Impact of *Clostridium difficile* toxin gene PCR result on decisions to de-isolate patients: Do the ends justify the means?

Journal of Infection Prevention
2018, Vol. 19(3) 138–140
© The Author(s) 2018
Reprints and permissions:
sagepub.co.uk/journalsPermissions.nav
DOI: 10.1177/1757177418755309
jip.sagepub.com

Kirsti A Morris¹, Kerrie Davies^{1,2} and Mark H Wilcox^{1,2}

Abstract

We aimed to determine how often *Clostridium difficile* toxin gene PCR assay (CDPCR)-negative patients were appropriately removed from single room contact isolation. Hospital databases were used to collect information on glutamate dehydrogenase (GDH)-positive, toxin-negative inpatients (February–April 2015). Of 60 CDPCR-negative patients, only two (3%) were removed from single room isolation. At least 36% of 53 CDPCR-positive results did not influence bed management. In conclusion, identification of *C. difficile* toxigenic status did not impact significantly on decisions whether to continue single room isolation. Cost-benefit analysis should be undertaken before CDPCR testing is introduced.

Keywords

Clostridium difficile, PCR, toxigenic status, single room

Date received: 11 September 2017; accepted: 10 December 2017

Background

Clostridium difficile infection (CDI) is considered the most common cause of nosocomial infectious diarrhoea among adults in the developed world (Walters and Zuckerbraun, 2014). Since the clinical features of healthcare-associated diarrhoea cannot reliably distinguish *C. difficile* from other causes, laboratory confirmation is essential. UK and European guidelines recommend glutamate dehydrogenase (GDH) EIA or nucleic acid amplification testing (NAAT) to screen samples, followed by a sensitive toxin detection method (Planche et al., 2013). Guidelines also suggest that NAATs can be used as a third test when a GDH-positive, toxin-negative result is obtained, to gain further information about infection control implications (Crobach et al., 2016; Department of Health, 2016). We have audited compliance with the local clinical guideline for prevention of *C. difficile* transmission: ‘if the toxin gene PCR test is negative then the patient does not require source isolation (unless there is an alternative infective cause of their diarrhoea)’.

Methods

The *C. diff* Chek-60 glutamate GDH assay (Techlab, Blacksburg, VA, USA), the DoH recommended Cell

Cytotoxicity Neutralisation Assay and the Xpert *C. difficile* test (Cepheid, Sunnyvale, CA, USA) were used to ascertain the toxin/toxigenic status of patients. Data from 113 inpatients aged > 2 years whose stool samples were GDH-positive and toxin-negative between February and April 2015 were included. A combination of Trust and external IT systems was utilised to gather dates of sample receipt, GDH antigen, toxin and *C. difficile* toxin gene testing, and of result reporting. The Trust electronic patient record (EPR) system allowed access to patient ward and bed numbers and, in some cases, reasons for isolation other than CDI. This resource, along with the ICNetTM infection surveillance system, allowed confirmation of single room usage. The electronic surveillance system also indicated whether appropriate advice was delivered to ward senior nurses regarding

¹Microbiology Department, Leeds Teaching Hospitals NHS Trust, Leeds, UK

²Leeds Institute for Biomedical and Clinical Sciences, University of Leeds, Leeds, UK

Corresponding author:

Kirsti A Morris, Mycology Reference Centre, Microbiology Department, Old Medical School, Leeds General Infirmary, Thoresby Place, Leeds LS1 3EX, UK.

Email: Kirsti.morris@nhs.net

Table 1. Patient transfers following GDH-positive/toxin-negative/CDPCR-negative results on stool samples submitted for CDI testing (n = 60).

		n	%
Patient not transferred from single room to bay bed	No documented reason	23	38
	Patient discharged before single room advice communicated	16	27
	Patient discharged same day or day after single room advice communicated	9	15
	Reason documented for patient remaining in single room, e.g. MRSA carrier	10*	17
Patient transferred from single room to bay bed		2	3

*One patient too ill to be moved; three with MRSA; one with norovirus; two with extended spectrum beta-lactamase (ESBL); one bone marrow transplant (BMT) patient; one patient remained symptomatic; one with high risk assessment of exposure to carbapenemase-producing organism.

Table 2. Patient transfers following GDH-positive/toxin-negative/CDPCR-positive results on stool samples submitted for CDI testing (n = 53).

		n	%
Patient did not remain in single room despite positive CDPCR result	Patient discharged same day or day after single room advice communicated	8	15
	Patient discharged before single room advice communicated	4	8
	Patient not residing in single room before result	1	2
Patient remained in single room	No documented reason other than <i>C. difficile</i>	34	64
	Reason other than <i>C. difficile</i> documented	6*	11

*One patient too ill to be moved; two patients remained symptomatic; one patient had MRSA; two patients had norovirus.

isolation following a CDPCR result. Ethical approval and patient consent was not required for this study.

Results

In total, 60/113 GDH-positive/toxin-negative samples were CDPCR-negative; the remainder were CDPCR-positive. Tables 1 and 2 show the bed management decisions for patients with GDH-positive/toxin-negative/CDPCR-negative and -positive results, respectively.

The CDI diagnostic algorithm turnaround time was in the range of 2–10 days with a median of three days. Of the 25 CDPCR-negative patients who were discharged before de-isolation advice could be communicated, 24 (96%) had a turnaround time of ≤ 4 days (68% ≤ 3 days).

Notes within the electronic surveillance system demonstrated that IPC nurses gave advice on single room usage to ward senior nurses within one day of the reporting of CDPCR results for all cases.

Of the 23 patients with CDPCR-negative results who remained in single rooms with no alternative reasons documented, 13 (57%) were residing in wards with single room to bay bed ratios of 1:3 or less. Seven of these patients were residing in wards comprising only single rooms.

Discussion

In at least 68% of all GDH-positive/toxin-negative cases captured by this audit, the CDPCR result did not have an

effect on single room usage. A proportion of the CDPCR-positive patients remaining in single rooms may have done so regardless of this result. In 33% of all GDH-positive/toxin-negative cases, the CDPCR result was of no relevance with regards to single room usage as the patient had been discharged before advice could be acted upon. As the turnaround times in 96% of these cases were ≤ 4 days, this is unlikely to have been a contributing factor to the lack of utility of the CDPCR testing.

Patients were moved out of a single room in only 3% of CDPCR-negative cases (n = 2). The lack of patient bed/ward transfers in CDPCR-negative cases within the 'no documented reason' category (n = 23, Table 1) could be explained by the large proportion of patients residing on wards with a high number of single rooms compared to bay beds. For example, 26% patients were residing on haematology wards solely comprising single rooms.

In total, £4013 was spent on CDPCR tests which did not influence single room usage (one test = £52.12). This could represent a cost saving of approximately £16,000 per annum to the Trust. It is possible that this saving could be offset by the cost of an outbreak, should a patient unknowingly carrying the toxin gene be moved out of a side room. This would require further investigation, however, which is outside of this audit scope. A limitation of this study is that we could not confirm the validity of the isolation data using the various electronic systems. The lack of information available on the 38% of toxin and CDPCR-negative cases

not de-escalated, for example, whether they remained symptomatic, coupled with the high number of single rooms available in this setting may affect the generalisability of the results.

Nevertheless, we demonstrate that CDPCR results rarely impact on single room usage within our Trust. It must be considered that this result can serve other functions such as being used as an adjunct in clinical algorithms and treatment, in understanding the local epidemiology of *C. difficile* and/or to inform clinicians in cases of re-admission. Although this is a local audit, other institutions should consider reviewing the use of laboratory testing algorithms to ensure the most efficient use of resources if using CDPCR for third-line testing.

Declaration of conflicting interest

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: KD has received grant support from Cepheid.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Peer review statement

Not commissioned; blind peer-reviewed.

ORCID iD

Kerrie Davies <https://orcid.org/0000-0001-6862-5355>

References

- Crobach MJ, Planche T, Eckert C, Barbut F, Terveer EM, Dekkers OM, Wilcox MH and Kuijper EJ. (2016) European Society of Clinical Microbiology and Infectious Diseases: update of the diagnostic guidance document for *Clostridium difficile* infection. *Clinical Microbiology and Infection* 16: 30025–30028.
- Department of Health. (2016) *Updated guidance on the diagnosis and reporting of Clostridium difficile*. London: Department of Health. Available at: <https://www.gov.uk/government/publications/updated-guidance-on-the-diagnosis-and-reporting-of-clostridium-difficile>.
- Planche TD, Davies KA, Coen PG, Finney JM, Monahan IM, Morris KA, O'Connor L, Oakley SJ, Pope CF, Wren MW, Shetty NP, Crook DW and Wilcox MH. (2013) Differences in outcome according to *Clostridium difficile* testing method: a prospective multicentre diagnostic validation study of *C difficile* infection. *Lancet Infectious Diseases* 13: 936–945.
- Walters PR and Zuckerbraun BS. (2014) *Clostridium difficile* infection: clinical challenges and management strategies. *Critical Care Nurse* 34: 24–35.