Addressing healthcare-associated infections and antimicrobial resistance from an organizational perspective: progress and challenges

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This paper explores the progress and challenges associated with the application of organizational factors and approaches to infection prevention and control (IPC) and antibiotic stewardship (AS) in England, many of which have been considered and supported by the Advisory Committee on Antimicrobial Resistance and Healthcare-associated Infections (ARHAI). An organizational perspective is described and the wider macro context and socio-political forces that shape an organizational approach are considered. Factors that drive organizational change in IPC and AS are discussed. The tensions, constraints and dilemmas that can occur are identified and outstanding challenges are debated. Some recommendations for the future direction of IPC and AS organizationally focused strategies and research are proposed.

Keywords: organizations, infection control, antibiotic stewardship

Introduction

The last decade has seen a significant transition in the management of healthcare-associated infection (HCAI) and antimicrobial resistance (AMR). At the start of the decade, in the vast majority of hospitals in England, infection prevention and control (IPC) and antibiotic stewardship (AS) were the tasks of a usually small, technically focused, clinical group of microbiologists and infection control staff. At the end of the decade, HCAI prevention was ‘everyone’s responsibility’, built into legislative, regulatory and organizational frameworks and the concept of antimicrobial stewardship informed organizational measures to tackle antimicrobial misuse.1

Two HCAIs, namely methicillin-resistant Staphylococcus aureus (MRSA) bloodstream infection (BSI) and Clostridium difficile infection (CDI), which have been the focus of the last decade in England, are showing declining numbers. However, the overall challenge of HCAI remains and the challenge of AMR continues to grow nationally and globally. In the absence of the introduction of new technologies, the decline in those two infections suggests that the change relates to improving practice within organizations.2 This paper, based on issues discussed by the Advisory Committee on Antimicrobial Resistance and Healthcare-associated Infections (ARHAI), considers factors that drive organizational change in the context of macro-level change, such as institutional and socio-political forces.

An organizational perspective

An organizational perspective provides an understanding of changes in practice at the organizational level through the examination of the design, structure, culture, processes and behaviours evident in the organization.3 Behaviours at individual and team level are the focus of much health service research, particularly that related to IPC and AS, but this has been less true at an organizational level.

The study of organization-level behaviours and the interrelationship and interdependencies between individuals, teams and the organization are the subject of an extensive body of organizational research and academic literature that is applied increasingly to healthcare. The interdependencies within an ecological system have provided a useful analogy for how an organization functions.4 Theoretical frameworks have been developed where organizations can be considered as biological systems, existing as elements in a complex ecosystem, and evolution is regarded as a dynamic pattern of relations between organizations and their environments, which is critical for survival.5

Changing organizations

Organizations are in constant change, through internal processes and interaction with context. Change can occur in a number of ways. Two polarized forms of change management
are ‘top-down’ and ‘bottom-up’. Top-down change implies that power is centralized at the top and that change is mandated through a top-down, directive communication process, and the approach maintains system stability. In contrast, bottom-up change describes inter-group collaboration and participative processes that encourage change at grass roots level within an organization. This approach is locally driven, supports innovation and improvement, and facilitates research and the improvement of defective systems and processes. The challenge in any change programme is to find the balance between these two approaches and recognize and manage the tension between them. Both forms of change can be influenced by broader macro-level factors, such as the impact of regulatory mechanisms or the impact of socio-political influences. With IPC, much of the visible change was top-down, with regulatory changes introduced by the Department of Health (DH) to ensure Trusts would take actions to lower their infection rates. Many Trusts reacted to these by introducing top-down, mandated change from Board level. Other Trusts had already commenced innovative work around infection prevention, both top-down (for example introducing performance management) and bottom-up (such as ensuring IPC and AS were on the agendas of effective local committees within the hospital).

Consideration of a shifting context

The organizational perspective is shaped by the macro environment and wider socio-political forces influencing the organization and the practice of IPC and AS, and these factors must be taken into account. One contextual influence is the international awareness of patient safety that increased exponentially following the 1999 Institute of Medicine report ‘To Err is Human’ and the 2001 ‘Crossing the Quality Chasm’ report. The latter report recognized the importance of the organizational level to the delivery of safe, high-quality healthcare and provided a blueprint for organizational improvement in patient safety led by the Institute of Health Improvement (IHI). Six areas for improvement at the organizational level were targeted: (i) the need for robust systems; (ii) better use of information technology; (iii) investment in workforce knowledge and skills; (iv) more consistent development of teams; (v) better coordination of services and care; and (vi) more sophisticated and extensive measurement of performance and outcomes. These areas for improvement were integral to the launch of two IHI campaigns: the ‘100000 Lives Campaign’ in 2004 and the ‘5 Million Lives Campaign’ in 2006, in which HCAI reduction was a major component.

Nationally, the impact of media interest and political and patient concern over the increasing infection rates in 2003–04 combined to make IPC the top priority of the DH. Key initiatives caused hospital clinicians and managers to start making changes at the organizational level. Similar strategies to those used by IHI were adopted with the introduction of high-impact interventions for Trusts to reduce HCAIs, although there were fewer strategies aimed at AS. In particular, the introduction of government legislation (the Health Act 2006 and the subsequent Health and Social Care Act 2008) implemented mandatory organizational level requirements for IPC. The Care Quality Commission was established as a regulatory agency that had powers to enforce registration requirements for health and social care organizations. Other changes included the introduction of the role of the Director of Infection Prevention and Control (DIPC), the introduction of clinical performance targets and monitoring and the increased direct accountability of Trust chief executives.

The shift from technical to strategic

In the last decade, a shift in mindset about infection control appears to have taken place. This can be observed in the shift from a technical expert and clinical approach to a more strategic approach, focused on organizational interventions. This shift has been influenced by several factors, one of which is a change in the ‘ownership’ of infection control. In many Trusts, prior to the changes introduced in 2004, IPC was perceived as the responsibility of a small, discrete service within the hospital that worked reactively trying to ‘fire fight’ infection problems as they arose, with inadequate resources to work prospectively to address underlying infection issues and with inadequate surveillance data to inform a prospective approach. Infection problems were addressed at a technical team or individual level, where specialist expertise in infection was relied on, rather than using organizational strategies and interventions to support the IPC agenda.

Gradually over the last decade, infection control, depending on the degree of readiness within individual organizations and the effectiveness of infection control teams, has become embedded in the infrastructure of organizations. The same now needs to be done with AS. The government drive to make infection control everyone’s business has contributed to that change in affecting the relationship between the infection control team and rank and file doctors, nurses and managers. The same can be applied to AS, as it can only be dealt with effectively if there is recognition across the broad body of prescribers and those influencing prescribers of the benefits of prudent use of antimicrobials. The role of health workers, such as nurses and pharmacists, in acting as knowledge brokers and exercising discretionary behaviours to influence positive prescribing decisions are increasingly recognized as being essential to effective antibiotic prescribing practices.

This paper explores the most relevant organizational factors that have contributed to this significant shift in mindset from technical to more strategic and discusses the tensions, dilemmas and constraints that can occur as a result of implementing these drivers of change.

Exploring the drivers of organizational change

Performance management

The introduction by the government of clinical performance targets to enable external benchmarking for two infections, MRSA bacteraemias in 2004 and CDI in 2007, served as key organizational drivers in the reduction of infection rates. The targets were associated with central monthly monitoring and reporting and associated visits by DH Improvement Teams, to assess progress or address problems in hospital Trusts. The target of a 50% reduction in MRSA bloodstream infections was met in 2008 and the target of a 30% reduction in CDI was
met in 2009. Whilst this approach was mandatory at national level, locally some hospital Trusts chose to build quality metrics relating to IPC into existing organizational structures, such as the balanced scorecard. This is a mechanism used by private and public sector organizations to monitor targets across a range of performance areas (financial, clinical, strategic and operational) and facilitates links between infection metrics and all other quality metrics for the organization. Balanced scorecards for divisions or directorates have been used to engage the clinical leadership in stretching but achievable targets for different aspects of infection and to encourage internal benchmarking. The success of this approach relies upon excellent surveillance data, face validity of the scorecard with staff and good data feedback. When this is achieved, it serves to create accountability for infection at all levels in the organization. The indicators used within the scorecard need to address issues of strategic clinical importance in the organization, and need to be relevant to clinicians and reflect clinically valid methods of measurement. These methods are also applied to AS by some Trusts and are recommended to be adopted nationally.

Although these performance approaches have been perceived to be effective, they result in a series of dilemmas at the organizational level. One such dilemma is deciding which aspects of infection to monitor. Research on the use of targets has highlighted the unintended consequences for other disease processes or clinical areas when one target is focused on to the exclusion of others, particularly in an environment of scarce resources, as in the case of Stoke Mandeville Hospital. A report on two outbreaks of CDI in the hospital which resulted in a number of deaths stated that waiting time targets were prioritized over patient safety-related matters. A challenge for the DIPC role and the IPC service is maintaining local clinical effectiveness and credibility whilst focusing on external mandatory targets, when these may not be central to local patient safety issues or infection priorities in the organization or patient population. The temptation is to worry about what the hospital Board, driven by the government, are measuring and focusing on, but the danger is that these measures may be insignificant. Critical local patient safety issues may be overlooked and a process of ‘cultural entrapment’ may ensue where the shared norms, values and assumptions in the organization can blind the leaders within that organization to crucial performance issues that occur outside the field of organizational perception. These problems can be overcome by the DIPC and IPC team remaining mindful and autonomous, particularly in circumstances where they have to present potentially conflicting proposals that might have a disadvantageous impact on the Trust performance. For example, the introduction of more sensitive molecular diagnostic tests for C. difficile is likely to improve patient safety but increase the numbers of C. difficile cases reported for the Trust. The DIPC and IPC team also need to balance delivering the external agenda whilst remaining advocates for locally important infection issues. Standardized approaches and external review to address any performance shortfalls in an explicit manner and at an early stage can be used to overcome some of these tensions.

**Raising and maintaining profile**

A key challenge for the DIPC and others involved in IPC is to create a high clinical and managerial profile for infection in the hospital. This relies on infection leaders having a high level of organizational awareness and being able to ensure that issues rise up agendas in the organization, in an environment where many sponsors may be competing to get issues raised but only a few succeed. In particular, this is relevant for Board-level agendas and can be linked to the effectiveness of the DIPC role at Board level. However, this also depends on the receptiveness of key players, such as the chief executive and medical director. Decision makers (Boards) can only process a small number of issues; otherwise there is danger of overload, so issue blocking can occur. This problem can be counteracted by powerful professional interest groups and lobbies who can help issues rise up agendas. In some Trusts, local patient groups have contributed to raising infection control concerns or, as in the Stoke Mandeville C. difficile outbreak, the Royal College of Nursing intervened when nurses had raised infection concerns but had not felt listened to. The wider political prominence of an issue, such as the political momentum to reduce MRSA rates, can influence organizational agendas, as can other external issues, such as government policy, global infection threats and technological advances.

A further issue in creating a high profile for infection throughout the organization is the importance of key clinical leaders effectively role-modelling positive behaviours relating to IPC and AS. Role modelling by consultants can be a key influencer of junior doctors’ behaviours, particularly in relation to areas such as hand hygiene and aseptic technique; however, all professional groups can benefit from excellent role models in their area of work.

The use of existing hospital communication mechanisms and relationship building with the in-house communications team can assist in generating a positive internal profile for IPC, where key infection control messages are incorporated into day-to-day communications and images within the hospital. The use of feedback from patients and staff in the form of patient complaints and the staff and patient satisfaction survey provide a valuable steer on the effectiveness of the HCAl approach in the hospital.

The profile of IPC and AS can only be raised in hospitals in the long term if local leaders feel motivated by the message of change and are incentivized to achieve and sustain the change. Leaders need to be convinced that it is the right approach, e.g. that the change directly improves patient care and clinical outcomes. Consultant leaders can also be incentivized to adopt and lead in IPC and AS best practice and in related innovation and applied research, if these will be recognized through the merit award process, or improve their status in the organization or have research impact.

**Leadership**

Leadership is a critical factor in achieving an effective IPC programme. A recent study identified four key factors associated with successful leaders in infection prevention: (i) nurturing a culture of clinical excellence and effectively communicating it to staff; (ii) overcoming barriers of resistance from people or
processes that prevent effective HCAI management; (iii) acting as inspirational role models; and (iv) thinking strategically while acting locally, which involves coalition building, leveraging their personal reputation to move ideas forward and influencing committees through politicking. The same study found that infection prevention leaders could be more effective in improving patient safety activities than senior executives seeking to achieve the same goal. This diffusion of the impact and transferability of the skills of IPC leaders could perhaps be harnessed and more successfully utilized. The role of the leader in setting and communicating priorities influences the relative emphasis on finance and performance against infection and patient safety within each level of the organization.

The creation of the DIPC role provided an opportunity to have additional clinical leadership on the hospital Board. A role profile for the DIPC produced by the DH recommends that ‘The DIPC will be a highly visible, senior, authoritative individual who provides assurance to the Board that systems are in place and correct policies and procedures are adhered to across the organization to ensure safe and effective healthcare. The DIPC will be an effective leader who will enable the organization to continuously improve its performance in relation to HCAIs. In particular, the requirement to challenge professional and organizational barriers and inappropriate clinical practice or antibiotic prescribing decisions necessitates a DIPC who is confident in demonstrating leadership amongst their peer group and clinical colleagues.

In addition to an effective DIPC role, leadership at all levels of the organization plays an important role. One mechanism to achieve this is through the role of champions. Active champions influence organizational change through four functions: (i) building organizational support for new practices; (ii) protecting those involved in implementation from organizational rules and systems that may be barriers; (iii) helping to access the use of organizational resources for implementation; and (iv) supporting the growth of organizational coalitions to achieve implementation. One study notes that an effective inter-professional coalition of champions may be needed to achieve significant organizational behaviour change, whereas one lone influential champion may achieve a relatively straightforward change such as new technology. Most infection prevention improvements require organization-wide behaviour change and therefore a network of active champions who are skilled at developing inter-professional coalitions are required. This might be achieved through local clinical leadership with an existing ward nurse taking on a champion role or a designated doctor within a clinical team championing infection improvements. The tension inherent in this process is the need to embed IPC completely, but to ensure that there remains an overall responsibility and accountability for it through leadership with infection expertise and clout to ensure that a strategic approach to infection development is achieved. This requires a willingness on both sides to be less concerned about power bases and more concerned about taking a holistic view of IPC in the organization.

The importance of infection leadership at organizational and strategic level is illustrated through the notable failures in leadership that were documented in reports on the outbreaks of *C. difficile* at Stoke Mandeville Hospital and Maidstone and Tunbridge Wells NHS Trust. The impact of a negative leadership style is evidenced in the Healthcare Commission report, which stated (p. 67) ‘The picture given to the investigation team about the culture and style of management at the trust was that it was focused, controlling and oppressive and driven by the pursuit of targets and the reconfiguration of services’. Although the issues raised in both reports suggest multifactorial problems, the central issue of the need for executives to achieve a safe balance between safety issues and performance is illustrated in the previous and following excerpts of the report (p. 64): ‘Many clinicians had concerns that on occasions the targets were being achieved at the expense of the control of infection and the safety of patients’. Effective CEO leadership, leadership at all levels of the organization and a strong DIPC presence on the hospital Board are critical in ensuring a strategic emphasis on infection prevention with associated clinical practice change at local level.

**Coalition building and cross-boundary working**

Where IPC has been effective, cross-boundary working is in evidence. This involves breaking down the ‘silo mentality’, where infection control teams are focused on their own issues in their own discrete areas, and encouraging infection teams to work effectively with other groups and individuals. One aspect of cross-boundary working is coalition building through the development of relationships and networks with other key groups or individuals. This requires collaboration, which is defined by the five underlying concepts of sharing, partnership, power, interdependency and a dynamic, evolving process, and can be complex given strong professional jurisdictions between the various professional groups. The leadership qualities and collaborative skills of all professional groups within the infection control team will determine how effectively relationships with other clinical groups can be developed and maintained. Links with associated clinical groups, particularly those in high-risk areas, such as renal, cardiac and intensive care, are critical for addressing specialty-specific infection issues. Similarly, cross-boundary working is critical for agreeing shared approaches to antibiotic prescribing. Successful antimicrobial stewardship programmes (including policies, surveillance, guidelines, education, prevalence reports and audit of practice) are one example of cross-boundary working where a multidisciplinary culture of shared knowledge is advocated and all healthcare workers support and act upon the principles of prudent antibiotic prescribing.

The development of coalitions with key individuals such as the chief executive is critical to ensure that IPC is embedded in, and a prerequisite of, decision making. The demonstrable support of chief executives is fundamental if they are to successfully provide leadership on IPC for the whole organization. Coalitions with functional directors, such as the director of human resources to plan workforce issues (e.g. training, recruitment, contracts, occupational health) and the director of finance to assist with activity and financial issues (e.g. capital planning, business planning, resource allocation), are essential to ensure that IPC is translated from strategic Board level to adequately resourced and implemented local practice level. Infection risk needs to be considered in all areas of hospital management. Collaborations with other corporate departments, such as estates and facilities, and with nursing and bed management, enable a multifaceted perspective on issues such as planning a new unit, improving a patient pathway or procuring new equipment.
Achieving these collaborations requires the IPC team to be situated at the organizational level in the hospital hierarchy, rather than within an individual service.

**Systems design**

Advances in multimodal approaches to IPC and AS have been made using systems design and the application of human factors to support best practice. Examples of such approaches are the shaping of the environment in which decisions are made through the use of effective tools to support and aid decision making, e.g. care bundles, the provision of the appropriate packs at the point of care and the design of antibiotic prescriptions or drug charts. In order to maximize the effectiveness of the decision-making environment, cognitive biases that underpin behaviours should be incorporated, a process known as ‘choice architecture’. Nudge is defined as ‘any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives’.32 Thus, a pharmacist designing an antibiotic guideline is a choice architect and has the power to influence, often through small and apparently insignificant alterations, the design of the guideline, leading to changes in behaviour of those using the guideline. The exercise of choice architecture does not block or burden individuals from making choices, but attempts to subconsciously move people in particular directions.32

**Assessing the challenges: the wider context**

**Sustainability**

Over the last decade, significant resources have been committed by the government and hospital Trusts to improving IPC in the UK. Concerns exist amongst policy makers and organizational leaders that when the focus on IPC is diverted to another escalating priority issue, the progress that has been made will falter and possibly reverse. There are a range of challenges that act as barriers to sustainability. The shifting nature of external priorities and party politics is one such barrier. Recent NHS reform proposals and cost reductions have the potential to divert healthcare workers’ attention towards structural changes within the health service. A recent National Audit Office report highlighted concerns about the delivery of safe, high-quality care juxtaposed against the transition to a new configuration of health services.33 In this context, given the scale of cost reductions (£20 bn by 2014), maintaining and building on IPC progress to date will be challenging and will require a strong IPC leadership presence on hospital Boards to compete effectively for IPC resources, mitigate the risk of cost reduction and gain credence on a crowded Board agenda. In addition, there will be the challenge of leveraging influence externally with the new general practitioner (GP) commissioning consortia proposed under the new arrangements. The unintended consequences of these wide-ranging, cross-organizational changes might have a negative impact on infection control as the focus of attention is on the transition. Continued diligence will be needed to monitor processes and practices that are currently tracked and those that are not, and to act rapidly to respond to any early alerts of lapses in process34 or rising infection rates, regardless of external events.

**Comparative analysis of models**

There is a need to be academic and analytical about examining delivery models for IPC services and how they are embedded in an organization. At the current time, there is inadequate high-quality empirical research linking team or organizational processes to the desired outcomes. As Pronovost reports, safety parameters are difficult to capture owing to lack of standardized definitions, surveillance systems often relying on self-reporting, denominators being largely unknown and the time period for exposure being unspecified.35 He argues for standardized surveillance systems to address this, yet recognizes that ‘the science of linking structural elements to patient safety outcomes is immature’.34 A mixed methods approach has been recommended for healthcare research, which may be particularly appropriate for IPC research.36 This type of research might involve epidemiologists and economists using a ‘positivist’ perspective and drawing on largely quantitative methods, working alongside organizational studies researchers drawing on mainly qualitative methods to evaluate the same organizational change in IPC.36 The strength of this approach is that the breadth and depth of the change can be captured: the quantifiable changes in service delivery and the qualitative analysis of structures, behaviours, culture and processes.

**Health economics**

A further challenge is the need to utilize economic models for assessing the proposed implementation of IPC programmes and for costing IPC benefits adequately, particularly when competing for diminishing healthcare resources. Economic models assess costs against preventable infections and health benefits associated with the implementation of an IPC intervention.

From a cost angle, an economist’s interpretation of costs for economic appraisal, rather than that of a cost accountant, is required to capture the increased investment required for additional infection control programmes, to identify which costs (fixed or variable) change when infections fall and to work with the high percentage of fixed costs found in healthcare within the time period for decision making.37 Within the costing modeling, either research design approaches can be used to estimate the independent effects of infections on cost outcomes or, alternatively, statistical techniques can be employed. Despite the complexity of IPC delivery in acute care, it is possible to determine what extra costs might be incurred as part of a novel or additional infection control organizational intervention.37 Health benefits can be measured by changes to quality and quantity of life for which quality-adjusted life years (QALYs) are most commonly used. In order to understand the health benefit impact of an IPC programme, the risks of infection and death under different programmes need to be quantified.37 Both cost and health benefit information can be combined to undertake economic evaluations of IPC innovations. Within the NHS, these types of economic evaluation are limited, yet this methodology provides a more sophisticated mechanism to take decisions on the potential impact of a new programme. The use of these methodologies is hampered by the lack of...
available information on which to base evaluations, the lack of this skill set either within or available to the IPC or AS teams and the high ratio of fixed costs associated with the majority of healthcare organizations. Quantifying the complex externality of poor IPC and AS and the impact outside acute care is still poorly developed.

Resilience

Organizational resilience can be understood as ‘the intrinsic ability of an organization (system) to maintain or regain a dynamically stable state, which allows it to continue operations after a major mishap and/or in the presence of a continuous stress’. A further challenge is to understand the factors that contribute to maintaining organizational resilience in the face of unexpected infection events, such as outbreaks or pandemics and, perhaps more importantly, in the face of continuous changes externally, such as health system reorganizations or new governments. In the latter case, the impacts of significant continuous external changes act as stressors on the organization and can affect its ability to maintain resilient functioning. The leaders within an organization are required to constantly make sense of these external stressors and to respond in a manner that ensures the organization reacts or adapts appropriately to these changes and simultaneously maintains the effective delivery of health services, with the potential internal stressors that may also be occurring, such as leadership changes, outbreaks or financial constraints. To achieve this balancing act, conditions need to exist in the organization at all levels to maintain this equilibrium. Research in this area is in its infancy but mechanisms to assess organizational resilience have been developed and the factors that contribute to organizational resilience in healthcare are being studied.

Developing a robust research base

Gerberding identifies four key challenges in the need to transform health protection research based around content, complexity, competencies and capacity. These challenges can be elaborated as the importance of health goals and critical knowledge gaps in driving research priorities, the importance of recognizing contextual as well as individual determinants from a holistic view point, the existence of robust multidisciplinary and interdisciplinary networks and the importance of large long-term investments and longitudinal studies. To achieve these recommendations will require collaboration across existing research centres, the development of multidisciplinary teams internationally as well as nationally and the formation of networks with other disciplines, such as psychology, organizational studies, economics and business. There is a need for the use of qualitative, multi-method research to capture the nuances of organizational level change and to translate research into practice. The UK Clinical Research Collaboration research funding initiative has made a start in supporting such cross-cutting collaborative research (http://www1.imperial.ac.uk/medicine/about/institutes/cipm/).

Integration

The integration of IPC into local business and planning at Trust level is a key top-down message, but similar organizational efforts need to be made at national as well as local level to integrate IPC and AS into the national health infrastructure so they do not remain isolated issues and the messages are not effectively embedded at national level. IPC and AS should be integrated into the activities of, for example, specialist bodies and professional networks, in order that they are incorporated into training, monitoring, policy and practice developments.

Future direction—where next?

It will be increasingly important that IPC and AS expert leaders employ an understanding of organizations to effect change and influence strategy and practice. Influencing at organizational level can provide access to financial and physical resources, support for change, access to leaders across the organization and the use of existing organizational structures and processes to build-in IPC and AS requirements. In addition, there is a need for an improved understanding of organizational culture. The lessons learned in IPC should be applied to AS. Those involved in IPC and in AS benefit from understanding the nuances of organizational culture in terms of changing attitudes and behaviours and as a mechanism to encourage leadership and role modelling around effective behaviours. Many hospitals now employ staff with experience in organizational development who could be co-opted to assist in designing behavioural change programmes and supporting communication strategies.

Another possibility is the potential for international collaboration and learning. Benefits can be gained from considering models internationally. From a performance perspective, international comparison and benchmarking can assist with improving standards of patient safety. From a knowledge and practice perspective, understanding alternative models of IPC and the macro context can assist with re-evaluating the strengths and weaknesses of existing services and designing new alternatives. The better understanding of the health economics of IPC and AS through such comparative analyses of models would be particularly beneficial. A further possibility is to look beyond existing organizational boundaries to consider intra-organizational collaborations and work. Given that IPC and AS cross organizational boundaries, the unit for study should be expanded to the ‘health economy’, which in future English health reconfigurations may include GP consortia, community providers and acute provision.

IPC can be considered as an indicator for managing complexity. In hospitals where IPC or other aspects of patient safety have not been well managed, subsequent reports have shown a failure to manage complex systems effectively and failure to balance safety against performance. Clinical and non-clinical managers in hospitals should be encouraged to recognize the value and use of IPC as an indicator of managing complexity.

The value of a variety of data to drive quality improvement and the better use of existing data to support surveillance and monitoring is recognized. This needs to be addressed more widely nationally, with the better use of existing national datasets on antibiotic use to inform and support AS and the better use of surveillance and performance data that exist in a variety of specialist networks and bodies to inform and support IPC. This also furthers integration and coalition building.
potential benefits incurred by adopting an organizational approach and the potential disadvantages if an organizational level is not managed well, it would be recommended that expert advisory groups on IPC and AS should contain people with organizational expertise, to advise on policy and practice improvements from an organizational perspective to increase the success of delivering IPC and AS in an organizational context.

**Conclusions**

In summary, a significant shift has occurred towards recognition of infection control as a key aspect of patient safety and public health in acute care and an indicator of quality of care and management. Although embedding infection prevention in patient care begins at the patient's bedside, it must be considered in all aspects of managing a hospital and ensuring a safe patient journey. The challenge will be maintaining organizational momentum when socio-political attention wanes and the macro context and influences and health priorities change. Antimicrobial stewardship within organizations is also an essential part of quality care, patient safety and public health and must be linked to IPC. The same rigour regarding data gathering, process monitoring and regulatory frameworks applied to IPC should now be applied to AS. Addressing HCAIs and AS using organizational strategies is essential to ensure that these are managed consistently and comprehensively across organizations and at national level. Future work needs to focus on achieving a sustainable and resilient approach and leveraging continued support through research and more sophisticated health benefit models.

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