CQI activities with a focus on health checks, smoking, otitis media and sexually transmitted infections. There is evidence that at least some local WA Indigenous PHC services had made substantial strides in the management of conditions such as Type 2 diabetes over the previous decade, [11] and in the development of local CQI systems more recently.[12]

South Australia

Engagement of PHC services with the ABCD program in South Australia (SA) commenced in 2006, with a few services using the ABCD tools on their own initiative. The SA State Government provided policy and funding support to the ABCD National Research Partnership between 2010-2014, with additional funding provided by the Lowitja Institute for a research officer to work closely with the Aboriginal Health Council of South Australia (AHCSA) as both a researcher and coordinator for participating ACCHSs. By 2012, in addition to 10 ACCHSs, there were five state government-run health services using ABCD CQI tools and processes on a pilot basis, supported in various ways by their Local Health Networks.[13]

Policy support in SA was relatively limited and the implementation and ongoing CQI support to PHC services relied heavily on the small team based at AHCSA, and the ABCD project network. Research on PHC professionals' perspectives on barriers and enablers to CQI in the SA context identified health workforce capability - including the availability of CQI coordinator support – and senior management and leadership support for CQI as being vital to effective implementation. Organizational systems and individual behavior change, with regional collaborations and the use of systems approaches, were identified as key requirements for successful and sustained implementation of CQI.[13]

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Additional File 4: Estimated effect of jurisdictional location on care quality (% increase in services) for each area of care*

	Preventive Health (n=75 services; 9,627 audit records)			Type 2 Diabetes (n=95; 10,103)		
	Coef	**p-value**	**95% CIs**	**Coef**	**p-value**	**95% CIs**
Audit Year	4.23	<0.0001	(3.22 - 5.23)	2.44	<0.0001	(1.84 - 3.04)
Audit Cycle	-1.14	0.08	(-2.43 - 0.15)	0.64	0.12	(-0.17 - 1.45)
Jurisdiction (QLD reference)	11.66	<0.0001	(5.61 - 17.70)	15.73	<0.0001	(11.87 - 19.58)
LRTest chi^2 (1df)	13.65(p=0.0002)			50.13(p<0.0001)		
VPC	17.0%			18.2%		
	Child Health (n=74; 6,724)			**Maternal Health** (n=38; 2,180)		
	Coef	**p-value**	**95% CIs**	**Coef**	**p-value**	**95% CIs**
Audit Year	0.67	0.28	(-0.53-1.87)	-0.97	0.025	(-1.82 - -0.12)
Audit Cycle	0.74	0.37	(-0.89 - 2.36)	6.10	<0.0001	(4.78-7.42)
Jurisdiction (QLD reference)	4.98	0.07	(-0.42 - 10.38)	-2.38	0.27	(-6.59 - 1.83)
LRTest chi^2 (1df)	3.22(p=0.07)			1.22(p=0.27)		
VPC	15.0%			16.6%		

* As measured by the Quality of Care Index (QCI)
Coef = Coefficient
LRTest = Likelihood Ratio Test
VPC = Variance Partition Coefficient

SQUIRE Category	SQUIRE Explanation	Authors response
Title and Abstract		
1. Title	Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centeredness, timeliness, cost, efficiency, and equity of healthcare, or access to it).	Page 1- The title of the manuscript indicates that it is a comparative case study looking at the impact of policy support on the uptake of CQI activities and the impact on quality of care and the context in which it occurred. *"Impact of policy support on uptake of evidence-based continuous quality improvement activities and the quality of care for Indigenous Australians: a comparative case study."*
2. Abstract	• Provide adequate information to aid in searching and indexing • Summarize all key information from various sections of the text using the abstract format of the intended publication	Page 2 - We have structured the abstract as required by BMJ Open using the headings Objectives, Design, Setting, Participants, Interventions, Results and Conclusions.
Introduction		
3. Problem description and 4. available knowledge	• Nature and significance of the local problem • Summary of what is currently known about the problem, including relevant previous studies	The introduction clearly identifies the current relevant evidence and the current gap in knowledge. Page 4; Line 5 - *"Internationally, there is wide variation in adherence to best practice clinical guidelines between health services and between health professionals.[1] There is a growing body of evidence about the effectiveness of continuous quality improvement (CQI) in increasing adherence to guidelines and on the factors that contribute to this.[2] Variation in quality of care between health services has been demonstrated, including in populations with poorer health status, such as Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) peoples in Australia.[3,4]"* Page 4; Line 43 - *"While system-wide approaches to CQI have been associated with achieving large-scale improvements in health outcomes, there is limited evidence of the effectiveness of CQI over an extended period.[2] A positive policy environment is widely recognised as vital for effective development and implementation of programs to prevent and manage chronic disease,[8] with previous cross-regional analyses identifying the importance of regional level policies in enhancing clinical performance*

		in Indigenous PHC in Australia.[4] However, there is limited evidence as to the effect of government policy on the uptake and impact of CQI over time."
5. Rationale	Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work.	Page 5; Line 3 - *"This paper examines the influence of health policy decisions at the Australian state/territory level and how these may have influenced:* *i) trends in the consistent uptake of evidence-based CQI tools …* *ii) quality of care (as reflected in adherence to best practice guidelines) in Indigenous PHC services."* Page 7; Line 26 - *"We use a comparative case study design to relate state/territory level policy support for CQI to trends in its uptake and in quality of care"*
6. Specific Aims	Purpose of the project and of this report	The specific aim is clearly stated in the abstract and in the main body of the paper. Abstract Page 2; Line 3- *We examined the impact of state/territory policy support on 1) uptake of evidence-based CQI activities, and 2) quality of care for Indigenous Australians.* Main body of paper Page 5; Line 3: *This paper examines the influence of health policy decisions at the Australian state/territory level and how these may have influenced:* *i) trends in the consistent uptake of evidence-based CQI tools available through a research-based CQI initiative (the Audit and Best Practice in Chronic Disease (ABCD) Program; and* ii) *quality of care (as reflected in adherence to best practice guidelines) in Indigenous PHC services.*
Methods – what did you do?		
7. Context	Contextual elements considered important at the outset of introducing the intervention(s)	We have described the context of the study in the introduction - national policy context of CQI in Indigenous primary health care, Indigenous peoples health and access to primary care, ABCD Program of work. Because understanding of the context is relevant to the aim we have included this information in the introduction before the statement of the aim (see Page 4 Line 18 – 55; Page 5 Line 16- 36)
8. Intervention & 9. Study of the intervention	• Description of the intervention(s) in sufficient detail that others could reproduce it and specifics of the team involved in the work • Approach chosen for assessing the impact of the intervention(s) and approach used to establish whether	• The policy and infrastructure support provided in different jurisdictions is described in depth in the findings section (see Page 9 onwards) and also in supplementary material. • The methods are described in detail (see Page 7 onwards).

	the observed outcomes were due to the intervention(s)	• The outcome measures (trends in CQI activity and trends in quality of care) are described in the methods section (Page 7; Line 56 – Page 8 Line 30). • Questions of attribution or observed trends to policy and infrastructure are addressed in the discussion (Page 15 onwards)
10. Measures	• Measures chosen for studying processes and outcomes of the intervention(s), including rationale for choosing them, their operational definitions, and their validity and reliability • Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost • Methods employed for assessing completeness and accuracy of data	The case study methods are explained in the first paragraph in the methods section. For example, Page 7; Line 26 - *'We use a comparative case study design to relate state/territory level policy support for CQI to trends in its uptake and in quality of care. The five states/territories provide the 'cases' for comparison as they all have some consistent CQI data available through participation by services in the ABCD Program.'* The case study method captures the contextual elements that may have influenced the intervention and outcomes. Details of the clinical audit methods are detailed in the methods (Page 7; Line 26), table 1 (Page 5; Line 43) and supplementary material (Page 24). For example (Page 7; Line 46), *'Data on CQI activity and on adherence to clinical best practice guidelines were available through ABCD. This paper focuses on four priority aspects of care: preventive, Type 2 diabetes, maternal care and child health. The CQI and clinical record audit processes through which data are collected and reported at health service level are summarized in Table 1 and Additional File 1, and described in more detail elsewhere.[3,12]'*
11. Analysis	• Qualitative and quantitative methods used to draw inferences from the data • Methods for understanding variation within the data, including the effects of time as a variable	The methods section (page 7 onwards) of the manuscript contains a full description of the methods utilised. We also provide a supplementary file (see Additional File 1) that contains further details on methods. Variation in the audit data are reflected in the box plots in the Supplementary Material (Page 25 onwards).
12. Ethical considerations	Ethical aspects of implementing and studying the intervention(s) and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest	A statement about formal ethical approval has been made within the manuscript. For example (page 9; Line 7-11), *"Ethical approval for the ABCD National Research Partnership was obtained from research ethics committees in each relevant Australian jurisdiction."* A more detailed version of ethics statement is made at the end of the paper with other declarations, see Page 20; Line 20.

		We have also provided a statement about any potential conflict of interests and funding sources, see Page 19, Line 37 and Page 20, Line 43 respectively.
Results – What did you find?		
13. Results	• Initial steps of the intervention(s) and their evolution over time (e.g., time-line diagram, flow chart, or table), including modifications made to the intervention during the project • Details of the process measures and outcome • Contextual elements that interacted with the intervention(s) • Observed associations between outcomes, interventions, and relevant contextual elements • Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the intervention(s). • Details about missing data	We have presented the findings under two major headings that link directly to the aims of the manuscript. • *Policy initiatives that may have influenced uptake of the ABCD Program CQI, by state and territory* (see Page 9 ; Line 16) • *Trends in quality of care* (see Page 13 ; Line 51)
Discussion – what does it mean?		
14. Summary	• Key findings, including relevance to the rationale and specific aims • Particular strengths of the project	The first two paragraphs of the discussion are a summary of the key findings in relation to the aims of the paper. For example, (Page 15; Line 17)) *"Progressive and sustained uptake of ABCD tools occurred in the NT in the context of consistent long-term policy and infrastructure support for CQI. This contrasted with a) a rapid rise and subsequent fall in uptake of these tools in Queensland where the initial high-level policy and infrastructure support was not sustained following a change of government in 2012; and b) low levels of uptake in jurisdictions with relatively less policy and infrastructure support (NSW, WA, SA). The consistent long-term policy and infrastructure support for CQI in the NT was also associated with steady improvements or maintenance of high-quality care (as reflected in clinical best practice guidelines) for the four aspects of care that were the major focus of ABCD CQI efforts, and reduction in variation between health services for two of these. This contrasted with the situation in Queensland where there was a relatively limited effect on adherence to best practice guidelines and on variation between health services."* *"While this study does not provide an in-depth examination of the complex processes*

		that might explain different trends in the uptake of tools, or how CQI processes have impacted on quality of care in different jurisdictions, some insight has been provided by previous studies of the ABCD CQI program and the evaluation of the NT CQI Strategy. Gardner highlighted the complexity of the process of uptake of CQI, and the critical role of alignment of policies and incentives; a systems approach; organization-wide commitment; leadership at all levels; and resources to support implementation.[14] Our findings of relatively low uptake of CQI in jurisdictions with limited policy and infrastructure support, and the rapid drop in use of CQI tools when policy, infrastructure and funding support was withdrawn in Queensland, highlights the critical role these play in supporting its uptake. In other states, the lack of clear and consistent policy direction, resourcing and sustained high-level leadership and management support for CQI, and relative lack of engagement in wide-scale CQI research has led to a diversity of locally driven initiatives with an associated lack of systematic analysis and reporting of data for CQI purposes. This appears to have been a barrier to demonstrably effective uptake of CQI in many Indigenous PHC services between 2005 and 2014."
15. Interpretation	• Nature of the association between the intervention(s) and the outcomes • Comparison of results with findings from other publications • Impact of the project on people and systems • Reasons for any differences between observed and anticipated outcomes, including the influence of context • Costs and strategic trade-offs, including opportunity costs	We have included a section in the discussion on interpretation and comparison to relevant literature: For example (page 16; Line 11) , *"The limited availability of data for systematic analysis and reporting of relevant data, other than in Queensland and NT, has precluded meaningful analysis of adherence to best practice guidelines for most states/territories. The first report on national Key Performance Indicators (nKPIs) from Indigenous PHC organizations showed that in 2012-13 those in Queensland and the NT performed better against almost all process-of-care indicators,[20] attributing this to the relatively well-established CQI programs in these jurisdictions. The third and most recent nKPI report, which includes data up to December 2014,[21] shows improvements for 17 of the 19 process-of-care measures for all jurisdictions combined, with continued relatively high performance in the NT and Queensland and most marked recent improvement in WA. The analysis presented in this paper points to the importance of high-level policy support and resourcing for implementation of systematic CQI processes to enhance quality of care. The relatively high performance, and the greater ability to report nKPI data, in the NT and Queensland demonstrate the benefits of systematic CQI processes for reporting of data on KPIs as well as for*

		enhancing quality of care.
16. Limitations	• Limits to the generalizability of the work • Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis • Efforts made to minimize and adjust for limitations	In our discussion we have a number of paragraphs that outline the limitations of the work, efforts made to minimize limitations and generalizability. For example (page 17: Line 10 – Line 52), *"An important limitation of our study is that it is not possible to determine clearly the extent to which trends in data on quality of care have been influenced by policy support for the ABCD CQI program or to other initiatives (e.g. funding, workforce or infrastructure developments). The difficulty of demonstrating causality is common to much policy research,[22] however we argue here for contribution rather than attribution …."* *"The ABCD data are not representative of all Indigenous PHC services. There was variable participation in different jurisdictions and by government-operated and community-controlled health services. …The ABCD data need to be interpreted in relation to a range of other CQI activities in Indigenous PHC services over the period for which data has been reported[9,11]. While there were some substantial initiatives, particularly in the NT and Queensland, most CQI initiatives were small scale, narrow in scope and without the capability to analyze and report consistent data to the extent possible through ABCD. Nor has it been possible to assess systematically these CQI activities or their impact on quality of care. In addition, there were a range of non-CQI initiatives at the national [e.g. Indigenous Chronic Disease Package [23] and local levels, which may have impacted on quality of care over the period for which we have reported data."* *The authors of this paper have all had longstanding involvement with the ABCD Program as researchers, service providers, managers or policy makers/advisors. While our interest in ABCD may have influenced our interpretation of the data, the diversity of roles, insights and perspectives that we bring allows for critical reflection in the interpretation of the data, and brings rigor to this type of research.[22]*
17. Conclusions	• Usefulness of the work • Sustainability • Potential for spread to other contexts • Implications for practice and for further study in the field	Within the discussion we address implications for policy, practice and further research. For example (page 17; Line 55), *"The ABCD experience, as reflected in this paper, has important implications for practice, policy and further research, including the implementation of the National*

	• Suggested next steps	*CQI Framework for Aboriginal and Torres Strait Islander PHC [9]. For clinical staff and management of health services, the benefits of participating in this type of collaborative program include access to a CQI system that provides data on recent performance and trend data across the broad scope of primary care, and the ability to benchmark against other services at the regional, state/territory and national level. For policy professionals, benefits include the ability to monitor adherence to best practice guidelines at all levels, and to target improvements to specific aspects or modes of care, [19] population groups (e.g. children or the elderly) or geographic locations. An important challenge for ongoing and new CQI initiatives is to enhance local ownership and engagement, while ensuring the use of standard tools and supporting the analytical capability that enables the use of consistent good quality data for CQI purposes at multiple levels of the system. Sustaining efforts to deliver the best care according to changing evidence over time remains important and warrants further attention."* Our concluding statement also contains information about next steps and potential spread. For example (Page 18; Line 23), *"Our study adds to the accumulating evidence on the conditions that enable CQI efforts to be most effective. The findings show the potential contribution that systematic and sustained policy and infrastructure support can make to wide-scale uptake and to the effectiveness of CQI methods in improving the quality of care. It is now about 10 years since our first published paper on the potential for CQI to enhance the quality of health care for Indigenous Australians. With the development of a National CQI Framework in 2015 [9] it appears we may be at the dawn of a new era of wide-scale and systematic use of CQI methods. While local efforts are vital to the effective use of CQI methods, state/territory-level policy and resources will be critical to building capability and a supportive environment."*
Other information		
18. Funding	Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting	We have made full disclosure of funding (see Page 20 ; Line 10) and any conflicts of interest (page 19; Line 37) within the manuscript.

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Impact of policy support on uptake of evidence-based continuous quality improvement activities and the quality of care for Indigenous Australians: a comparative case study

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Impact of policy support on uptake of evidence-based continuous quality improvement activities and the quality of care for Indigenous Australians: a comparative case study

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ABSTRACT

Objectives: To examine the impact of state/territory policy support on 1) uptake of evidence-based continuous quality improvement (CQI) activities, and 2) quality of care for Indigenous Australians.

Design: Mixed-method comparative case study methodology, drawing on quality of care audit data, documentary evidence of policies and strategies, and the experience and insights of stakeholders involved in relevant CQI programs. We use multilevel linear regression to analyse jurisdictional differences in quality of care.

Setting: Indigenous primary health care services across five states/territories of Australia.

Participants: 175 Indigenous primary health care services.

Interventions: A range of national and state/territory policy and infrastructure initiatives to support CQI, including support for applied research.

Primary and secondary outcome measures:

i) trends in the consistent uptake of evidence-based CQI tools available through a research-based CQI initiative (the Audit and Best Practice in Chronic Disease (ABCD) Program; and

ii) quality of care (as reflected in adherence to best practice guidelines)

Results: Progressive uptake of evidence-based CQI activities and steady improvements or maintenance of high-quality care occurred where there was long-term policy and infrastructure support for CQI. Where support was provided but not sustained there was a rapid rise and subsequent fall in relevant CQI activities.

Conclusions: Health authorities should ensure consistent and sustained policy and infrastructure support for CQI to enable wide-scale and ongoing improvement in quality of care and, subsequently, health outcomes. It is not sufficient for improvement initiatives to rely on local service managers and clinicians, as their efforts are strongly mediated by higher system level influences.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- Using a mixed-method comparative case study methodology and drawing on data from 175 Indigenous primary health care services across Australia, we examine the impact of state/territory policy support and strategies on 1) uptake of CQI activities, and 2) quality of care for Indigenous Australians.

- Our analysis of several years of data from the largest and most comprehensive CQI program in Australia shows that consistent and sustained policy and infrastructure support for CQI enables wide-scale and ongoing improvement in quality of care and, subsequently, health outcomes.

- Our study adds to the accumulating evidence on the conditions that enable CQI efforts to be most effective.

- The authors of this paper have all had longstanding involvement with a national CQI program as researchers, service providers, managers or policy makers/advisors.

- A limitation of our study is that it is not possible to clearly attribute the extent to which trends in data on quality of care have been influenced by various concurrent policy and other initiatives.

INTRODUCTION

Internationally there is wide variation in adherence to best practice clinical guidelines between health services and between health professionals.[1] There is a growing body of evidence about the effectiveness of continuous quality improvement (CQI) in increasing adherence to guidelines and on the factors that contribute to this.[2] Variation in quality of care between health services has been demonstrated, including in populations with poorer health status, such as Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) peoples in Australia.[3,4]

Indigenous people's health, and access to primary health care

Australia is a high-income country with gross disparities in health outcomes between Indigenous and non-Indigenous people. This inequity has complex causes, including historical trauma and dispossession as a result of colonisation, social and economic conditions, and persistent racism. While the Indigenous population is about 730,000 (3% of the Australian total), the numbers and proportion of the population varies widely between jurisdictions.[5]

Indigenous people access primary health care (PHC) through services specifically established to meet their needs - both community-controlled and government-managed – and private general practice.[6]

Positive policy environment

A recently proposed four-level framework to describe the causes of the 'evidence–practice gap'[7] backs up previous work that has called for change at multiple levels of the health system to support wide-scale improvement in the quality of care.[8] While system-wide approaches to CQI have been associated with achieving large-scale improvements in health outcomes, there is limited evidence of the effectiveness of CQI over an extended period.[2] A positive policy environment is widely recognised as vital for effective development and implementation of programs to prevent and manage chronic disease,[9] with previous cross-regional analyses identifying the importance of regional level policies in enhancing clinical performance in Indigenous PHC in Australia.[4] However, there is limited evidence as to the effect of government policy on the uptake and impact of CQI over time.

This paper examines the influence of health policy decisions at the Australian state/territory level and how these may have influenced:

i) trends in the consistent uptake of evidence-based CQI tools available through a research-based CQI initiative (the Audit and Best Practice in Chronic Disease (ABCD) Program; and

ii) quality of care (as reflected in adherence to best practice guidelines) in Indigenous PHC services.

National policy context - CQI in Indigenous PHC

The rapid growth since 2002 in CQI initiatives in Indigenous PHC has been supported to varying extents by several large-scale CQI programs operating across a number of Australian states/territories, for example, the Australian Primary Care Collaborative (APCC), Healthy for Life, and the ABCD Program.[10-12] As a program of applied research, ABCD is the longest running and most extensively documented of these initiatives (Table 1). To some extent, the Healthy for Life program encouraged use of ABCD tools and processes by commissioning and promoting some of the audit tools in the program. Similarly, engagement with the APCC may have been a stimulus for services to explore the use of ABCD tools and processes, and vice versa. In 2015, the Australian Government Department of Health provided funding for the development and implementation of a National CQI Framework for Aboriginal and Torres Strait Islander PHC,[10] which outlines roles and responsibilities for CQI at various levels of the system.

[INSERT Table 1]

Table 1: The ABCD Program and continuous quality improvement tools

The Audit and Best Practice in Chronic Disease (ABCD) Program is a continuous quality improvement (CQI) action research project that employed a systems approach to enhancing care delivered through Indigenous primary health care (PHC) services across Australia.[3] Commencing in 2002, ABCD brought together service providers, policy makers and researchers in a collaborative program of applied research, with the aims of developing and enhancing the feasibility of CQI tools and processes on a wide scale, examining factors associated with variation in quality of care and strategies that have been effective in improving quality of care, and to work together to enhance the implementation of effective

strategies. We have previously reported on factors that influence variation in quality of care between health services [11] and are engaged in an ongoing program of research on priorities and strategies for improvement.[13] Supported by a national CQI support entity (One21seventy), since 2010, more than 270 Indigenous PHC services have used standardized evidence-based best-practice clinical audit and system assessment tools to assess and reflect on health service system performance, typically on an annual basis. The tools have been used to varying extent in all Australian states/territories.

[INSERT FIGURE 1]

CQI tools developed through the ABCD Program cover priority aspects of PHC (including preventive care, diabetes, child health, and maternal health). The clinical audit tools were developed by expert working groups, with participation of specialists in relevant aspects of care and health service staff.[3] The tools were designed to enable services to assess their work against best practice standards as reflected in widely accepted evidence-based guidelines; each tool is accompanied by an audit protocol. The ABCD audit tools are ideally used in a system-oriented collaborative and supportive CQI approach, together with an assessment of health service system performance conducted by health service staff in a facilitated group discussion using a standardized systems assessment tool.[14] The evidence of effectiveness of the ABCD CQI process [11,15] is consistent with international evidence of effectiveness of quality improvement strategies. [2]

The ABCD Program

For the duration of its operation the ABCD program has had a strong focus on both developing the evidence base for CQI in Indigenous PHC as well as supporting implementation of evidence based CQI practices.[3,16,17] The ABCD program, and its associated service support arm One21seventy, has been used most extensively in the Northern Territory (NT) and Queensland (QLD) by both government and community-controlled Indigenous PHC services, and to a lesser extent in New South Wales (NSW), South Australia (SA) and Western Australia (WA). The timing and nature of policy and funding support for ABCD and other CQI programs has varied between jurisdictions. The most substantial support was available in the NT and QLD, and was generally of smaller scale and more fragmented in NSW, SA and WA.[10,17](Table 1).

METHODS

We use a comparative case study design to relate state/territory level policy support for CQI to trends in its uptake and in quality of care. The five states/territories provide the 'cases' for comparison as they all have some consistent CQI data available through participation by services in the ABCD Program.

Information on the use of CQI processes and tools, and on policy and infrastructure support for CQI initiatives is drawn from publicly available sources. Information from these documentary sources is supplemented by the experience and insights of the authors, all of whom have been closely involved (including as service providers, managers, policy makers and advisors, CQI coordinators, and researchers) over an extended period in relevant CQI programs.

Data on CQI activity and on adherence to clinical best practice guidelines were available through ABCD. This paper focuses on four priority aspects of care: preventive, Type 2 diabetes, maternal care and child health. The CQI and clinical record audit processes through which data are collected and reported at health service level are summarized in Table 1 and Additional file 1, and described in more detail elsewhere.[3,15]

Outcome measures

For the purpose of assessing extent of CQI activity using ABCD standard tools we sum the number of different audit tools used in each health service in each year for each jurisdiction.

We use a composite Quality of Care Index (QCI) to measure overall adherence to evidence based clinical best practice guidelines in the delivery of care for each audit tool over successive years. The QCIs provide a measure of adherence to a package of evidence based practices within each area of care. They therefore provide a more holistic measure of quality of clinical care (for example overall delivery of type 2 diabetes care) than specific items of care (for example monitoring or control of HbA1c). We report on these QCIs for only the NT and QLD, as these jurisdictions had data available from a large number of health services. QCIs were calculated by dividing the total number of client services for each client by the total number of possible services in the QCI.[15] We use box plots to report QCIs for participating health services by jurisdiction for consecutive years, and for consecutive audit cycles for health services that completed audits for at least three cycles (Additional file 2). Data on additional cycles are reported where there were data from at least half of the health services that completed audits in at least three cycles.

Statistical analysis

As the data have a hierarchical structure (patients within health services), mixed multi-level linear regressions were run to test the effect of jurisdictional location (NT and Queensland) on service delivery (as measured by the QCI). Up to four audit cycles were included in the analysis where there were sufficient numbers of health services to enable cross-jurisdictional comparison. To minimize confounding, we confined analysis to health centers that completed the same number of audit cycles within each jurisdiction. The level of service delivery to individual clients (continuous variable: percentage of QCI delivered) was modelled with health service as an additional level random effect. Each model included adjustments for year of audit and audit cycle completed. Jurisdictional location (categorical) was included as a fixed effect. Variance Partition Coefficients were calculated to measure how much variability in adherence to best practice guidelines between health services was attributable to jurisdictional location. Inspection of residual plots showed no obvious deviations from normality or homoscedasticity. P-values were obtained by likelihood ratio tests of the model with jurisdictional location against the empty model without this effect. A p-value ≥ 0.05 was considered statistically non-significant. Statistical analyses were conducted with STATA software, V.14.

Ethics approval

Ethical approval for the ABCD National Research Partnership was obtained from research ethics committees in each relevant Australian jurisdiction.[3]

FINDINGS

Policy initiatives that may have influenced uptake of the ABCD Program CQI, by state and territory

A number of national CQI initiatives may have influenced uptake of ABCD along with those being implemented simultaneously by the states/territories.[10,12] An overview of CQI policy initiatives, by jurisdiction, showing the greatest uptake of the ABCD CQI tools is presented in summary form in Table 2 and in more detail in Additional file 3.

[INSERT Table 2]

Table 2: Key policy and resourcing developments for CQI initiatives including ABCD 2005-2015

National initiatives that supported CQI across multiple jurisdictions	
2002 – 2006	• Continuous Improvement Projects
2005 – ongoing	• Australian Primary Care Collaborative
2005 – ongoing	• Healthy for Life Program – while not specifically a CQI program, it did have a CQI component
2010 – 2016	• One21seventy – National Centre for Quality Improvement in Indigenous Primary Health Care
State and Territory programs	
Northern Territory	
2002 – 2005	• Government and ACCHO sectors supported CQI research through the original ABCD Project
2005 – 2009	• … and the ABCD Extension Project
2009	• NT CQI Strategy endorsed by the Aboriginal Health Forum
2012	• Wide-scale employment of CQI Coordinators and Facilitators to support PHC services across the NT
2013	• External evaluation of the NT CQI investment
Queensland	
2005 – 2006	• Review commissioned to identify best options for improving Indigenous health identifies CQI as a priority
2007	• Development and implementation of CQI Program endorsed at senior government level
2008	• Employment of CQI Coordinators and Facilitators to support PHC services across QLD
2008	• North QLD Steering Committee established with key stakeholders, including Royal Flying Doctor Service, Apunipima Cape York Health Council and QLD Health
2010	• … further major investment in CQI support – including contract

	with One21seventy to provide CQI support to services
2010	• Peak community-controlled organisation implemented 'collaborative style' CQI processes using electronic data extraction
2011	• State-wide CQI Steering Committee established
New South Wales	
2006	• NSW Health provided funding to the peak community-controlled organisation AH&MRC to support CQI among NSW ACHHS through building infrastructure, skills and data collection systems, and to share models of good practice
2010	• Several NSW Indigenous PHCs commenced use of ABCD CQI tools through contracts with One21seventy on their own initiative
2015	• AH&MRC published CQI Success Stories from ten ACCHSs
Western Australia	
2005 – 2009	• WA Health provided funds for a CQI Project Officer to support ABCD Program in WA
2006 – 2007	• Peak community-controlled organisation, AHCWA, conducted a pilot of the Australian Primary Care Collaborative in several ACCHSs
2012 – 2015	• AHCWA Research Partnership on CQI
2014	• Holman review recommended implementation of a state-wide CQI program, with reference to One21seventy
2014 – 2015	• AHCWA reported actively promoting CQI to all member services
South Australia	
2008 – 2009	• Review of the evidence conducted
2010 – 2014	• SA Health and Lowitja Institute provided funds for a CQI Project Officer to support ABCD Program in SA. Quality Improvement Officer based at peak community-controlled organisation supporting analysis and feedback to community-controlled health services in SA
Engagement with ABCD Research in each State and Territory	
Northern Territory	
2002	• ABCD Program originated in 12 health services in the NT, building on prior work on chronic disease, best-practice guidelines, clinical information systems in Indigenous PHC
2005	• ABCD Extension phase supported development of a CQI hub in Central Australia and Top End
2011 – 2014	• All NT Government health services and many ACCHS participated in the ABCD National Research Partnership, with NT ABCD Project Officer supported by funding from NT Health
Queensland	
2007 – 2008	• ABCD Extension phase supported development of a CQI hub in QLD
2011 – 2014	• All QLD Health services and several ACCHS participated in the ABCD National Research Partnership, with QLD ABCD Project Officer supported by funding from the Lowitja Institute
New South Wales	
2005	• Maari Ma Health Aboriginal Corporation in far west NSW commenced with ABCD Program
2011 – 2014	• Maari Ma Health Aboriginal Corporation participates in the ABCD National Research Partnership

Western Australia	
2005 2011 – 2014	• ABCD Extension phase supported development of a CQI hub in WA • Several ACCHS and WA health services participated in the ABCD National Research Partnership, with WA ABCD Project Officer supported by funding from the Lowitja Institute

Notes: ABCD – Audit and Best Practice for Chronic Disease; ACCHO - Aboriginal Community-Controlled Health Organisation; ACCHS – Aboriginal Community-Controlled Health Service; ACHSA – Aboriginal Health Council of South Australia; AHCWA – Aboriginal Health Council of Western Australia; AH&MRC – Aboriginal Health and Medical Research Council; CQI – continuous quality improvement; NSW – New South Wales; NT – Northern Territory; PHC – primary health care; QAIHC – Queensland Aboriginal and Islander Health Council; QLD – Queensland; SA – South Australia; WA – Western Australia.

A total of 286 Indigenous PHC services used ABCD standard tools and reported data through the One21seventy web-based information system between 2005 and 2014. Of these health services, 175 voluntarily provided de-identified clinical audit data for analysis and reporting.

Northern Territory

The most substantial early uptake of the CQI tools was in the NT (Table 2; Figure 2; Additional file 3) where they were implemented in 12 health services following the first evidence of their success.[3] There was a decline in the use of the tools in the NT in 2010, the final year of the extension phase of the ABCD research project, followed by a large increase in use the following year. This increase coincided both with the establishment of One21seventy as a service support agency for using ABCD CQI tools and processes, and with the commencement of the NT CQI Strategy and corresponding funding support. The use of ABCD CQI tools plateaued over the period 2012-2014. An external evaluation commissioned by the NT Government supported sustainability and embedding of processes.[18]

[INSERT FIGURE 2]

Queensland

In QLD, use of the ABCD CQI tools commenced in 2007/8, with the engagement of QLD Health and some community-controlled PHC services (largely in the north of the state) in the

ABCD Program (Table 2; Figure 2; Additional file 3). This followed an internal review of evidence on improving health care delivery, and subsequent recommendations to increase investment in CQI in 2008 and again in 2010. There was a rapid increase in the use of the tools to a peak in 2011 and 2012, following the second investment by QLD Health in CQI coordinators and facilitators and in supporting health services to access ABCD tools and the One21seventy web-based information system. There was a marked decline in the use of the ABCD CQI tools in 2013 and 2014, following the change in Government in 2012, a lack of policy support and cuts in funding.

New South Wales

Use of the ABCD CQI tools in NSW peaked in 2008 and 2009, but declined as the state's early leading exponent of CQI, Maari Ma Health Aboriginal Corporation in Broken Hill, shifted attention to using the ABCD audit tools in selected aspects of clinical care and applying CQI techniques to the management of various organizational systems and processes (Table 2; Figure 2; Additional file 3). There was some continuing use of ABCD CQI tools in Maari Ma Health and in other NSW services despite the absence of direct support for the use of these tools from NSW health authorities.

Western Australia

In WA, use of the ABCD CQI tools increased from 2005 to a peak in 2008 and 2009 across several health services (Table 2; Figure 2; Additional file 3). The decline in usage coincided with the end of ABCD's extension phase, but a number of health services continued to use the tools despite relatively limited engagement with ongoing research and no direct support from WA health authorities.

South Australia

A small number of services used the ABCD CQI tools in SA between 2006 and 2010, and slightly more between 2011 and 2014 – the increase coinciding with provision of limited funding and policy support from research and SA health (Table 2; Figure 2; Additional file 3). This policy support occurred after an internal review (similar to QLD) on the evidence and best options to improving delivery of care.

Trends in quality of care

The QCIs of adherence to best practice guidelines for health services in the NT generally show improvement over audit cycles and over successive years. More specifically, between audit cycles 1 and 4 the median % of services delivered for participating health centres increased by more than 25% for overall preventive care, and by about 10% for overall type 2 diabetes care and overall child health care (Additional file 2; Table 3). There was also improvement in the median % of services delivered in successive years for all four areas of care. The improvement in the NT is accompanied by a reduction in variation between health services for preventive care and child health QCIs, due to improvement among poorer performing health services.

[INSERT Table 3]

Table 3: Summary of care quality trends over years and CQI cycles in Northern Territory and Queensland. See Additional file 2 for more detailed data.

	Trend over time		**Trend over CQI cycles**		**Variation over CQI cycles**	
Area of Care	NT	QLD	NT	QLD	NT	QLD
Diabetes	↑	~	↑	~	*	~
Preventive	↑	~	↑	~	~	~
Child	↑	↓	↑	~	~	~
Maternal	↑	↑	↑	↑	*	~
Legend: ↑ Improvement ~ No change ↓ Decrease * Reduced variation						

Notes: NT – Northern Territory; QLD – Queensland; CQI –continuous quality improvement

In QLD, the QCIs of adherence to best practice guidelines show a mixed picture. There was improvement in the median % of services delivered for participating health services between audit cycles 1 and 4 of about 15% for overall antenatal care. For overall type 2 diabetes care and overall preventive care there was an increase in the median % of services delivered of about 10% and 5% respectively between audit cycles 1 and 3, followed by a decline at audit cycle 4 (Additional file 2; Table 3). There was no clear trend for diabetes care over successive years or over audit cycles, or for preventive care over time. There was a declining trend over successive years and no clear increasing or decreasing trend over audit cycles for child health. Nor was there a clear reduction in variation between health services in any of the

four areas of care over time or over audit cycles.

The multi-level linear regression analyses showed that there was a significant difference between the two jurisdictions for preventive and diabetes care. After adjusting for year of audit and number of cycles completed, the predicted increase in adherence to best practice for NT compared to QLD health services was 12% (95%CI: 5.61-17.70; p<0.0001) and 16% (95%CI: 11.87-19.58; p<0.0001) for preventive and diabetes care respectively. Jurisdictional location accounted for 17% and 18.2% of the explained variability in adherence to best practice guidelines for both. There was no significant difference between jurisdictions in relation to child or maternal care (Table 4).

[INSERT Table 4]

Table 4: Estimated effect of jurisdictional location on care quality (% increase in services) for each area of care*

	Preventive Health (n=75 services; 9,627 audit records)			**Type 2 Diabetes** (n=95; 10,103)		
	Coef	**p-value**	**95% CIs**	**Coef**	**p-value**	**95% CIs**
Audit Year	4.23	<0.0001	(3.22 - 5.23)	2.44	<0.0001	(1.84 - 3.04)
Audit Cycle	-1.14	0.08	(-2.43 - 0.15)	0.64	0.12	(-0.17 - 1.45)
Jurisdiction (QLD reference)	11.66	<0.0001	(5.61 - 17.70)	15.73	<0.0001	(11.87 - 19.58)
LRTest chi^2 (1df)	13.65(p=0.0002)			50.13(p<0.0001)		
VPC	17.0%			18.2%		
	Child Health (n=74; 6,724)			**Maternal Health** (n=38; 2,180)		
	Coef	**p-value**	**95% CIs**	**Coef**	**p-value**	**95% CIs**
Audit Year	0.67	0.28	(-0.53-1.87)	-0.97	0.025	(-1.82 - -0.12)
Audit Cycle	0.74	0.37	(-0.89 - 2.36)	6.10	<0.0001	(4.78-7.42)
Jurisdiction (QLD reference)	4.98	0.07	(-0.42 - 10.38)	-2.38	0.27	(-6.59 - 1.83)
LRTest chi^2 (1df)	3.22(p=0.07)			1.22(p=0.27)		
VPC	15.0%			16.6%		

* As measured by the Quality of Care Index (QCI)
Coef = Coefficient
CI = confidence interval
LRTest = Likelihood Ratio Test
QLD = Queensland
VPC = Variance Partition Coefficient

DISCUSSION

Progressive and sustained uptake of ABCD tools occurred in the NT in the context of consistent long-term policy and infrastructure support for CQI. This contrasted with a) a rapid rise and subsequent fall in uptake of these tools in QLD where the initial high-level policy and infrastructure support was not sustained following a change of government in 2012; and b) low levels of uptake in jurisdictions with relatively less policy and infrastructure support (NSW, WA, SA). The consistent long-term policy and infrastructure support for CQI in the NT was also associated with steady improvements or maintenance of high-quality care (as reflected in clinical best practice guidelines) for the four aspects of care that were the major focus of ABCD CQI efforts, and reduction in variation between health services for two of these. This contrasted with the situation in QLD where there was a relatively limited effect on adherence to best practice guidelines and on variation between health services.

While this study does not provide an in-depth examination of the complex processes that might explain different trends in the uptake of tools, or how CQI processes have impacted on quality of care in different jurisdictions, some insight has been provided by previous studies of the ABCD CQI program [11,15, 19-24] and the evaluation of the NT CQI Strategy. [18] Gardner highlighted the complexity of the process of uptake of CQI, and the critical role of alignment of policies and incentives; a systems approach; organization-wide commitment; leadership at all levels; and resources to support implementation.[19] Our findings of relatively low uptake of CQI in jurisdictions with limited policy and infrastructure support, and the rapid drop in use of CQI tools when policy, infrastructure and funding support was withdrawn in QLD, highlights the critical role these play in supporting its uptake. In these states, the lack of clear and consistent policy direction, resourcing and sustained high-level leadership and management support for CQI, and relative lack of engagement in wide-scale CQI research has led to a diversity of locally driven initiatives with an associated lack of systematic analysis and reporting of data for CQI purposes. This appears to have been a

barrier to demonstrably effective uptake of CQI in many Indigenous PHC services between 2005 and 2014.

The limited availability of data for systematic analysis and reporting of relevant data, other than in QLD and NT, has precluded meaningful analysis of adherence to best practice guidelines for most states/territories. The first report on national Key Performance Indicators (nKPIs) from Indigenous PHC organizations showed that in 2012-13 those in QLD and the NT performed better against almost all process-of-care indicators,[25] attributing this to the relatively well-established CQI programs in these jurisdictions. The third and most recent nKPI report, which includes data up to December 2014,[26] shows improvements for 17 of the 19 process-of-care measures for all jurisdictions combined, with continued relatively high performance in the NT and QLD and most marked recent improvement in WA. The analysis presented in this paper points to the importance of high-level policy support and resourcing for implementation of systematic CQI processes to enhance quality of care. The relatively high performance, and the greater ability to report nKPI data, in the NT and QLD demonstrate the benefits of systematic CQI processes for reporting of data on KPIs as well as for enhancing quality of care.

The independent evaluation of the NT CQI Strategy provides important insights into the relative success of CQI initiatives in the NT. There has been no comparable publicly available independent evaluation in QLD, NSW, WA or SA, and it may be that an external evaluation such as that of the Strategy plays a role in ensuring sustainability and momentum. The formalized collaborative engagement of the community-controlled and government sectors in the NT through the Aboriginal Health Forum, and the shared commitment and enthusiasm for a territory-wide CQI Strategy, have also contributed to the achievements in the NT. Given the importance of working effectively together to respond to the complex care needs of Indigenous patients, it appears that a partnership approach adopted across service sectors is a critical component underpinning efforts in improving quality of care.

Another important component has been the adaptation of collaborative methods to sustain the engagement of experienced front-line service providers and managers, such as bringing them together to share learnings. Together with sustained investment, the shared commitment and enthusiastic engagement in CQI in the NT is likely to have engendered the sense of collective efficacy and collective valuing of CQI data that has led to the effectiveness of CQI.[11]

An important limitation of our study is that it is not possible to determine clearly the extent to which trends in data on quality of care have been influenced by policy support for the ABCD CQI program or to other initiatives (e.g. funding, workforce or infrastructure developments). The difficulty of demonstrating causality is common to much policy research,[27] however we argue here for contribution rather than attribution. Improvements to the quality of care in NT built on substantial earlier initiatives, including electronic patient information record systems, the development and implementation of a Chronic Disease Strategy and sustained commitment to workforce development.

The ABCD data are not representative of all Indigenous PHC services. There was variable participation in different jurisdictions and by government-operated and community-controlled health services. For example, in the NT there were substantial numbers of both service types participating in ABCD, but relatively low numbers of community-controlled services in QLD. The ABCD data need to be interpreted in relation to a range of other CQI activities in Indigenous PHC services over the period for which data has been reported[10,12]. While there were some substantial initiatives, particularly in the NT and QLD, most CQI initiatives were small scale, narrow in scope and without the capability to analyze and report consistent data to the extent possible through ABCD. Nor has it been possible to assess systematically these CQI activities or their impact on quality of care. In addition, there were a range of non-CQI initiatives at the national [e.g. Indigenous Chronic Disease Package] [28] and local levels, which may have impacted on quality of care over the period for which we have reported data. More generally, as with all research of this type it is vital to consider historical, socioeconomic and health service and system contexts in assessing the generalizability or transferability of the findings to other primary healthcare settings in Australia or internationally.

The authors of this paper have all had longstanding involvement with the ABCD Program as researchers, service providers, managers or policy makers/advisors. While our interest in ABCD may have influenced our interpretation of the data, the diversity of roles, insights and perspectives that we bring allows for critical reflection in the interpretation of the data, and brings rigor to this type of research.[27]

The ABCD experience, as reflected in this paper, has important implications for practice, policy and further research, including the implementation of the National CQI Framework for Aboriginal and Torres Strait Islander PHC.[10] For clinical staff and management of health services, the benefits of participating in this type of collaborative program include access to a CQI system that provides data on recent performance and trend data across the broad scope of primary care, and the ability to benchmark against other services at the regional, state/territory and national level. For policy professionals, benefits include the ability to monitor adherence to best practice guidelines at all levels, and to target improvements to specific aspects or modes of care, [24] population groups (e.g. children or the elderly) or geographic locations. An important challenge for ongoing and new CQI initiatives is to enhance local ownership and engagement, while ensuring the use of standard tools and supporting the analytical capability that enables the use of consistent good quality data for CQI purposes at multiple levels of the system. Sustaining efforts to deliver the best care according to changing evidence over time remains important and warrants further attention.

CONCLUSION

Our study adds to the accumulating evidence on the conditions that enable CQI efforts to be most effective. The findings show the potential contribution that systematic and sustained policy and infrastructure support can make to wide-scale uptake and to the effectiveness of CQI methods in improving the quality of care. It is now about 10 years since our first published paper on the potential for CQI to enhance the quality of health care for Indigenous Australians. With the development of a National CQI Framework in 2015 [10] it appears we may be at the dawn of a new era of wide-scale and systematic use of CQI methods. While local efforts are vital to the effective use of CQI methods, state/territory-level policy and resources will be critical to building capability and a supportive environment.

Figure List

Figure 1: Distribution and use of ABCD Program continuous quality improvement tools in health services, over time, as at 2007, 2011 and 2015

Figure 2: Uptake of ABCD continuous quality improvement tools and major policy influences on trends in Northern Territory and Queensland

List of abbreviations

ABCD: Audit and Best Practice in Chronic Disease

CQI: Continuous Quality Improvement

PHC: Primary Health Care

nKPI: National Key Performance Indicators

NSW: New South Wales

NT: Northern Territory

QCI: Quality of Care Index

QLD: Queensland

SA: South Australia

WA: Western Australia

Consent for publication

Not applicable

Availability of data and material

The ABCD dataset analyzed during the current study is not publicly available due to health centre confidentiality, but is available from the corresponding author on reasonable request and if consistent with the project's ethics approvals.

Authors' contributions

RB conceived and had the primary role in drafting of the manuscript. VM undertook the quantitative data analysis and had a major role in drafting and review. All other authors (SL, ST, CP, TW, JB, FC, RK, LC) played substantial roles in providing information on QI initiatives in various states and territories, in analysis and interpretation of data, and review of successive drafts of the manuscript. All authors read and approved the final manuscript.

Competing interests

RB was the Scientific Director of One21seventy, a not-for-profit entity within Menzies School of Health Research that provided CQI support on a fee for service basis to primary healthcare services across Australia. RB is also the lead investigator on the ABCD Research Program, and other authors are co-investigators. None of the authors received financial support from One21seventy, and One21seventy did not provide any financial support for the preparation of this manuscript. The authors have no other competing interests in the preparation of this manuscript.

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Ethics

Ethics approval was obtained from human research ethics committees (HRECs) in each jurisdiction: Northern Territory HREC-EC00153 & HREC-12-53; New South Wales HREC/11/GWAHS/23; Queensland HREC/11/QTDD/47; South Australia Aboriginal Health Research Ethics Committee 04-10-319; Western Australia Curtin University HR140/2008; WA Country Health Services 2011/27;WA Aboriginal Health Information and Ethics Committee 111-8/05; University of Western Australia RA/4/1/5051.

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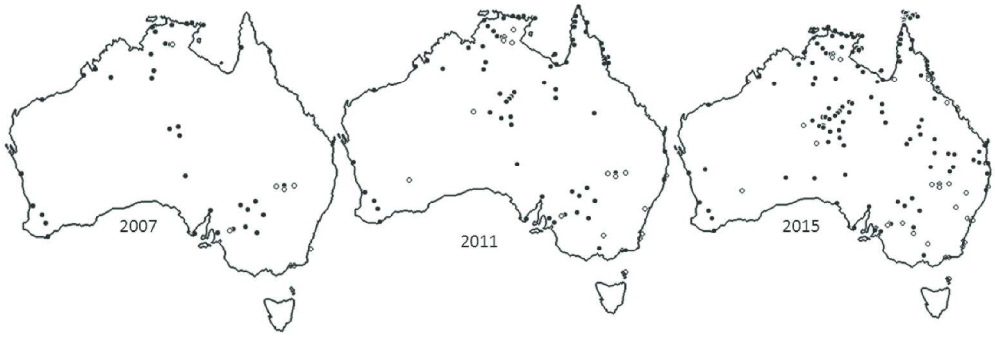

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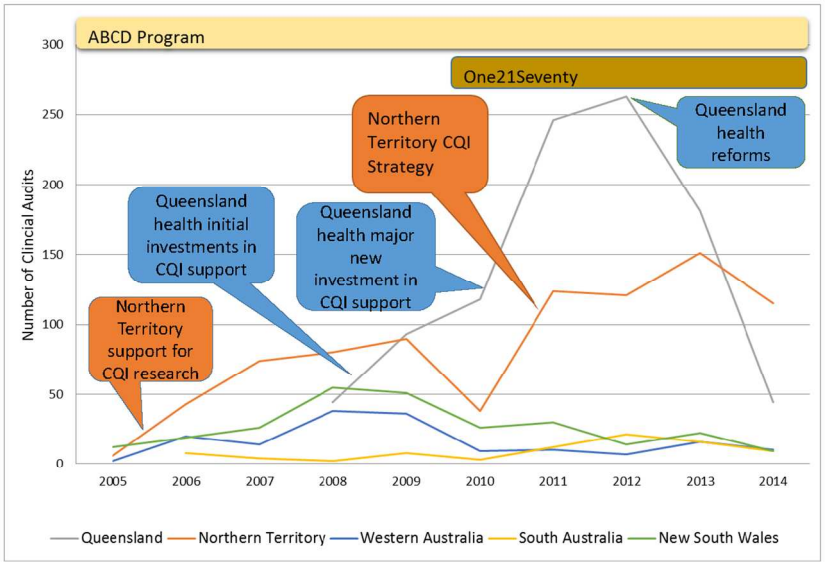

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Additional File 1: Clinical audit process, sample size and audit inclusion criteria

Conduct and reporting of clinical audits – audits were generally done by health service staff, trained in the use of standard tools and supported by quality improvement facilitators and continuous quality improvement (CQI) program staff. Where appropriate health service staff were not available, the audits were done by trained CQI facilitators working in state/territory CQI support roles. Data were collected using standardised CQI tools, entered into a web-based information system, and analysed through an automated process, with reports made available to health services in real time for use in local quality improvement processes. Reports of aggregated data for clusters of health services, by region or state, were also available through the web-based information system to support regional or state/territory level CQI efforts.

Sampling and sample size for Preventive care, Diabetes, Maternal and Child health audits. Where the eligible population was 30 clients or less, the audit protocol recommended including all records. Where the eligible population was greater than 30, the protocol provided guidance on the random selection of records, with the number depending on the precision of estimates required by health service staff. A new sample was used for each audit period. For Preventive care and Child health, the samples were stratified by age and gender; for Diabetes care samples were stratified by gender.

Preventive care	***Diabetes***	***Child health***	***Maternal health***
Included clients must: be between 15 and up to 55 years; have no diagnosis of diabetes, hypertension, coronary heart disease, chronic heart failure, rheumatic heart disease or chronic kidney disease; not be pregnant or less than 6 weeks postpartum; and have been resident in the community for 6 months or more in the last 12 months.	Included clients must: have a clear, documented diagnosis of Type 2 Diabetes; be 15 years or older; and have been a resident in the community for 6 months or more in the last 12 months. Clients are excluded if they have Type 1 diabetes, gestational diabetes or autoimmune nephropathy.	Included children must: have been resident in the community for 6 months or more of the past 12 months (or if the child is <12 months, resident in the community for at least half of the time since birth); and have no major health anomaly such as Down Syndrome, cerebral palsy, heart defects or inherited disorders.	Included women must: have an infant between 2 and 14 months; have been resident in the community for 6 months of the infant's gestation; and have used the health service as the usual source of primary health care.

Additional File 2 – Quality of Care Index for preventive care, diabetes care, child health and maternal health care, 2005–2014

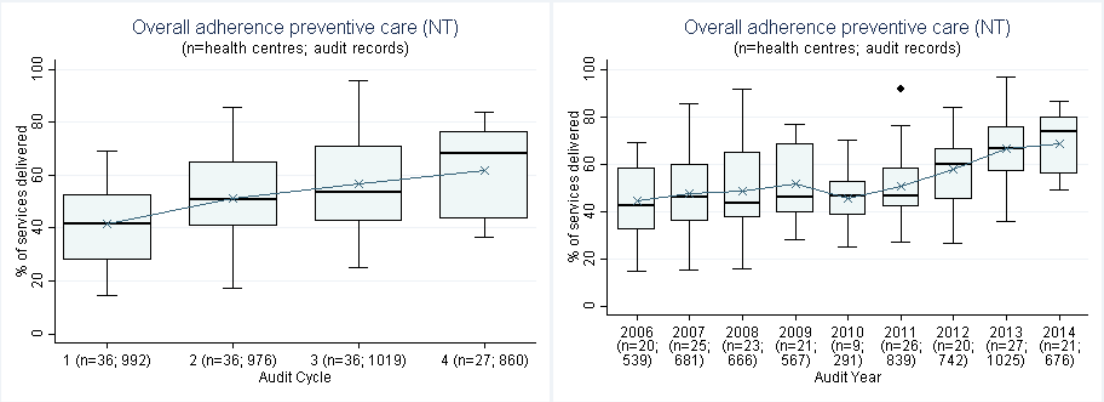
Reading the box plots

The box plots show the median, mean, 25th and 75th centile and range between health services for each jurisdiction, year and audit cycle. They also show outliers, defined as health services where the value for the indicator is more than 1.5 times the difference between the 25th and 75th centile from the median.

Preventive care (2005–2014)

QCI includes (up to 15 service items): weight, waist circumference, blood pressure, urinalysis, blood glucose levels, oral health check, nutrition & physical activity brief intervention, smoking & alcohol use recorded and brief interventions where required, sexually transmitted infection check (gonorrhea, chlamydia & syphilis) and pap smear.

Northern Territory



Queensland

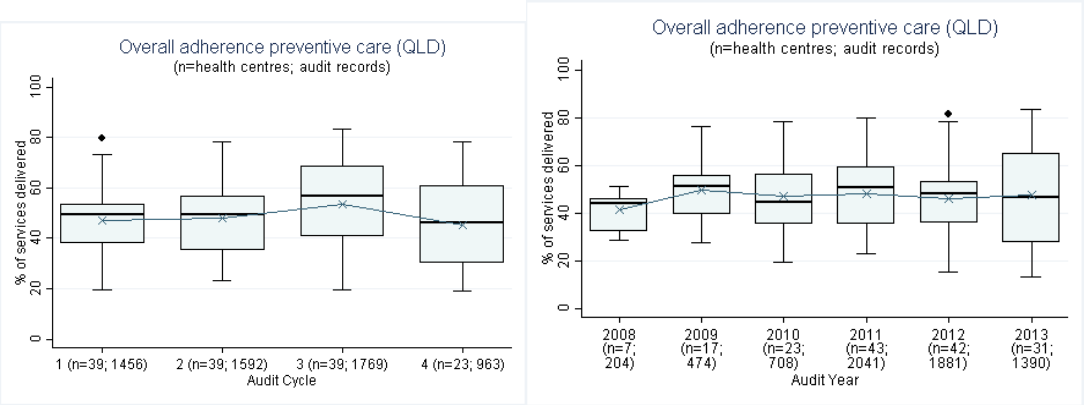
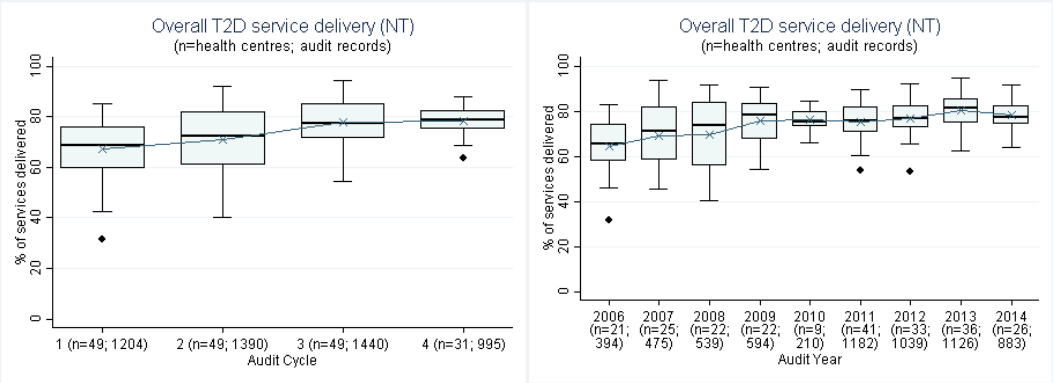


Figure 2.1: Mean percent QCI services delivered to well clients per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services), NT and QLD (n=number of health services; number of client records audited who attended in previous 24 months)

Diabetes care (2005–2014)

QCI includes (up to 22 service items): GP Management Plan, record of discussion on chronic disease management & medications, influenza & pneumococcal vaccination, blood pressure, smoking & alcohol use recorded and brief intervention where required, weight, waist circumference, nutrition & physical activity brief intervention, ACR, lipids, cholesterol, eGFR, body mass index, visual acuity, dilated eye check, feet check, HbA1c.

Northern Territory



Queensland

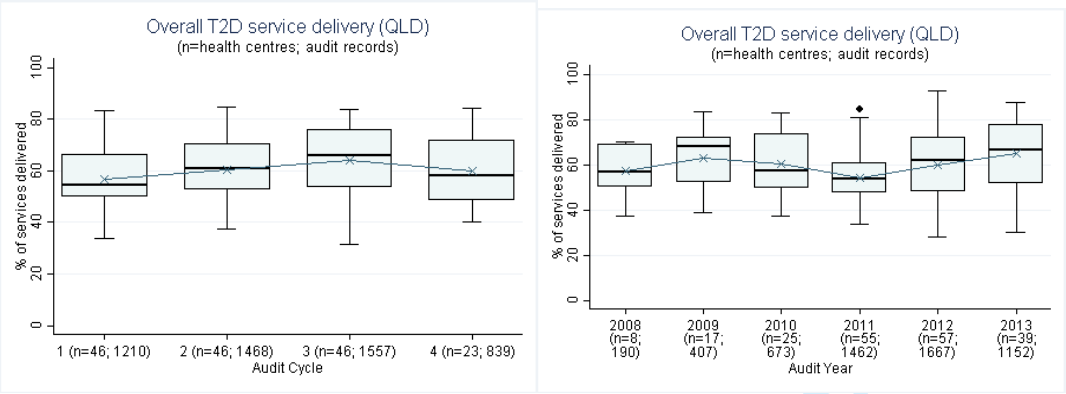
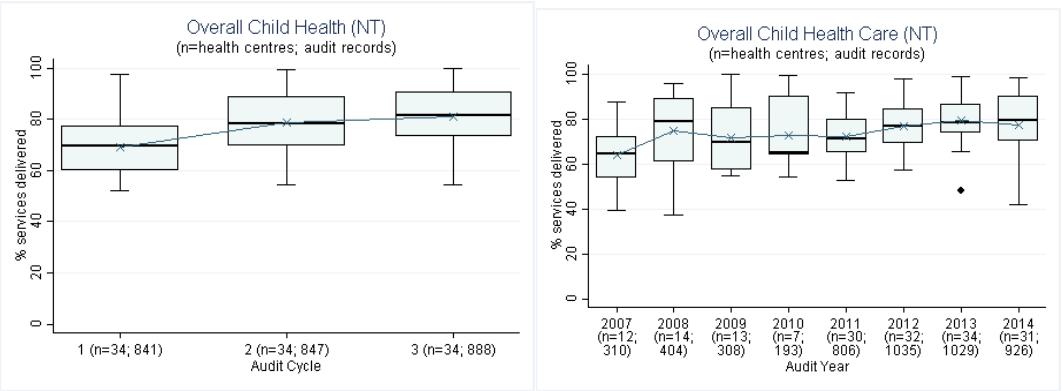


Figure 2.2: Mean percent QCI services delivered to patients with Type 2 diabetes per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services) , NT and QLD (n=number of health services; number of client records audited who attended in previous 12 months)

Child health (2007–2014)

QCI includes up to 10 service items: weight, height, ear exam, nutrition, head circumference, hip exam, sudden infant death syndrome prevention advice, breastfeeding advice, developmental check, testes check.

Northern Territory



Queensland

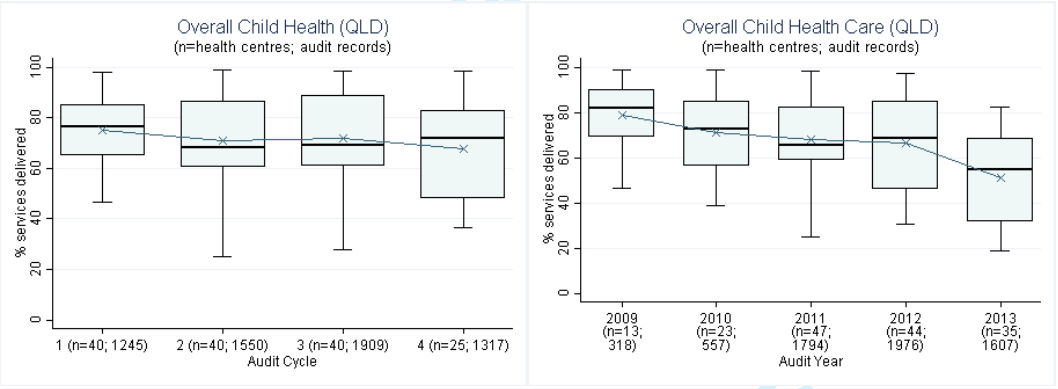
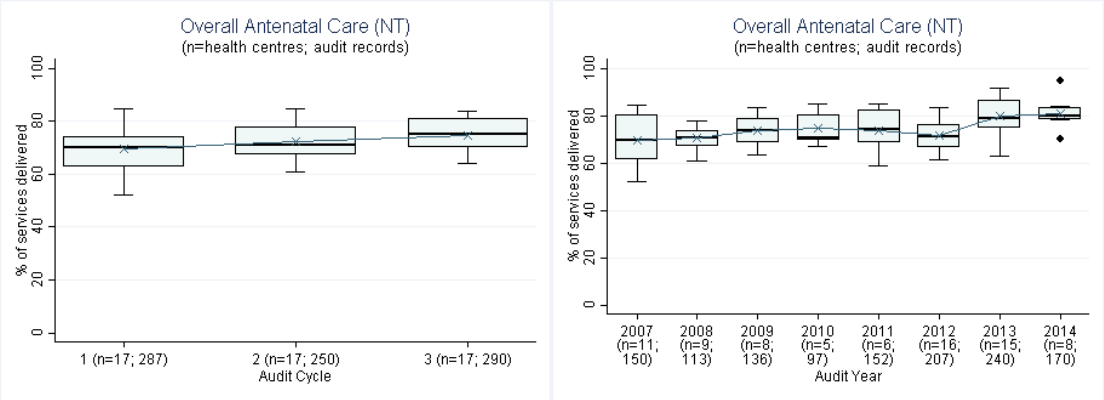


Figure 2.3: Mean percent QCI services delivered to children per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services) , NT and QLD (n=number of health services; number of child records audited who attended in previous 12 months)

Maternal health (2007–2014)

The antenatal QCI includes 26 best practice service items present in the maternal health audit tool: ≥7 antenatal visits, estimated gestational age ≤13 weeks at first antenatal visit, blood pressure (1st, 2nd & 3rd trimester), urinalysis (1st & 2nd trimester), BMI (1st trimester), fundal height (2nd & 3rd trimester), fetal movements (3rd trimester), blood glucose (2nd trimester), documentation of blood group, antibody status, rubella, Hepatitis B status, mid-stream urine, full blood examination, Syphilis serology, HIV, PCR test, smoking and alcohol use status recorded (1st & 3rd trimester), social risk and emotional wellbeing assessments, planning for care and birthing, nutrition, breastfeeding, domestic and social environment, and cultural considerations.

Northern Territory



Queensland

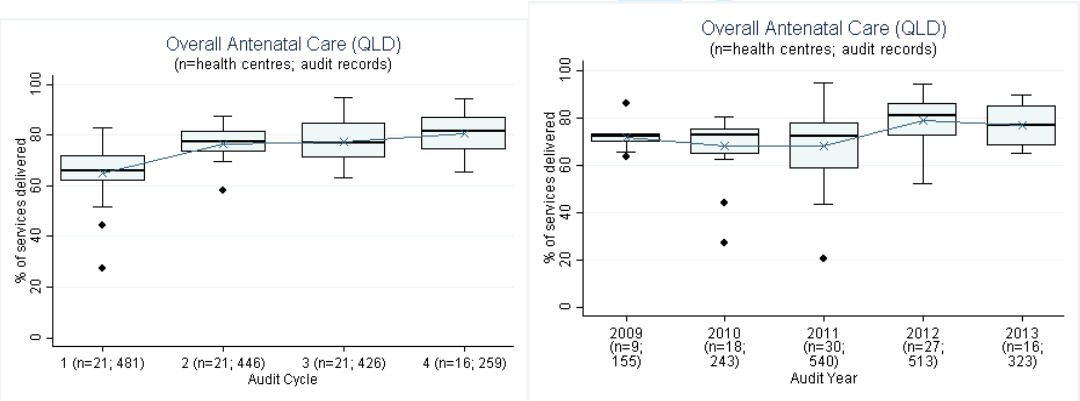


Figure 2.4: Mean percent QCI services delivered to pregnant women per health service, by audit cycle (health services that have at least 3 years of audit data) and by audit year (all health services) , NT and QLD (n=number of health services; number of client records audited)

Additional File 3 – Detailed description of policy context by state and territory

Northern Territory

In early 2009, a Continuous Quality Improvement (CQI) Strategy was endorsed by the Northern Territory (NT) Aboriginal Health Forum – comprising the Commonwealth Department of Health and Ageing (now Department of Health); the NT Department of Health; and the Aboriginal Medical Service Alliance of the Northern Territory (or AMSANT, the peak community-controlled health service body in the NT) – with the goal of building a consistent approach to CQI across the NT Indigenous primary health care (PHC) sector. The NT CQI Strategy was part of a broader Indigenous PHC reform agenda that incorporated the Expanded Health Service Delivery Initiative (EHSDI),[1] which included a substantial increase in funding and an expansion of remote PHC services, a program of regionalization, and the development of key performance indicators (KPIs). The Strategy built on a history of leadership and innovation in Indigenous PHC, including in relation to community control of PHC services, the development and implementation of a Chronic Disease Strategy, guideline development, electronic information systems, and chronic disease management, as well as on the Audit and Best Practice in Chronic Disease (ABCD) CQI work which originated in the NT in 2002.[1,2]

The CQI Strategy included: i) establishment of a Steering Committee (made up of representatives from each of the three organizations' in the Aboriginal Health Forum); ii) engagement of two CQI Coordinators to provide leadership, advice and training; iii) funding to support CQI Facilitators in each Health Service Delivery Area of the NT; and iv) support for regular CQI Collaborative meetings. By the end of 2012 there were 16 facilitator positions across the NT, and more than 200 health professionals, including 25 Aboriginal Health Workers, had been trained in the use of CQI tools and processes.[3] The CQI Strategy was allocated around $2.79m per year, with the intention that CQI should be a core PHC activity.[1]

The independent evaluation of the NT CQI Strategy [1] found that it 'had been successful in establishing the practice of quality improvement across the NT Aboriginal PHC system… to build the beginnings of a system-wide culture of quality improvement'. The Strategy was found to have resulted in an increase in 'overall CQI capability and capacity', 'enthusiasm and fervor among health workers for quality improvement', 'wide engagement of health service managers and clinicians in CQI activities' and had contributed to 'staff becoming adept at using ePIRS (electronic Patient Information Record Systems) and the data in these systems being improved'. The evaluation highlighted the ABCD CQI tools as providing a 'solid technical basis for CQI' and 'technical rigor behind the approach', and developing routine clinical information systems to generate and regularly report on agreed Indigenous health KPIs to NT Government-operated services. Under the guidance of the CQI Steering Committee, the NT provided national leadership in developing specialized infrastructure support and workforce capacity for wide-scale implementation of CQI.[3]

Queensland

In 2005–2006, the Queensland Government undertook a review both of the readiness of services to commence CQI and of the evidence as to its effectiveness in improving health care delivery. This provided a foundation for subsequent investment.

Following the lead of the NT, in 2007–2008 Queensland Health appointed a CQI Coordinator and regional facilitators to support the implementation of CQI processes in Indigenous PHC

services as part of ABCD. A restructure in 2008 provided a key leverage point, and change through reform, as the funding for CQI was expanded from north Queensland specific to state-wide. A North Queensland CQI Steering committee was established in 2008 with key stakeholders, including Royal Flying Doctor Service, Apunipima Cape York Health Council and Queensland Health. There was a further investment in CQI in 2010, including a contract with One21seventy to provide CQI support to Indigenous health services.

In 2011, Queensland Health established a state-wide Primary Health Care CQI Steering Committee and a team with responsibility for CQI in Indigenous health services.[3] The team included two coordinators and 12 locally based facilitators, whose task was to develop and implement a coordinated CQI approach using One21seventy tools and processes with a focus on supporting Queensland Health services, although this support and access to One21seventy was available to Aboriginal Community Controlled Health Services (ACCHSs) as well. CQI was included in the Queensland Chronic Disease Guidelines, and the section on CQI was strengthened in 2008. This CQI initiative was part of the Queensland Chronic Disease Strategy and was supported by the Making Tracks Policy and Accountability Framework for improving health outcomes for Indigenous people (funded through Australian Government 'Closing the Gap' funding.[4]

By late 2012, the CQI team established by the Queensland Health initiative was supporting 75 services across the state to conduct CQI, with engagement of other service organizations in addition to those managed by Queensland Health. This work aligned with the development of evidence-based clinical guidelines, and orientation and training packages.[3] The infrastructure and policy support for CQI provided by Queensland Health was adversely affected by changes in the policy environment, with budget cuts and health reforms following the implementation of regionalization through the *Queensland Health and Hospitals Network Act 2011* and the change of government in Queensland in 2012. Contracts for CQI support and tools through One21seventy were discontinued and there was a loss of dedicated CQI support positions throughout the state.

Other significant CQI work in Queensland included a partnership between the state's peak Indigenous health body, Queensland Aboriginal and Islander Health Council, and a state-based general practice organization that used collaborative-style methods, supported by implementation of an electronic clinical information system. A report for 2009-2010 showed high performance on a number of indicators, with wide variation between services on others.[5] In 2011 it was reported that 13 of the 21 Aboriginal Community Controlled Health Services were participating.[3]

Other Indigenous health organizations' have used CQI methods for clinical governance purposes at a regional level in recent years, for example Apunipima Cape York Health Council and Institute of Urban Indigenous Health.

New South Wales

In New South Wales (NSW), participation in ABCD commenced in 2005, driven primarily by the initiative and resources of a regional ACCHS, Maari Ma Health Aboriginal Corporation, which used the CQI process to support and evaluate implementation of its Chronic Disease Strategy. This organization has gone on to integrate a systems-oriented CQI approach into the ongoing management of its service.[6]

While NSW Health showed some interest in supporting engagement with ABCD more widely, there was no specific policy or funding support provided to services for their participation. However, several NSW-based ACCHSs and other PHC organizations' (such as Divisions of General Practice) used the ABCD tools through engaging with One21seventy. NSW Health funded the state's peak Indigenous health body, the Aboriginal Health and Medical Research Council (AHMRC), to support its member services with CQI activities through building infrastructure, skills and data collection systems, and to share models of good practice in CQI in the Indigenous PHC context. In 2015 the AHMRC produced web-based resources and a DVD describing success stories in 10 NSW ACCHSs, reflecting the use of a variety of tools, processes and approaches to CQI. Other than for those services participating in the ABCD program, or for a relatively small number of selected indicators available through national KPIs reporting, there appears to be no publicly available reports on clinical performance for Indigenous PHC services in NSW.

Western Australia

In Western Australia (WA), the state government provided some funding for a project officer to work with the ABCD program between 2005 and 2009, but there was no clear policy or infrastructure to encourage engagement by PHC services. Continued engagement with the ABCD Program over 2010-2014 was supported by a project officer funded through the Lowitja Institute. Participation was heavily reliant on the initiative of individual services and the support of a small research team based with one of ABCD's academic partner organizations' and on the national ABCD project network. While some services were encouraged to use ABCD tools and processes through their participation in the national Healthy for Life program, there were inadequate resources to support the use of CQI tools and processes among services distributed across the vast distances of WA.

Concurrent with the early implementation of ABCD in WA, the Aboriginal Health Council of WA (AHCWA) in 2006 implemented the Australian Primary Care Collaboratives program (referred to then as the National Primary Care Collaborative or NPCC) in seven selected sites. An evaluation of this initiative in mid-2007 reported that 'the central notions of quality improvement had been introduced' and that 'systems were in place to varying degrees', which created 'the potential to improve the way in which chronic health needs are addressed'.

However, the evaluation also noted that 'it was clear that there was a need for the NPCC Program to be more responsive to the needs and desires of specific ACCHSs'. While participating services were reported to be satisfied with the NPCC program, they were 'less enthusiastic about the program continuing', or its roll-out to other ACCHSs.[7]

Between 2012 and 2015, AHCWA engaged in a research partnership that had an initial focus on conducting a systematic review of the effectiveness of CQI programs in PHC settings in Indigenous and ethnic minority populations, and identifying common elements among programs with improved outcomes.[8]. There appear to be no publicly available reports on subsequent work arising from the AHCWA-Australian National University research partnership.

A review of WA Health Programs in 2014 argued for the implementation of a state-wide system for CQI with 'transparent measurements, accountable comparisons and resultant action plans', with specific reference to the evidence base developed by the ABCD Program and the benefits of adopting the One21seventy system.[9] In 2014–15, AHCWA acknowledged the generally

low capacity for CQI in the state, and reported the organization had begun actively promoting CQI to all member services.[10]

Five member services were reported to be engaged in CQI activities with a focus on health checks, smoking, otitis media and sexually transmitted infections. There is evidence that at least some local WA Indigenous PHC services had made substantial strides in the management of conditions such as Type 2 diabetes over the previous decade, [11] and in the development of local CQI systems more recently.[12]

South Australia

Engagement of PHC services with the ABCD program in South Australia (SA) commenced in 2006, with a few services using the ABCD tools on their own initiative. The SA State Government provided policy and funding support to the ABCD National Research Partnership between 2010-2014, with additional funding provided by the Lowitja Institute for a research officer to work closely with the Aboriginal Health Council of South Australia (AHCSA) as both a researcher and coordinator for participating ACCHSs. By 2012, in addition to 10 ACCHSs, there were five state government-run health services using ABCD CQI tools and processes on a pilot basis, supported in various ways by their Local Health Networks.[13]

Policy support in SA was relatively limited and the implementation and ongoing CQI support to PHC services relied heavily on the small team based at AHCSA, and the ABCD project network. Research on PHC professionals' perspectives on barriers and enablers to CQI in the SA context identified health workforce capability - including the availability of CQI coordinator support – and senior management and leadership support for CQI as being vital to effective implementation. Organizational systems and individual behavior change, with regional collaborations and the use of systems approaches, were identified as key requirements for successful and sustained implementation of CQI.[13]

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SQUIRE Category	SQUIRE Explanation	Authors response
Title and Abstract		
1. Title	Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centeredness, timeliness, cost, efficiency, and equity of healthcare, or access to it).	Page 1- The title of the manuscript indicates that it is a comparative case study looking at the impact of policy support on the uptake of CQI activities and the impact on quality of care and the context in which it occurred. *"Impact of policy support on uptake of evidence-based continuous quality improvement activities and the quality of care for Indigenous Australians: a comparative case study."*
2. Abstract	• Provide adequate information to aid in searching and indexing • Summarize all key information from various sections of the text using the abstract format of the intended publication	Page 2 - We have structured the abstract as required by BMJ Open using the headings Objectives, Design, Setting, Participants, Interventions, Results and Conclusions.
Introduction		
3. Problem description and 4. available knowledge	• Nature and significance of the local problem • Summary of what is currently known about the problem, including relevant previous studies	The introduction clearly identifies the current relevant evidence and the current gap in knowledge. Page 4; Line 5 - *"Internationally, there is wide variation in adherence to best practice clinical guidelines between health services and between health professionals.[1] There is a growing body of evidence about the effectiveness of continuous quality improvement (CQI) in increasing adherence to guidelines and on the factors that contribute to this.[2] Variation in quality of care between health services has been demonstrated, including in populations with poorer health status, such as Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) peoples in Australia.[3,4]"* Page 4; Line 43 - *"While system-wide approaches to CQI have been associated with achieving large-scale improvements in health outcomes, there is limited evidence of the effectiveness of CQI over an extended period.[2] A positive policy environment is widely recognised as vital for effective development and implementation of programs to prevent and manage chronic disease,[8] with previous cross-regional analyses identifying the importance of regional level policies in enhancing clinical performance*

		in Indigenous PHC in Australia.[4] However, there is limited evidence as to the effect of government policy on the uptake and impact of CQI over time."
5. Rationale	Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work.	Page 5; Line 3 - *"This paper examines the influence of health policy decisions at the Australian state/territory level and how these may have influenced:* *i) trends in the consistent uptake of evidence-based CQI tools …* *ii) quality of care (as reflected in adherence to best practice guidelines) in Indigenous PHC services."* Page 7; Line 26 - *"We use a comparative case study design to relate state/territory level policy support for CQI to trends in its uptake and in quality of care"*
6. Specific Aims	Purpose of the project and of this report	The specific aim is clearly stated in the abstract and in the main body of the paper. Abstract Page 2; Line 3- *We examined the impact of state/territory policy support on 1) uptake of evidence-based CQI activities, and 2) quality of care for Indigenous Australians.* Main body of paper Page 5; Line 3: *This paper examines the influence of health policy decisions at the Australian state/territory level and how these may have influenced:* *i) trends in the consistent uptake of evidence-based CQI tools available through a research-based CQI initiative (the Audit and Best Practice in Chronic Disease (ABCD) Program; and* ii) *quality of care (as reflected in adherence to best practice guidelines) in Indigenous PHC services.*
Methods – what did you do?		
7. Context	Contextual elements considered important at the outset of introducing the intervention(s)	We have described the context of the study in the introduction - national policy context of CQI in Indigenous primary health care, Indigenous peoples health and access to primary care, ABCD Program of work. Because understanding of the context is relevant to the aim we have included this information in the introduction before the statement of the aim (see Page 4 Line 18 – 55; Page 5 Line 16- 36)
8. Intervention & 9. Study of the intervention	• Description of the intervention(s) in sufficient detail that others could reproduce it and specifics of the team involved in the work • Approach chosen for assessing the impact of the intervention(s) and approach used to establish whether	• The policy and infrastructure support provided in different jurisdictions is described in depth in the findings section (see Page 9 onwards) and also in supplementary material. • The methods are described in detail (see Page 7 onwards).

	the observed outcomes were due to the intervention(s)	• The outcome measures (trends in CQI activity and trends in quality of care) are described in the methods section (Page 7; Line 56 – Page 8 Line 30). • Questions of attribution or observed trends to policy and infrastructure are addressed in the discussion (Page 15 onwards)
10. Measures	• Measures chosen for studying processes and outcomes of the intervention(s), including rationale for choosing them, their operational definitions, and their validity and reliability • Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost • Methods employed for assessing completeness and accuracy of data	The case study methods are explained in the first paragraph in the methods section. For example, Page 7; Line 26 - *'We use a comparative case study design to relate state/territory level policy support for CQI to trends in its uptake and in quality of care. The five states/territories provide the 'cases' for comparison as they all have some consistent CQI data available through participation by services in the ABCD Program.'* The case study method captures the contextual elements that may have influenced the intervention and outcomes. Details of the clinical audit methods are detailed in the methods (Page 7; Line 26), table 1 (Page 5; Line 43) and supplementary material (Page 24). For example (Page 7; Line 46), *'Data on CQI activity and on adherence to clinical best practice guidelines were available through ABCD. This paper focuses on four priority aspects of care: preventive, Type 2 diabetes, maternal care and child health. The CQI and clinical record audit processes through which data are collected and reported at health service level are summarized in Table 1 and Additional File 1, and described in more detail elsewhere.[3,12]'*
11. Analysis	• Qualitative and quantitative methods used to draw inferences from the data • Methods for understanding variation within the data, including the effects of time as a variable	The methods section (page 7 onwards) of the manuscript contains a full description of the methods utilised. We also provide a supplementary file (see Additional File 1) that contains further details on methods. Variation in the audit data are reflected in the box plots in the Supplementary Material (Page 25 onwards).
12. Ethical considerations	Ethical aspects of implementing and studying the intervention(s) and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest	A statement about formal ethical approval has been made within the manuscript. For example (page 9; Line 7-11), *"Ethical approval for the ABCD National Research Partnership was obtained from research ethics committees in each relevant Australian jurisdiction."* A more detailed version of ethics statement is made at the end of the paper with other declarations, see Page 20; Line 20.

		We have also provided a statement about any potential conflict of interests and funding sources, see Page 19, Line 37 and Page 20, Line 43 respectively.
Results – What did you find?		
13. Results	• Initial steps of the intervention(s) and their evolution over time (e.g., time-line diagram, flow chart, or table), including modifications made to the intervention during the project • Details of the process measures and outcome • Contextual elements that interacted with the intervention(s) • Observed associations between outcomes, interventions, and relevant contextual elements • Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the intervention(s). • Details about missing data	We have presented the findings under two major headings that link directly to the aims of the manuscript. • *Policy initiatives that may have influenced uptake of the ABCD Program CQI, by state and territory* (see Page 9 ; Line 16) • *Trends in quality of care* (see Page 13 ; Line 51)
Discussion – what does it mean?		
14. Summary	• Key findings, including relevance to the rationale and specific aims • Particular strengths of the project	The first two paragraphs of the discussion are a summary of the key findings in relation to the aims of the paper. For example, (Page 15; Line 17)) *"Progressive and sustained uptake of ABCD tools occurred in the NT in the context of consistent long-term policy and infrastructure support for CQI. This contrasted with a) a rapid rise and subsequent fall in uptake of these tools in Queensland where the initial high-level policy and infrastructure support was not sustained following a change of government in 2012; and b) low levels of uptake in jurisdictions with relatively less policy and infrastructure support (NSW, WA, SA). The consistent long-term policy and infrastructure support for CQI in the NT was also associated with steady improvements or maintenance of high-quality care (as reflected in clinical best practice guidelines) for the four aspects of care that were the major focus of ABCD CQI efforts, and reduction in variation between health services for two of these. This contrasted with the situation in Queensland where there was a relatively limited effect on adherence to best practice guidelines and on variation between health services."* *"While this study does not provide an in-depth examination of the complex processes*

		that might explain different trends in the uptake of tools, or how CQI processes have impacted on quality of care in different jurisdictions, some insight has been provided by previous studies of the ABCD CQI program and the evaluation of the NT CQI Strategy. Gardner highlighted the complexity of the process of uptake of CQI, and the critical role of alignment of policies and incentives; a systems approach; organization-wide commitment; leadership at all levels; and resources to support implementation.[14] Our findings of relatively low uptake of CQI in jurisdictions with limited policy and infrastructure support, and the rapid drop in use of CQI tools when policy, infrastructure and funding support was withdrawn in Queensland, highlights the critical role these play in supporting its uptake. In other states, the lack of clear and consistent policy direction, resourcing and sustained high-level leadership and management support for CQI, and relative lack of engagement in wide-scale CQI research has led to a diversity of locally driven initiatives with an associated lack of systematic analysis and reporting of data for CQI purposes. This appears to have been a barrier to demonstrably effective uptake of CQI in many Indigenous PHC services between 2005 and 2014."
15. Interpretation	• Nature of the association between the intervention(s) and the outcomes • Comparison of results with findings from other publications • Impact of the project on people and systems • Reasons for any differences between observed and anticipated outcomes, including the influence of context • Costs and strategic trade-offs, including opportunity costs	We have included a section in the discussion on interpretation and comparison to relevant literature: For example (page 16; Line 11) , *"The limited availability of data for systematic analysis and reporting of relevant data, other than in Queensland and NT, has precluded meaningful analysis of adherence to best practice guidelines for most states/territories. The first report on national Key Performance Indicators (nKPIs) from Indigenous PHC organizations showed that in 2012-13 those in Queensland and the NT performed better against almost all process-of-care indicators,[20] attributing this to the relatively well-established CQI programs in these jurisdictions. The third and most recent nKPI report, which includes data up to December 2014,[21] shows improvements for 17 of the 19 process-of-care measures for all jurisdictions combined, with continued relatively high performance in the NT and Queensland and most marked recent improvement in WA. The analysis presented in this paper points to the importance of high-level policy support and resourcing for implementation of systematic CQI processes to enhance quality of care. The relatively high performance, and the greater ability to report nKPI data, in the NT and Queensland demonstrate the benefits of systematic CQI processes for reporting of data on KPIs as well as for*

		enhancing quality of care.
16. Limitations	• Limits to the generalizability of the work • Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis • Efforts made to minimize and adjust for limitations	In our discussion we have a number of paragraphs that outline the limitations of the work, efforts made to minimize limitations and generalizability. For example (page 17: Line 10 – Line 52), *"An important limitation of our study is that it is not possible to determine clearly the extent to which trends in data on quality of care have been influenced by policy support for the ABCD CQI program or to other initiatives (e.g. funding, workforce or infrastructure developments). The difficulty of demonstrating causality is common to much policy research,[22] however we argue here for contribution rather than attribution ...."* *"The ABCD data are not representative of all Indigenous PHC services. There was variable participation in different jurisdictions and by government-operated and community-controlled health services. ...The ABCD data need to be interpreted in relation to a range of other CQI activities in Indigenous PHC services over the period for which data has been reported[9,11]. While there were some substantial initiatives, particularly in the NT and Queensland, most CQI initiatives were small scale, narrow in scope and without the capability to analyze and report consistent data to the extent possible through ABCD. Nor has it been possible to assess systematically these CQI activities or their impact on quality of care. In addition, there were a range of non-CQI initiatives at the national [e.g. Indigenous Chronic Disease Package [23] and local levels, which may have impacted on quality of care over the period for which we have reported data."* *The authors of this paper have all had longstanding involvement with the ABCD Program as researchers, service providers, managers or policy makers/advisors. While our interest in ABCD may have influenced our interpretation of the data, the diversity of roles, insights and perspectives that we bring allows for critical reflection in the interpretation of the data, and brings rigor to this type of research.[22]*
17. Conclusions	• Usefulness of the work • Sustainability • Potential for spread to other contexts • Implications for practice and for further study in the field	Within the discussion we address implications for policy, practice and further research. For example (page 17; Line 55), *"The ABCD experience, as reflected in this paper, has important implications for practice, policy and further research, including the implementation of the National*

	• Suggested next steps	*CQI Framework for Aboriginal and Torres Strait Islander PHC [9]. For clinical staff and management of health services, the benefits of participating in this type of collaborative program include access to a CQI system that provides data on recent performance and trend data across the broad scope of primary care, and the ability to benchmark against other services at the regional, state/territory and national level. For policy professionals, benefits include the ability to monitor adherence to best practice guidelines at all levels, and to target improvements to specific aspects or modes of care, [19] population groups (e.g. children or the elderly) or geographic locations. An important challenge for ongoing and new CQI initiatives is to enhance local ownership and engagement, while ensuring the use of standard tools and supporting the analytical capability that enables the use of consistent good quality data for CQI purposes at multiple levels of the system. Sustaining efforts to deliver the best care according to changing evidence over time remains important and warrants further attention."* Our concluding statement also contains information about next steps and potential spread. For example (Page 18; Line 23), *"Our study adds to the accumulating evidence on the conditions that enable CQI efforts to be most effective. The findings show the potential contribution that systematic and sustained policy and infrastructure support can make to wide-scale uptake and to the effectiveness of CQI methods in improving the quality of care. It is now about 10 years since our first published paper on the potential for CQI to enhance the quality of health care for Indigenous Australians. With the development of a National CQI Framework in 2015 [9] it appears we may be at the dawn of a new era of wide-scale and systematic use of CQI methods. While local efforts are vital to the effective use of CQI methods, state/territory-level policy and resources will be critical to building capability and a supportive environment."*
Other information		
18. Funding	Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting	We have made full disclosure of funding (see Page 20 ; Line 10) and any conflicts of interest (page 19; Line 37) within the manuscript.