***Clostridium difficile* multidisciplinary team root cause analysis: impact on clinical care and circumvention of financial penalties posed by clinical commissioning groups, but at what cost?**

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Abstract

Background: In Hampshire Hospitals NHS Foundation Trust, in addition to an on-the-spot investigation into hospital-onset *Clostridium difficile* infection (CDI) by the infection prevention team, a multidisciplinary team root cause analysis (MDT-RCA) forum has been developed. The MDT-RCA aims to deliver a more thorough investigation into individual cases and the recommendation of cases to the clinical commissioning groups (CCG) appeals panel against potential financial penalties (£10,000 per breached case). We mainly aimed to investigate the financial impact of MDT-RCA to the Trust.

Methodology: Over two years, 84 cases of hospital-onset CDI cases were reviewed by the MDT-RCA forum.

Results: Among this cohort, no additional learning outcomes were identified by the MDT-RCA over those that were found by on-the-spot investigations. In total, 543 staff members attended the MDT-RCA at a potential cost to the Trust of £23,795.74–£51,670.10. The Trust appealed against financial penalties for 27 cases and 14 were successful, i.e. £140,000 would have been avoided had targets been breached by 14 cases. However, targets were only breached by two cases, meaning only £20,000 in fines was avoided. Deducting this from the total costs of the MDT-RCA meant the Trust lost £3,795.74–£31,670.10.

Conclusion: Over the two years reviewed, the MDT-RCA proved to be costly to the Trust, with no additional learning or quality improvement measures identified.

Keywords

Clostridium difficile, *Clostridium difficile* infection, root cause analysis, clinical commissioning group

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Introduction

Between 1990 and 2004, rates of *Clostridium difficile* infections (CDI) changed in different age groups in England, with the greatest increase occurring in those aged 60–64 years. Changes in healthcare provision, laboratory testing and patient risk factors may have contributed to this. Complex epidemiological changes including the emergence of more virulent strains such as ribotype 027 associated with more severe disease, higher mortality and relapse rates, and outbreaks may have also been a driving factor (Freeman et al., 2010).

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High CDI rates in the early 2000s led to concerted efforts by the NHS to reduce the incidence of infections, mainly through promoting strict infection prevention practices and antimicrobial stewardship. Mandatory reporting and CDI targets were also introduced for hospitals and Trusts. These efforts have been very successful with the incidence of reported *C. difficile* in England declining by approximately 80% since 2006 (Dingle et al., 2017). This was followed by a more complex change in the epidemiological landscape of CDI, including a lack of predominant circulating strains, new laboratory testing and technologies as well as reports suggesting that patient-to-patient transmission in hospital of particular strains of *C. difficile* is not currently a major feature of reported CDIs (NHS England, 2014).

Subsequently new guidance was published on the diagnosis and reporting of CDI (Department of Health, 2012). The guidance recommended the combination of two tests, the first of which should be either a nucleic acid amplification test (NAAT), which detects the presence of toxin gene, or a glutamate dehydrogenase (GDH) test, which detects an antigen that is produced in high amounts by both toxin-producing and non-toxin-producing *C. difficile* strains. The second test should be a sensitive toxin enzyme immunoassay (EIA) that detects the presence of toxins (Department of Health, 2012). Additionally, interpretations of test results and mandatory reporting were also changed. Two test-positive results (NAAT + EIA or GDH + EIA) must be included in mandatory reporting regardless of presence of disease. If GDH or the NAAT alone is positive, then although *C. difficile* could be present, mandatory reporting is not required (Department of Health, 2012). No test, or combination of tests, is infallible and the clinical condition of the patient should always be taken into consideration when making management and clinical choices.

There is a continuing requirement for NHS organisations to demonstrate year-on-year reductions in *C. difficile* cases based on the previous year's trend reduction in *C. difficile* cases. NHS England publishes CDI objectives (targets, ceilings) for acute trusts and clinical commissioning groups (CCG) for each financial year (NHS Improvement, 2017). Their aim is to drive continuous improvement from healthcare providers. In addition to targets, NHS England also publishes guidance setting out how CCGs can exercise discretion in deciding whether or not to impose sanctions on providers for breach of their *C. difficile* targets, taking into account specific circumstances relating to individual cases, reasons for a particular infection and determining whether sanctions are appropriate.

Like any incident in the healthcare system, it is recognised that lessons should be learnt following each CDI and that this learning should be shared and acted upon to prevent the same incident occurring to others and elsewhere. Root cause analysis (RCA) investigation is a well-recognised mechanism within the NHS to identify how

and why patient safety incidents happen, to identify areas for improvement and develop recommendations that deliver safer care for patients.

Hampshire Hospitals NHS Foundation Trust (HHFT) has contractual agreements with five local CCGs. The infection prevention team reports all healthcare-acquired infection (HCAI) incidents to the relevant appropriate CCGs via the clinical governance team. Breaches of *C. difficile* targets incur financial penalties to the Trust to the value of £10,000 per case. The CCGs have decided to offer an appeal process for inpatient HCAI CDIs during which cases are presented to a CCG panel. If the panel members find that no lapse of care occurred, based on rigorous standards set out by the CCGs, then the Trust may avoid financial penalties for those cases. However, these cases remain apportioned to the Trust.

In HHFT, in addition to an on-the-spot RCA by the infection prevention and control nurses (IPCN) in conjunction with the ward staff generating real-time feedback, a new model multidisciplinary team root cause analysis (MDT-RCA) forum was developed in June 2014. The MDT-RCA forum is composed of core members including the Director of Infection Prevention and Control (a microbiologist/infectious disease physician), lead IPCN, surveillance officer, antimicrobial pharmacist, domestic manager, governance manager as well as an administrator and invited members including clinicians, nurses and ward managers for affected patients and areas. The main aim of the MDT-RCA is to deliver a more rigorous investigation that maximises our learning from HCAs and allows cases to be referred to the CCG panel for appeal against potential financial penalties. The main objectives of this report are to share our findings through a review of data from 24 months of MDT-RCA (June 2014 to June 2016) and to identify the impact of the process on: (1) identifying cases that can be referred to appeal in order to avoid potential financial penalties; and (2) the cost of MDT-RCA to the Trust versus potential savings from the appeal process.

To our knowledge there are no published reports that address these objectives.

Methodology

Location, bed numbers and targets

HHFT serves a population of approximately 600,000 across Hampshire and parts of West Berkshire. The Trust consists mainly of two major district general hospitals (Winchester and Basingstoke) and a community hospital (Andover) with a combined total of more than 850 beds. HHFT's targets during 2014–2015 and 2015–2016 were 37 and 34 reportable hospital-acquired *C. difficile* cases, respectively. As per local agreements with the CCGs, any breach of those targets resulted in a £10,000 penalty per

case unless the CCG appeal panel members deemed the cases unavoidable.

Testing methods and definitions

In HHFT, patients with type 5–7 stools based on the Bristol Stool Chart were identified as having possible CDI and stools were screened by a NAAT test followed by a toxin EIA. Mandatory reporting was based on national guidance as described above (Department of Health, 2012). The patient's clinical condition was taken into consideration when making management and clinical choices regarding therapy (which is not the focus of this report). Hospital onset cases of *C. difficile* were defined as those in which stool samples were collected for testing 48 h after admission and were PCR-positive.

On-the-spot RCA by the IPCN and referrals to the MDT-RCA forum

Over the 24-month period, all hospital-onset *C. difficile*-positive cases identified were initially investigated by the IPCN, antibiotic pharmacist and ward staff (on-the-spot). Real-time feedback was performed on all these cases and learning points were subsequently disseminated in various ways including through mandatory training, governance reports and infection control committee reports to Trust boards.

Cases of toxigenic hospital-onset CDI were reported to Public Health England and went forward to the MDT-RCA forum for review. Some non-toxigenic (non-reportable) cases were also referred to the MDT-RCA forum due to identified shortfalls, lapses of care or possible cross-infection. The findings from the MDT-RCA forum were reported to the Serious Event Review Group (SERG) for Trust-wide evaluation and feedback to divisional governance groups and subsequent actions were agreed.

MDT-RCA forum meetings, cost estimation and referral to CCG panel

MDT-RCA forums were held monthly at each acute hospital site, i.e. two panels per month. Minutes of these meetings were reviewed to calculate the number of staff members who attended and their category and grades. Minimum and maximum hourly pay rates for each staff category/grade (Royal College of Nursing, 2016) were calculated using NHS pay scales based on banding or seniority. The minimum and maximum hourly rates for each individual staff grade/category were multiplied by the number of attendances to get an actual basic cost of staff for the MDT-RCA.

Additionally, deviation costs or opportunity costs were estimated based on cost for time spent preparing paperwork and data gathering for each case prior to the MDT-RCA and physically attending the MDT-RCA followed by writing

reports. These tasks were regarded as a deviation from the routine or usual activities for that staff member. The minimum deviation cost was calculated to be equal to the minimum actual cost spent in each MDT-RCA for each staff category, if staff members were not involved in pre-meeting data gathering. The maximum deviation cost was calculated to be equal to the maximum actual cost spent for each MDT-RCA forum and an equal cost for similar time spent on pre-meeting preparations, plus the cost of staff not carrying out their routine revenue-generating procedures/activities at those times, i.e. double the maximum actual cost. Potential total costs were calculated by adding together actual basic costs and deviation costs.

Each toxigenic *C. difficile* case was reviewed in the MDT-RCA forum in detail to determine if there was a lapse in patient care and, if not, to prepare a report to the CCG panel for appeal, based on local CCG criteria which are based on national guidance (NHS Improvement, 2017). The decisions of the CCG panel were reviewed and shared with the Executive and Divisional Boards. Potential savings were calculated for each successful case, meaning avoidance of £10,000 per each successful case.

Results

Over the 24-month period (June 2014 to June 2016), 509 *C. difficile* cases were detected in the microbiology laboratory in HHFT by NAAT screening, of which 207 (40.6%) were hospital-acquired, all of which had on-the-spot RCA. A total of 69 (33%) of these hospital-acquired cases were reportable to Public Health England (PHE) under current guidelines (Department of Health, 2012). These, together with 15 non-reportable cases (i.e. total 84 cases [40%]), were referred by the IPCN to the MDT-RCA forum. Further details on these cases are included in Table 1. Sixteen patients were referred to the MDT-RCA forum despite having diarrhoea on admission, as there was a more than 48-h delay in sending stool samples for *C. difficile*. These were therefore reported as part of the Trust's cases. Only 50% of these patients received antibiotics in the three months before the diagnosis of *C. difficile*, and in just under 90% of cases these antibiotics were unavoidable as there were clinical and/or microbiological reasons for these.

Key learning themes from the 84 cases are shown in Table 2. The main issues encountered were the delay in isolating symptomatic patients and the delay in sending stool samples to the laboratory. There were also concerns raised with lack of documentation, such as the clinical and nursing teams not completing the Trust *C. difficile* care pathway, and Diarrhoea and Vomiting risk assessment. All the key learning outcomes covered in Table 2 were issues raised by the IPCN while doing on-the-spot RCA, generating immediate feedback for the wards and staff involved. No additional learning points were picked up in the MDT-RCA.

Table 1. Basic background of 84 *C. difficile* cases requiring MDT-RCA review.

Category	Diarrhoea on admission (type 5–7 stool)	D&V risk assessment	Patient on laxatives at time of diagnosis	Patient on antibiotics prior or at time of diagnosis	<i>C. difficile</i> care pathway started	Potential preventable cases
Yes	16 (19)	43 (51)	27 (34.3)	42* (50)	76 (90.5)	3 (3.5)
No	66 (78.5)	41 (49)	56 (66.6)	42 (50)	5 (6)	66 (78.5)
Unknown	2 (2.5)		1 (1.2)			
Not applicable					3 (3.5) [†]	15 (18) [‡]

Results are presented as n (%).

*This includes antibiotics started in primary care. Among this cohort, in the three-month period before the CDI diagnosis, 24% had a single antibiotic course, 23% had two antibiotic courses and 53% of cases had at least three courses of antibiotics. Interestingly, based on the MDT-RCA findings, prescriptions were unavoidable in 89%, avoidable in 3.5% (choice or requirements) and indeterminable due to lack of information or documentation in 7.5%.

[†]Not initiated for clinical reasons, e.g. patient was on priorities of care pathway.

[‡]Difficult to decide based on information from notes if these cases were avoidable; as a result they were not submitted for appeal.

Actual, deviation and potential total costs of these MDT-RCA forum meetings are provided in Table 3. The estimated minimum and maximum actual basic cost of the staff attending the MDT-RCA meetings over the 24-month period were £11,897.87 and £17,216.67. Deviation costs were estimated to be in the range of £11,897.87–£34,433.43. When added together the total estimated costs for staff attending the meetings were in the range of £23,795.74–£51,670.10. These calculations did not include additional expenses such as the cost of meeting rooms and other overheads.

Among the 84 cases reviewed in the MDT-RCA forum during this period, 27 were submitted to the CCG to demonstrate no lapse of care and to appeal against any financial penalties in the event of target breaches. Out of these 27 cases, the CCG appeal panel upheld 14 cases, as there was no lapse of care identified. In 13 cases, the CCG disagreed with the Trust's MDT-RCA findings that there were no lapses of care (Table 4).

The potential savings from 14 successful appeal cases would have been the avoidance of £140,000 in sanctions/fines; however, during the 24-month period, we only had two breached cases, i.e. our sanctions or fines by the CCG for that period would have been equal to only £20,000. Deducting this from the potential costs of the MDT-RCA, we conclude that during the period evaluated, the Trust potentially lost £3795.74–£31,670.10. These calculations do not include additional costs incurred during preparation by the DIPC, deputy DIPC and the governance team in submitting these cases, the cost of travel and attending or dialling in to four half-day meetings to present to the CCG panel.

The number of CDI cases over the 24-month period was also looked at to see if there was any reduction. In the first quarter of the MDT-RCA (i.e. June to August 2014), there was a total of 11 reportable hospital-acquired CDIs and there were nine cases in the final quarter (i.e. March to May

2016). However, the number of reportable CDIs were on a downwards trend before the introduction of the MDT-RCA. Figure 1 showing the number of reportable CDI per 1000 bed-days.

Discussion

To our knowledge, this is the only published report discussing the costs of *C. difficile* MDT-RCA to NHS Hospital Trusts in light of appeals against sanctions from the CCG.

No additional learning points were identified during the MDT-RCA meetings above those covered in Table 2. It is possible this may reflect organisational issues with the methodology of the process and delivery of actions and outcomes from these, as opposed to the conceptual approach. For instance, we found that some issues or learning points were recurrent (documentation, processing issues, speed of isolation of suspected cases) suggesting challenging barriers to effectively overcome, some perhaps due to constraints in resource or estate. Although no additional learning points were identified, one possible benefit of the MDT-RCA meetings may have been heightening the awareness of CDI among staff that attended.

The main aims of the MDT-RCA are to improve quality of care; however, we focused on exploring the costs of these to the Trust. Although there are some data on the cost of managing hospital outbreaks, gathering precise data on the cost of HCAI is challenging, and attempts to count the cost of HCAI need to account for both actual expenditure and opportunity costs (Bou et al., 2009; Dik et al., 2016; Garlantezec et al., 2011; Jiang et al., 2016; Otter et al., 2016; Perencevich et al., 2007; Spearing et al., 2000; Stone et al., 2003). To our knowledge, there are no published data on the cost of MDT-RCA meetings in HCAI including *C. difficile*. Based on our calculations, the cost of the MDT-RCA forums over the two-year period in HHFT potentially cost £23,795.74–£51,670.10 and our potential saving for

Table 2. Key learning outcomes over this period of the 84 cases.

Key learning outcomes	Cases where this happened (n)	Cases where this happened in the first quarter (n)	Cases where this happened in the last quarter (n)	How these were addressed
Delay in taking sample (delay testing by the laboratory or arrival of samples to the hot lab in timely manner on two occasions)	21	3	1	Education, feedback, one-to-one discussions. Where the delay in sample arrival was noted, microbiology management and hospital transport addressed the issue by introducing more transport runs between the hospital sites and approving other ways when urgent transfer of samples is needed, e.g. using courier services
Delay in patient isolation	14	4	3	Education, change of policy to make it in line with national guidance. HHFT's policy at the time was to isolate patients within 4 h, which is more realistic compared with a national requirement of 2 h*
<i>C. difficile</i> cohorted with concomitant norovirus cases	10	0	0	Multiple education/training sessions were organised and carried out. This learning point is more challenging to address, particularly when a ward area is affected by Norovirus. Concomitant testing is unavoidable and incidental <i>C. difficile</i> cases can be identified which will put pressure on isolation and clinical management (to treat or not to treat)
Lack of documented evidence of enhanced cleaning	10	4	2	Education of staff to document and auditors to record accordingly
Lack of adequate documentation in nursing notes	4	0	0	As above
Lack of adequate documentation in clinical notes	8	2	0	As above
<i>C. difficile</i> care pathway not started in a timely manner	22	6	2	As above
Bristol Stool Chart not started	3	0	0	As above
No Diarrhoea and Vomiting risk assessment performed prior to diagnosis	41	6	5	As above

*This change was triggered by the MDT-RCA and feedback from the CCG appeal panel.

the two breached cases was only £20,000 meaning that during that period the Trust potentially lost £3795.74–£31,670.10. Therefore, for this cohort the MDT-RCA did not seem to be cost-effective. We need to emphasise that our calculation does not take into account the cost of patient care, bed loss, additional cleaning and waste disposal, impact on patient outcomes, antibiotic stewardship and additional staff training. In addition, 27 cases were

forwarded to the CCG for appeal against sanctions during this time period and the cost to the Trust of preparing for the appeal and the deviation costs of the DIPC, deputy DIPC and governance team in submitting these cases and participating in the CCG panel meetings has not been included. Furthermore, the cost of the CCG panel, which can be significant to the NHS and the taxpayer, has not been calculated within this report.

Table 3. Cost of MDT-RCA meetings based on basic payments.

Staff category/ grade	Attendances for 84 MDT- RCA (n)	Basic cost of staff/h* (£)		Actual basic cost of staff for these MDT- RCA* (£)		Deviation cost for all staff during MDT- RCA* (£)		Potential total cost to the Trust* (£)	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Nursing staff (band 7–8b)	129	15.89	29.19	2049.81	3765.51	2049.81	7531.02	4099.62	11,296.53
Surgical/ medical/ microbiology† consultants	150	36.50	49.26	5475.00	7389.00	5475.00	14,778.00	10,950.00	22,187
Antibiotic pharmacists (band 8a)	62	23.61	29.19	1463.82	1809.78	1463.82	3619.65	2927.64	5429.43
IPCN nurses (band 7–8a)	116	15.89	24.32	1843.24	2821.12	1843.24	5642.24	3686.48	8463.36
IPCN admin and surveillance (band 5)	56	11.90	14.41	666.4	806.96	666.4	1613.92	1332.80	2420.88
Governance and facilities (band 6–7)	30	13.32	20.81	399.6	624.3	399.6	1248.60	799.20	1872.90
Total	543	120.11	167.18	11,897.87	17,216.67	11,897.87	34,433.43	23,795.74	51,670.10

*Costs are based on 1-h meeting time that includes real time spent on each case (30–45 min) plus travel time to and from meeting venues. These are only basic costs and do not include supplements for on-call, awards or additional lead roles. This does not include staff time spent in sending statements or letters when they were physically unable to attend the meetings including consultants for 34 RCAs, antimicrobial pharmacists for 22 RCAs, governance and facilities for 54 RCAs. They do not include the cost of meeting rooms and other overheads.

- Basic cost of staff / h = minimum / maximum hourly rate for one staff category or grade.
- Actual basic cost = basic cost of staff group × number of staff in that category or grade attended these meetings.
- Minimum deviation cost = minimum actual cost spent in each MDT-RCA for each staff category or grade if staff members were not involved in pre-meeting data gathering.
- Maximum deviation cost = maximum actual cost spent for each MDT-RCA forum plus an equal cost for similar time spent on pre-meeting preparations, plus the cost of staff not carrying out their routine revenue-generating procedures / activities at those times, i.e. double the maximum actual cost.
- Potential total costs = actual basic costs plus deviation costs.

†In HHFT, the microbiologist is also the DIPC (the additional payment supplement has not been included).

Another interesting point, in our view, regarding the appeal process is that although there are national criteria to define what may constitute ‘lapse of care’ (NHS Improvement, 2017), appeal panels need to accept that the burden of proof needs to be greater and that a lapse in care needs to have a degree of causality. For example, a lapse would result from in-hospital transmission proven by ribotyping or a major issue in antimicrobial prescribing/stewardship. Where there were suboptimal practices relating to delays in isolation or obtaining and testing a stool sample or a deficiency in antimicrobial documentation (assuming choice, duration and indication were correct) these should be termed ‘deviations from best practice’ and should not be subject to financial penalties or lapse of care.

Although the total number of reportable CDIs did reduce slightly from the first quarter to the last quarter observed (i.e. from June–August 2014 to March–May 2016) from 11 to nine, respectively, the numbers overall were on a downwards trend before this (Figure 1). For this reason, it is

difficult to say that the MDT-RCA had a positive impact on reducing the number of CDI cases.

One of the reasons for CCG panel appeal failures included the concomitant (or possibly incidental) finding with Norovirus infection. As explained in Table 4, the CCG panel felt that as the Norovirus was acquired during the patients’ hospital stay, it meant that there was a breach in infection prevention practices and hence even an incidental finding of *C. difficile* was regarded as a lapse of patient care. We believe the MDT-RCA has no impact on occurrence of Norovirus and subsequent concomitant or incidental reportable or non-reportable *C. difficile* detection. The Infection Control Committee and the Trust board agreed that regardless of targets or sanctions, the trust will continue to test for *C. difficile* during Norovirus outbreaks, as identification and isolation of colonised cases should prevent onward transmission and hospital outbreaks.

Different CCGs may have different regulations or terms of reference for what may constitute a “lapse of care” and a

Table 4. Main reasons for appeal failures by the CCG panel.

Reason for appeal failure by CCG*	Comments
Delay in isolation without documentation of why the delay happened	Often the bed occupancy was 100% in hospital and there is no way we would have achieved the within 2 h isolation target; however, we need to clearly document these reasons there were discussion between staff, managers and IPCNs
Concomitant (or possibly incidental) finding with Norovirus infection. The CCG panel agreed that as the Norovirus was acquired during the hospital stay, it meant that there was a breach in infection prevention practices and hence even an incidental finding of <i>C. difficile</i> was regarded as a lapse of patient care	In HHFT, there are regular plans and preparedness for Norovirus infections including regular table-top exercise with nurses and managers on how to deal with these. However, the nature of the infection and susceptibility of patients means infection can spread rapidly despite 100% hygiene standards and infection prevention provision
Antibiotics were started for possible or probable hospital-acquired pneumonia (HAP) and subsequently the patient developed diarrhoea and was found to have <i>C. difficile</i> . This was regarded as a lapse of care as the HAP was itself a hospital-acquired infection	Diagnosis of HAP is very challenging; we continue to provide education and use more sensitive biomarkers like procalcitonin to avoid unnecessary use of antibiotics
Delay in testing a stool sample as the sample arrived late in the laboratory due to internal transport issues following a laboratory merger	This highlights the challenges associated with laboratory mergers and the impact this have on turnaround times of results. We continue to improve our transport between our sites
Deviation from hospital antibiotic guidelines, although the antibiotic was appropriate there was no documentation why the deviation from the usual trust guidelines occurred	As in the on-the-spot RCA improvement, documentation is required; however, this should not be regarded as lapse of care but may be a deviation of care
Delay in commencing <i>C. difficile</i> treatment or care pathway without documentation as to why this had occurred	As above
Failure to narrow down antibiotics based on culture and sensitivity without documentation why this happened	As above

*One or more of these could be applicable to each case.

Figure 1. HHFT: reportable CDI rate/1000 bed-days and trends.

weakness of this work is that it is not able to ascertain what is happening nationally. Additionally, the impact of an MDT-RCA approach in other organisations may be different from our experience; immeasurable benefits on quality of care may well exist and it may provide opportunities for relationship-building and team-working between different specialties. It is, however, our view that it is no more effective than a more responsive, real-time and leaner on-the-spot investigation approach encompassing timely feedback and enhanced individualised education. Ultimately, on a theoretical level, further reductions beyond a certain baseline may be realistically difficult to achieve for an organisation, given the clinical context of current practice and epidemiology of *C. difficile*. In conclusion, we found that MDT-RCA can be very costly without additional benefit to the on-the-spot investigation by IPCNs on *C. difficile* numbers or patients' outcome. Additionally, participation in the CCG appeal process can add further costs to Trusts and the NHS. Trusts should invest in smarter mechanisms to tackle HCAs, including on-the-spot direct feedback, education to clinical/nursing staff and targeted long-term improvements to sustain lower numbers of CDIs and improve patient outcomes.

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References

- Bou R, Lorente L, Aguilar A, Perpignan J, Ramos P, Peris M and Gonzalez D. (2009). Hospital economic impact of an outbreak of *Pseudomonas aeruginosa* infections. *Journal of Hospital Infection* 71: 138–142.
- Department of Health. (2012) Updated guidance on the diagnosis and reporting of *Clostridium difficile*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215135/dh_133016.pdf (accessed on 1 February 2017).
- Dik JWH, Dinkelacker AG, Vemer P, Lo-Ten-Foe JR, Lokate M, Sinha B, Friedrich AW and Postma MJ. (2016) Cost-analysis of seven nosocomial outbreaks in an academic hospital. *PLoS ONE* 11: e0149226.
- Dingle KE, Didelot X, Quan TP, Eyre DW, Stoesser N, Golubchik T, Harding RM, Wilson DJ, Griffiths D, Vaughan A, Finney JM, Wyllie DH, Oakley SJ, Fawley WN, Freeman J, Morris K, Martin J, Howard P, Gorbach S, Goldstein EJC, Citron DM, Hopkins S, Hope R, Johnson AP, Wilcox MH, Peto TEA, Walker AS and Crook DW; Modernising Medical Microbiology Informatics Group. (2017) Effects of control interventions on *Clostridium difficile* infections in England: an observational study. *Lancet Infectious Diseases* 17: 411–421.
- Freeman J, Bauer MP, Baines SD, Corver J, Fawley WN, Goorhuis B, Kuijper EJ and Wilcox MH. (2010) The changing epidemiology of *Clostridium difficile* infections. *Clinical Microbiology Reviews* 23: 529–549.
- Garlantézec R, Bourigault C, Boles JM, Prat G, Baron R, Tonnelier JM, Cosse M, Lefevre M, Jourdain S, Lelay G, Daniel L, Virmaux M, Le Du I, Tande D, Renault A and Lejeune B. (2011) Cost analysis of an intensive care unit closure due to an imipenem-resistant oxa-23 *Acinetobacter baumannii* outbreak. *Journal of Hospital Infection* 77: 174–175.
- Jiang Y, Resch S, Liu X, Rogers SO Jr, Askari R, Klompas M and Jayaraman SP. (2016) The cost of responding to an *Acinetobacter* outbreak in critically ill surgical patients. *Surgical Infections* 17: 58–64.
- NHS England (2014). *Clostridium difficile* infection objectives for NHS organisations in 2014/15 and guidance on sanction implementation. Available at: file:///Y:/Ideas%20for%20papers/RCA/JIP/Journal%20of%20Infection%20Prevention%20_%20SAGE%20Publications%20Inc_files/c-diff-obj-guidance.pdf (accessed on 1 February 2017).
- NHS Improvement. (2017) *Clostridium difficile* infection objectives. London: NHS England. Available at: <https://www.england.nhs.uk/patientsafety/associated-infections/clostridium-difficile/> (accessed on 24 July 2017).
- Otter JA, Burgess P, Davies F, Mookerjee S, Singleton J, Gilchrist M, Parsons D, Brannigan ET, Robotham J and Holmes AH. (2017) Counting the cost of an outbreak of carbapenemase-producing *Enterobacteriaceae*: an economic evaluation from a hospital perspective. *Clinical Microbiology and Infection* 23: 188–196.
- Perencevich EN, Stone PW, Wright SB, Carmeli Y, Fisman DN and Cosgrove SE; Society for Healthcare Epidemiology of America. (2007) Raising standards while watching the bottom line: making a business case for infection control. *Infection Control and Hospital Epidemiology* 28: 1121–1133.
- Royal College of Nursing. (2016) Pay scales for NHS nursing staff in England, Wales, Scotland and Northern Ireland from 1 April 2016. Available at: <https://www.rcn.org.uk/employment-and-pay/nhs-pay-scales-2016-17#subtab2> (accessed 24 July 2017).
- Spearing NM, Jensen A, McCall BJ, Neill AS and McCormack JG. (2000) Direct costs associated with a nosocomial outbreak of *Salmonella* infection: an ounce of prevention is worth a pound of cure. *American Journal of Infection Control* 28: 54–57.
- Stone PW, Gupta A, Loughrey M, Della-Latta P, Cimiotti J, Larson E, Rubenstein D and Saiman L. (2003) Attributable costs and length of stay of an extended-spectrum beta-lactamase-producing *Klebsiella pneumoniae* outbreak in a neonatal intensive care unit. *Infection Control and Hospital Epidemiology* 24: 601–606.

Annual Awards Programme 2018

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is that no person is harmed by a preventable infection.

Our mission...

is to inform, promote and sustain expert infection prevention policy and practice in the pursuit of patient or service user and staff safety wherever care is delivered.

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- Category 4: IPS Link Practitioner of the Year

For full information including the application form and award criteria visit: www.ips.uk.net/IPSAwards

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