Point-of-Care Testing Across Rural and Remote Emergency Departments in Australia: Staff Perceptions of Operational Impact

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Abstract. New South Wales (NSW) Health Pathology is implementing one of the world's largest managed PoCT services across rural and remote Emergency Departments (EDs) in New South Wales, Australia to improve patient access to care. The aim of this qualitative study was to gain a context-rich understanding of the operational impact of the NSW rollout of PoCT across rural and remote ED settings as experienced by frontline clinical staff. Clinical professionals (n=14) participated in interviews and focus groups in August 2015 at four rural and remote NSW EDs. Participants perceived that PoCT provided greater access to pathology thus facilitating more efficient and effective patient care via faster test turnaround and time to treatment and more effective decisions about the need to transfer patients to appropriate sites when required. These factors have a potentially important role in saving lives. Staff also identified innovative and disruptive challenges to clinical work patterns associated with PoCT implementation, particularly in relation to work flows, resource allocation and the governance arrangements.

Keywords. Pathology, evaluation, health informatics, point of care testing, rural, remote, Emergency Department

Introduction

In the broadest sense, Point of Care Testing (PoCT) refers to tests performed near patients and outside a traditional pathology laboratory [1]. PoCT can be conducted by patients themselves (typically at home), or by clinical personnel who are not necessarily trained in laboratory sciences (typically at the hospital bed side or in general practices or pharmacies) [1].

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Previously reported benefits of PoCT services include greater access to pathology testing, especially in regional and remote areas [2], expedited clinical decision making and treatment through faster test result turnaround times [3, 4], and improved clinician [2, 5] and patient satisfaction [5]. Potential barriers to the successful uptake of PoCT include safety and quality concerns around test result accuracy, training of device operators and device maintenance [4, 6], increased workload and responsibilities for clinical staff [4, 5], and the implementation of the service without consideration of the specific operational context [3, 7].

Quantitative studies evaluating the impact of PoCT have not been able to consistently show substantial improvements in patient outcomes [8], and it has been suggested that studies should examine PoCT within its particular operational context and consider its integration into, and/or adaptation to, existing clinical work patterns [4, 9]. Operational context is often a missing factor in much of the research evidence surrounding PoCT [3, 7]. As such, qualitative studies of PoCT can make a crucial contribution to addressing this research gap by providing unique and rich insights into the attitudes and experiences of clinical staff on how PoCT affects their daily work and current clinical pathways [5, 6].

Traditionally, hospitals in rural and remote areas suffer from the 'tyranny of distance' and without on-site laboratory support, face extended wait times for pathology results, alongside difficulties in specimen collection and transport [5, 10]. Therefore, the expected benefits commonly attributed to PoCT will likely have a greater impact in EDs in underserved rural and remote communities [1, 5, 10]. Yet, the majority of PoCT studies have been conducted in urban (most often teaching) hospitals which have regular access to laboratory based pathology [11], in primary care [6] or community and outpatient settings [2]. To the best of our knowledge there are no qualitative studies investigating the use of PoCT in Australian EDs. The aim of this study was to gain a context-rich understanding from frontline clinical staff of the operational impact of the rollout of PoCT across rural and remote EDs in NSW.

1. Method

1.1. Study Design

Semi-structured individual interviews and/or focus groups were conducted at four rural and remote EDs to investigate user perceptions based on their experiences of PoCT technology. Ethics approval was obtained from the Greater Western Area Health Service Human Research Ethics Committee and each participant provided written consent.

1.2. Setting and Participants

New South Wales (NSW) Health Pathology has implemented one of the world's largest managed PoCT services, with over 300 PoCT devices used by more than 5,000 operators in more than 150 regional, rural and remote EDs in NSW, Australia. This includes a large proportion of sites that do not have support of a 24/7 laboratory service [2, 12].

A purposive, and diverse sample of four EDs in rural and remote areas in NSW was selected based on the number of ED presentations per month (high: >500

presentations or low: <200 presentations), and percentage of PoCT usage (high: >25% of all presentations using PoCT or low: <12% of all presentations). This variation in the number of presentations and PoCT usage, helped to provide different perspectives about the operational impact of PoCT.

Participants were eligible if they had direct experience using PoCT. A total of 14 participants were interviewed across the four sites. Participants included clinical staff (10 females, four males) in a range of clinical roles: (Health Service/ Nurse Unit managers (HSM/ NUM), Enrolled/ Registered Nurses (EN/ RN), Visiting/ Career Medical Officers (VMO/ CMO), and radiographers. Table 1 provides background information on selected sites (A-D) including number of participants interviewed, ED attendance and PoCT use.

Table 1. Overview of data collection sites and participants.

	Site A	**Site B**	**Site C**	**Site D**
Staff Interviewed, n	3	6	2	3
ED presentation per month	>500 (high)	>500 (high)	<200 (low)	<200 (low)
PoCT usage (% of presentations)	<12 % (low)	>25% (high)	<12 % (low)	>25% (high)

1.3. Data Collection

In August 2015, 14-15 months after the initial implementation of PoCT at sites A-D, a total of four semi-structured individual interviews and five focus groups were undertaken on site by one member of the research team (EM). A total of 196 minutes of interviews and focus groups were recorded, with individual recordings ranging in length from nine to 40 minutes (average 22 minutes), resulting in a total of 137 transcript pages.

Semi-structured interviews were designed to explore several areas thought to illuminate the operational impact of PoCT, but also to provide participants with the opportunity to raise other topics of interest and importance to them, which could then be further discussed during the interviews/focus groups. Topics on the interview schedule included: perception of PoCT on work practices, perspectives on the reasons for variation in uptake of PoCT across various EDs, and end-user feedback on improvements to PoCT.

1.4. Data Analysis

All recordings were transcribed by a professional transcription service. To maintain participants' anonymity, site names de-identified, and assigned a code. Two members of the research team (EM and MD) applied the principles of thematic and content analysis and the constant comparison method to identify emerging themes through iterative analysis [13, 14]. After repeated readings of the transcripts to ensure immersion in the data, we independently assigned descriptive codes to a portion of the data to identify common concepts discussed by the participants. Descriptors were compared, and any disagreement resolved through joint discussion. On a third iteration, we established links between concepts to form (sub-)categories and we hand coded all data independently for to fine tune categories. The process of constant comparison

enabled us to extend and/or amend categories to reflect the themes emerging from the data and to finalise a coding scheme which MD used to code all data using QSR International's NVivo 10 qualitative data analysis software [15].

2. Results

Five overarching themes emerged from the data: Patient Outcomes, Clinical Practice, Pathology, Governance and Cost. The participants' perceptions of the PoCT service further framed the five themes, as either enhancing the efficiency, effectiveness and quality of care (enhanced practice), or in terms of the potential of the PoCT service for clinical innovation (disruptive/innovative potential). Representative participant quotes are provided alongside results to illustrate common participant perceptions.

2.1. Enhanced Practice

In relation to *Patient Outcomes* staff predominantly talked about PoCT as enhancing current clinical practice in rural and remote EDs and reported that PoCT allowed more efficient and effective treatment of patients. The positive influence of PoCT on patient outcomes was especially marked when clinical staff compared the patient journey pre- and post PoCT implementation and provided specific examples (see Table 2).

 In relation to *Clinical Practice* and *Governance* staff reported how PoCT improved their clinical practice. PoCT was viewed as increasing the confidence of nursing staff by providing them with appropriate clinical evidence to initiate treatment (see Table 2). Staff at two sites also emphasised the importance of PoCT for better integrated care as they were now able to provide additional clinical information when liaising with regional referral hospitals and/or to coordinate transfers to dedicated wards (see Table 2).

Table 2. Themes and representative quotes for Enhanced Practice.

Theme	Enhanced Practice
Patient Outcomes	I had an acute infarct come in and it was basically Troponin done, all her other - Chem-8 the CG4 were done. [Before PoCT] we would have only had to go on an ECG [and she] would have been going to [Regional Referral Hospital] first, without going straight to the Cath lab because they wouldn't have had any baseline blood testing to be done. [… now with PoCT] she was stented two and half hours later. [G]reat outcome, she's now walking around in the community.' Registered Nurse (RN) – B
Clinical Practice	You see a patient that comes in with clinical evidence of maybe sepsis and you do a lactate tests on the, the patients, and it is high, you want to start immediate treatment before you even transfer that patient to your referral centre, so it does make a lot of difference too. Visiting Medical Officer –B
Pathology	I think it's a great tool to have, especially in rural remote areas where you are isolated. Where you're isolated from doctors, you're isolated from pathologists,' Health Services Manager (HSM) - D
Governance	'Well it certainly gives you more information to be able to provide to [regional referral hospital].' RN - C
Cost	'Certainly we're not transferring people out for just simply because they need a blood test and we had been doing that prior. So […] there was ambulance costs or patient transport costs' HSM –B

In relation to *Pathology*, staff remarked on the improved access to timely pathology services (See Table 2). They noted that laboratory based test results in the past were subject to delays due to the time elapsed between blood draw, specimen collection and transport via courier, even before the actual analysis in the laboratory commenced.

In relation to *Cost*, staff reported perceived reductions in cost due to a reduced number of unnecessary transfer of patients to other health sites, which was caused by the lack of access to timely pathology services (see Table 2).

2.2. Innovative/Disruptive Potential

Staff also identified areas where the introduction of the managed PoCT service had challenged their current clinical work patterns.

In relation to *Patient Outcomes*, staff site A reported a perceived overuse of PoCT increasing the wait time to access PoCT devices and test turnaround time (See Table 3).

In relation to *Clinical Practice*, staff commented on the need for appropriate training and clinical experience to interpret PoCT results. Some nursing staff perceived results interpretation as an innovative yet challenging new responsibility for their profession, while others viewed it as currently beyond the scope of their role (see Table 3).

In relation to *Pathology*, staff reported an initial low confidence in the accuracy of PoCT tests, with laboratory based tests ordered to confirm PoCT results (see Table 3).

In relation to *Governance and Cost*, staff frequently commented on the time-intensive process of performing quality control (QC) and quality assurance (QA), PoCT's effect on workloads, and the need for additional, dedicated staff resources (see Table 3). Staff at two sites commented on the limited communication they received regarding the roll-out of the managed PoCT service and related documentation required for QC and QA (see Table 3).

Table 3. Themes and representative quotes for Innovative/ Disruptive Potential.

Theme	Disruptive Potential
Patient Outcomes	'[S]o if you have [...] six chest pains or something like that, you're trying to do a Trop I on all of them, that's 15 minutes per test and we've only got two machines, so, it can take quite a while.' Clinical Nurse Educator (CNE)- A
Clinical Practice	'And it's also put a bit of pressure on us as far as your skills for analysing pathology. […] You've got to really then read up on more and understand what [the results] means ' RN - B
	'If the doctor wasn't in town we wouldn't be doing [a PoCT test], we'd be transferring them out, RN - D
Pathology	'Like, for example, if you see a potassium of 8 on our point of care, […] you should wait for the formal [test results] one to come back, then you start treating your patient..' Career Medical Officer - A
Governance	'[N]ext thing I am bombarded with all this paperwork. There was paperwork we'd never done, what we were supposed to be doing, daily fridge checks, all this kind of stuff, that was never explained until [trainer] did it.' RN - B
Cost	There's also the cost of the people - like, me doing the QAP because I'm one of the more expensive people to be paying […] ' Nurse Unit Manager (NUM) - B

3. Discussion

Our findings provide supporting evidence about the positive impact of PoCT services for rural and remote EDs [1, 5, 10]. By improving access to previously limited pathology services in isolated EDs, PoCT was perceived as having facilitated more efficient and effective treatment of patients including faster test turnaround times, treatment onset time, and safe transfers to dedicated sites for optimal intervention care such as catheterisation or stenting [3]. The positive influence of PoCT on patient outcomes was especially marked when staff compared the patient journey pre- and post PoCT implementation. These factors have an important role in potentially saving lives in this operational context.

We also found that the operational impact in geographically isolated EDs was similar to previous findings reported from metropolitan or non-hospital contexts [3-5, 7, 9]. In our study, the implementation of PoCT was perceived as disruptive in cases where existing work patterns, resources and expectations were not adequately addressed. [3, 7]. In particular, existing workflows were often not adjusted to account for the increased workload related to QC and QA requirements, potentially leaving EDs short staffed [3, 5]. Dedicated operators responsible to ensure adherence to quality frameworks [10] could alleviate potential staff shortages but also create further costs. Nursing staff reported on the need for more training to interpret results [4, 5]. In line with previous evidence [9], participants in our study reported an initial low confidence in the accuracy of PoCT results. At the time interviews were conducted, the managed PoCT service had been implemented for more than one year and some users reported how an initial low confidence in PoCt results led to tests being duplicated in laboratory settings, but also noted how the confidence in PoCT results improved and unnecessary duplication decreased as time passed post implementation.

The results presented here are limited in that they are based on a small sample of clinical staff from one Australian state participating in interviews and focus groups. Further research could draw on ethnographic observations to identify how operational tasks can best be modified to overcome negative disruptions and fulfil the innovative potential of PoCT, and to inform strategies for PoCT roll out in similarly isolated sites.

4. Conclusion

This study provides new evidence relating to the operational impact of implementing a managed PoCT service across rural and remote Australian EDs. The results contribute to building an accurate and contextualised evidence base of benefits and challenges faced by clinical ED staff in areas with limited access to health care services following PoCT implementation.

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