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Themed Paper— Original Research

The role of pandemic planning in the management of COVID-19 in England from an infection prevention and control perspective: results of a national survey



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ABSTRACT

Objectives: This national survey aimed to explore how existing pandemic preparedness plans (PPP) accounted for the demands placed on infection prevention and control (IPC) services in acute and community settings in England during the first wave of the COVID-19 pandemic.

Study design: This was a cross-sectional survey of IPC leaders working within National Health Service Trusts or clinical commissioning groups/integrated care systems in England.

Methods: The survey questions related to organisational COVID-19 preparedness pre-pandemic and the response provided during the first wave of the pandemic (January to July 2020). The survey ran from September to November 2021, and participation was voluntary.

Results: In total, 50 organisations responded. Seventy-one percent ($n = 34/48$) reported having a current PPP in December 2019, with 81% ($n = 21/26$) indicating their plan was updated within the previous 3 years. Around half of IPC teams were involved in previous testing of these plans via internal and multi-agency tabletop exercises. Successful aspects of pandemic planning were identified as command structures, clear channels of communication, COVID-19 testing, and patient pathways. Key deficiencies were lack of personal protective equipment, difficulties with fit testing, keeping up to date with guidance, and insufficient staffing.

Conclusions: Pandemic plans need to consider the capability and capacity of IPC services to ensure they can contribute their critical knowledge and expertise to the pandemic response. This survey provides a detailed evaluation of how IPC services were impacted during the first wave of the pandemic and identifies key areas, which need to be included in future PPP to better manage the impact on IPC services.

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Introduction

In the UK National Health Service (NHS) trusts are required under the Civil Contingencies Act 2004 to prepare for emergencies, including pandemics.¹ These trusts are organisational units within the NHS of England and Wales, typically serving a general function

in a defined geographical area or a specialised function across a wider area. The most recent UK government simulation, which tested national pandemic influenza plans, Exercise Cygnus in 2016, identified that the United Kingdom was not sufficiently prepared in terms of plans, policies, and capabilities to respond to a pandemic.²

Involvement of infection prevention and control (IPC) experts and practitioners in the development of emergency management and pandemic plans is key to assess and mitigate the potential impact of infection transmission during major incidents.³ In a pandemic, IPC provides specialist advice to support decision-making across all levels of an organisation to minimise the risk of

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infection to staff and patients.⁴ This includes creating and revising policy and procedures in response to the situation as it develops. The critical role of IPC and the increased demands placed on their services needs to be considered in pandemic plans.

Assessment of preparedness for national pandemics has been targeted at influenza, with an assessment tool published by the European Centre for Disease Prevention and Control⁵ and recommendations from the World Health Organization.⁶ However, specific planning for IPC services does not feature, and there are currently no standards or guidelines to support this. Reidy et al.⁷ surveyed influenza pandemic preparedness related to IPC services in hospitals in the Republic of Ireland. Areas that required improvement were testing of plans, emergency planning committees, isolation capacity, and stockpiling of personal protective equipment (PPE).

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which caused the COVID-19 pandemic, began to affect the United Kingdom in early 2020. Creating unique pressures on IPC services, which were required to cope with enormous demands for advice, policy, decision-making, and activities, required to control all permutations of transmission between patients and staff.⁸ Assessing how well existing pandemic preparedness plans (PPP) accounted for demands placed on IPC services is key to prepare for future responses. This study aimed to explore the impact on IPC services in England during the first phase of the pandemic and how the IPC response was informed by PPP.

Methods

An online survey captured data from IPC service leaders across acute trusts, community trusts, mental health trusts, and commissioning bodies. As no validated tool exists to assess pandemic preparedness specific to IPC services, a survey was constructed based on best available evidence. Topic areas were informed by three existing tools and frameworks for general pandemic preparedness.^{5,7,9} The research team highlighted additional topic areas based on their experiences of working within IPC services or NHS settings during the pandemic.

Two versions of the survey were developed to ensure questions were relevant to either service providers (52 questions) or service commissioners (39 questions; [Supplemental File 1](#)). Service providers include NHS trusts set up to deliver hospital and community services and other aspects of direct patient care. Service commissioners encompass clinical commissioning groups (CCGs) or integrated care systems (ICSs) that commission most of the hospital and community NHS services in the region in which they operate.

Surveys were created in Qualtrics software, and data were captured electronically. Survey links were distributed via NHS England and Improvement to all 209 healthcare trusts and 109 CCGs in England. Professional networks, including the Infection Prevention Society and Healthcare Infection Society, publicised the survey.

Ethical considerations

Ethical approval was received in September 2021 from the [University of West London] Research Ethics Committee (UWL/REC/CNMH-01383). The Health Research Authority confirmed via personal correspondence that approval was not required from a national ethics committee. A voluntary sample completed the survey, with consent to participate implicit and presumed by survey completion. The details of the responding organisations were deidentified, and identification codes were used to represent the data to preserve confidentiality.

Data analysis

Data from completed surveys were entered into an Excel database. Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) software version 27. Descriptive statistics were used to explore and summarise the data. As not all questions were answered by all respondents, the number of responses is reported to provide clarity on the response rate to each question. Qualitative data from free text questions were managed in NVivo 12 software and organised into categories, which best represented the data. These are presented as frequencies; the number of times each category was identified, and the number of organisations that identified it in their response. This reflects whether it was a common point raised across many organisations or a specific issue for single organisations.

Inclusion and exclusion criteria

Only healthcare organisations in England were included. Settings included acute hospitals (general and specialist trusts), mental health trusts, community trusts, combined (acute and community) trusts, CCGs and ICSs. Surveys were excluded if they had answered less than 50% of the questions.

Results

Number of responses

A total of 50 surveys were completed between September and November 2021, giving a response rate of 16% (50/318). Responses were received from 35 service providers and 15 service commissioners ([Table 1](#)). Of the providers, 50% ($n = 25/50$) were acute hospital trusts (19 general hospitals, six specialist hospitals), 8% ($n = 4/50$) community health service providers, 6% ($n = 3/50$) combined acute and community trusts, and 6% ($n = 3/50$) mental health trusts. Commissioners comprised the remaining 30% ($n = 15/50$), which were CCGs ($n = 12$), an ICS ($n = 1$), and two unspecified.

Organisation demographics

Most service providers had between 500 and 999 beds (50%, 16/32), followed by <500 beds (38%, 12/32), and 1000–1499 beds (13%, 4/32). Numbers of level 2 and level 3 critical care beds, and the number of single rooms, with and without negative pressure, on main wards and intensive care units can be seen in [Table S1](#) and [Table S2](#) in [Supplemental File 2](#).

Existing PPP (pre-December 2019)

A breakdown of survey results related to existing pandemic plans is shown in [Table 2](#). Most service providers (82%, $n = 28/34$) had a current PPP in December 2019, and for service commissioners, this was 43% ($n = 6/14$). Plans tended to have been updated within the previous 3 years, with 19% ($n = 5/26$) updated more than 3 years ago. For those who co-ordinated their PPP with other organisations (59%, $n = 19/32$), this was commonly in conjunction with CCGs ($n = 12$), local resilience forums ($n = 11$), local authority public health agencies ($n = 9$), the national public health agency Public Health England ($n = 9$), ambulance service/other emergency responders ($n = 9$), community health services ($n = 8$), or NHS England ($n = 8$).

Most organisations had tested their PPP in internal (67%, $n = 22/33$) or multi-agency (70%, $n = 21/30$) tabletop exercises in the previous 2 years. These exercises discuss scenarios aimed at

Table 1
Number (% within column) of responding organisations by NHS region.

NHS region	Service providers	Service commissioners	Total
North West	10 (29%)	1 (7%)	11 (22%)
Midlands	6 (17%)	4 (27%)	10 (20%)
London	5 (14%)	2 (13%)	7 (14%)
North East and Yorkshire	3 (9%)	3 (20%)	6 (12%)
South West	3 (9%)	1 (7%)	4 (8%)
South East	2 (6%)	2 (13%)	4 (8%)
East of England	1 (3%)	0 (0%)	1 (2%)
Unspecified	5 (14%)	2 (13%)	7 (14%)
Total	35 (100%)	15 (100%)	50 (100%)

NHS, National Health Service.

Table 2
Breakdown of survey results related to existing pandemic preparedness plans by organisation type.

Elements of pandemic preparedness	Service providers (n = 35)		Service commissioners (n = 15)		Total (n = 50)	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Emergency planning						
Had a current pandemic preparedness plan or policy in Dec 2019	28 (82%)	6 (18%)	6 (43%)	8 (57%)	34 (71%)	14 (29%)
Current pandemic preparedness plan or policy in Dec 2019 updated in previous three years	19 (86%)	4 (17%)	2 (67%)	1 (33%)	21 (84%)	5 (19%)
Current pandemic preparedness plan or policy co-ordinated with other healthcare services	17 (71%)	7 (29%)	2 (50%)	2 (50%)	19 (68%)	9 (32%)
Had an emergency planning committee or similar group in Dec 2019	25 (83%)	5 (17%)	5 (56%)	4 (44%)	30 (77%)	9 (23%)
Had access to onsite laboratory services	17 (55%)	14 (45%)	—	—	—	—
Had existing contingency plans for increasing the capacity of IPC services/team	4 (13%)	28 (88%)	—	—	—	—
Had existing contingency plans for increasing isolation capacity	10 (30%)	23 (70%)	—	—	—	—
Had existing contingency plans for laboratory surge capacity	4 (27%)	11 (73%)	0	2 (100%)	4 (24%)	13 (76%)
Testing of existing plans						
Had tested plans in previous two years through an internal trust-level tabletop exercise	19 (70%)	8 (30%)	3 (50%)	3 (50%)	22 (67%)	11 (33%)
IPC team involved in last internal trust-level tabletop exercise	16 (64%)	9 (36%)	4 (67%)	2 (33%)	20 (65%)	11 (35%)
Had tested plans in previous two years through a multi-agency tabletop exercise	16 (76%)	5 (24%)	5 (56%)	4 (44%)	21 (70%)	9 (30%)
IPC team involved in last multi-agency tabletop exercise	13 (59%)	9 (41%)	4 (44%)	5 (56%)	18 (56%)	14 (44%)
Lessons from the most recent multi-agency tabletop exercise incorporated into pandemic plans	10 (83%)	2 (17%)	2 (67%)	1 (33%)	12 (80%)	3 (20%)

assessing whether organisations could enact their plans effectively in a real-world event. Organisations stated that IPC teams were involved in around half of internal (59%, $n = 19/32$) and multi-agency (55%, $n = 17/31$) tabletop exercises.

Most service providers had onsite laboratory testing facilities (55%, $n = 17/31$), with 27% ($n = 4/15$) of those who responded reported having contingency plans for laboratory surge capacity. A similar proportion of organisations (30%, $n = 10/33$) reported having plans regarding how to increase isolation capacity. For service provider IPC teams, only 13% ($n = 4/32$) had contingency plans for increasing their capacity.

Changes to IPC service provision and staffing

Most organisations reported increasing the capacity of IPC services in relation to working hours and staff availability. This included working longer hours (82%, $n = 37/45$), working more days in the 7-day week (85%, $n = 35/41$), and increasing on-call (68%, $n = 27/40$). Some organisations commented that this additional work was unpaid or done on an unofficial, or goodwill, basis. Staff capacity was increased via redeployment of staff (51%, $n = 22/43$), recruitment of new staff (38%, $n = 15/40$), return of recently retired staff (35%, $n = 14/40$) or volunteer IPC nurses (20%, $n = 8/40$).

Implementation of pandemic plans in the first wave

Existing plans or policies organisations commonly identified as informing their COVID-19 response were pandemic influenza plan (70%, $n = 35/50$), outbreak management plan (66%, $n = 33/$

50), and major incident plan (56%, $n = 28/50$; [Table S3 in Supplemental File 2](#)).

Impact on IPC services workload and essential supplies

Respondents were asked to rank IPC service activities based on the impact they had on their workload ([Table S4 and Table S5 in Supplemental File 2](#)). Activities with the highest impact included providing advice on PPE use, environmental control measures, patient placement, supporting incident command, policy/guideline writing and staff training.

Most (81%, $n = 35/43$) organisations reported seeking PPE and other IPC supplies from outside the normal supply chain. Items included eye protection ($n = 32$), FFP3 masks ($n = 28$), long-sleeved waterproof gowns ($n = 28$), alcohol hand rub ($n = 24$), fluid-resistant surgical masks ($n = 20$) and gloves ($n = 15$).

Patient management

To prevent transmission, service providers segregated patients with and without infection by stopping elective admissions ($n = 24$), redesignating wards ($n = 23$), stopping services ($n = 18$), reducing capacity on wards ($n = 14$) and use of Nightingale hospitals ($n = 4$).

Adequacy of COVID-19 testing

Testing capacity and turnaround time were adequate for 50% ($n = 6/12$) of service providers during the first wave. The ability to test within the trust tended to be established during the first wave,

with this occurring for 88% ($n = 7/8$) of organisations. Point-of-care testing only became adequate after the first wave for 91% ($n = 10/11$) of organisations. The main factors, which affected the ability of service providers to meet COVID-19 testing demands, were staff resources ($n = 19$), availability of reagents ($n = 14$) and availability of test kits ($n = 14$).

Most successful aspects of pandemic planning for first wave

Service providers

Service providers had clear commonalities in what they identified as successful in their pandemic planning (Table 3). Command structures (46%, $n = 11/24$) were identified as key to supporting the response, with comments related to how decision-making was facilitated by gold (strategic), silver (tactical) and bronze (operational) team command and control meetings. Clear channels of communication (38%, $n = 9/24$) were also important, alongside frequent meetings (often daily), effective communication and being proactive. Successful COVID-19 testing programmes (21%, $n = 5/24$) included testing of staff and asymptomatic testing, point-of-care testing in the emergency department and screening patients.

Service commissioners

Service commissioners identified working across systems (73%, $n = 8/11$) as successful in their pandemic planning where developing relationships, joint working and co-ordination across systems were key (Table 3). One organisation indicated the beneficial effect of the usual barriers to working across systems being removed. Creation of a local incident response centre (36%, $n = 3/11$) was essential for some in providing infrastructure to workstreams.

Least effective aspects of pandemic planning for first wave

Service providers

Services were asked to identify the least effective aspects of their pandemic planning (Table 3). These included a lack of PPE (35%, $n = 8/23$), specifically having no central stock database, no pandemic stocks, difficulties with procurement and short supplies.

Difficulties around fit testing (30%, $n = 7/23$) were highlighted with the pace of roll-out required and lack of equipment. Keeping up to date with national guidance (26%, $n = 6/23$) was a problem due to the frequency with which it changed, and the timings at which changes were released. Insufficient staffing (17%, $n = 4/23$) was raised as an issue with staff shortages, IPC team size and lack of administration staff.

Service commissioners

Issues included difficulties with working remotely (36%, $n = 4/11$) centred around inadequate technology and the ability of individuals to create conditions conducive to home working (Table 3). Redeployment of staff (36%, $n = 4/11$) caused difficulties due to lack of planning and continuing with business as usual, which prevented redeployment. Lack of PPE (27%, $n = 3/11$) was a problem for some, with supply chain issues, and insufficient PPE for care and residential homes. Effectiveness of communication (18%, $n = 2/11$) was negatively impacted by how information was managed and a top-down approach to dissemination. Again, keeping up to date with guidance (18%, $n = 2/11$) was identified, particularly the speed of updates and timing of release.

Key learning points from first wave review

Following the first wave of the pandemic, 63% ($n = 24/38$) of organisations conducted a review to identify key learning points. These are summarised below.

Service providers

Seven acute organisations shared their key learning points. Of these, 43% ($n = 3/7$) identified the need to embed PPE training and fit testing as part of an ongoing mandatory training programme. Staff well-being was identified as an issue (43%, $n = 3/7$) in terms of resilience and the ability to deal with further waves of COVID-19. Coping with patient deaths was also raised, with one organisation providing staff counselling. Two providers (29%, $n = 2/7$) identified problems with COVID-19 testing related to the speed of testing and strategy for swabbing admissions.

Table 3

Top five most successful and least effective aspects of pandemic planning for the first wave of the COVID-19 pandemic by number of organisations mentioned (each organisation was asked to identify three aspects).

Organisation type	Most successful aspects	Number of organisations
Service providers	Command structures	11
	Clear channels of communication	9
	Testing programme	5
	Staff willingness and teamwork	4
	Patient pathways	4
Service commissioners	Working across systems	8
	Creating local incident response centre	4
	Testing programme	3
	Dedicated IPC team	3
	Delivery of training	2
	Least effective aspects	Number of organisations
Service providers	Lack of PPE	8
	Fit testing	7
	Keeping up to date with guidance	6
	Insufficient staffing	4
	Clarity of guidance	3
Service commissioners	Difficulties with working from home	4
	Redeployment of staff	4
	Lack of PPE	3
	Effectiveness of communication	2
	Keeping up to date with guidance	2

IPC, infection prevention and control; PPE, personal protective equipment.

Service commissioners

Three service commissioners shared their key learning points. The main issue reported was keeping up to date with guidance (67%, $n = 2/3$). The remaining key learning points were only mentioned by single organisations, including staff well-being; IT issues; conflicting guidance; difficulties with resourcing; temporary discharge destinations needed; support for social care; and nurturing collaborative working.

Discussion

This survey found existing pandemic plans did not sufficiently prepare IPC services for the size and complexity of the response required during the COVID-19 pandemic, with clear unanticipated challenges across service providers and commissioners. Crucially some organisations, in particular service commissioners, had no pandemic plans in place in December 2019. Where plans did exist, a reported lack of involvement of IPC teams in tabletop exercises missed the opportunity for plans to be informed by IPC expertise. Even if IPC had been involved, this survey has shown that the potential impact of a pandemic on IPC services was not considered. Most organisations had no plans in place as to how to increase the capacity of the IPC team, and although teams increased their working hours and sought additional staff, they relied heavily on the goodwill of team members to meet service demands. Future planning needs to anticipate the pressures that pandemics place on this critical service and establish contingency plans to enable the IPC team to rapidly expand.

The management of patient pathways and cohorting to segregate known or potentially infected patients played a key role in preventing and controlling nosocomial spread of COVID-19. Organisations did not always have plans in place regarding how to increase capacity for laboratory surge testing, isolation capacity or spaces where isolation was possible. Nosocomial spread was a major issue in the United Kingdom, during the first wave. A total of 11.3% and 20.1% of COVID-19 in-patients were estimated to have acquired the virus in hospital.^{10,11} Rates high enough to impact on onward community transmission by discharged but infectious survivors. This demonstrates how the management of hospital in-patients is critical to controlling COVID-19 in the community.

Rapidly creating capacity or designing new ways to manage patient admissions may be required in a fast-moving pandemic situation. Patterson et al.¹² describe innovating their patient isolation practices by triaging patients and allocating them to single rooms if they were thought to be at high risk of having COVID-19 and comorbidities linked to poor outcomes. This approach was taken as they realised their existing isolation plans would have quickly overwhelmed their single room capacity. Carefully planning scenarios for managing isolation and cohorting, drawing on the experience of this pandemic, is essential to inform how an organisation might minimise health care-associated transmission in future pandemics.

Organisations reported shortages in PPE during the first wave, potentially making it difficult for frontline staff to adhere to IPC practices. Shortages were a clear challenge for IPC services globally.¹³ Countries with previous experience of an epidemic, such as the severe acute respiratory syndrome epidemic in Asia, were more likely to have avoided this because of planned stockpiling.¹⁴ Whereas the United Kingdom was criticised for its lack of pandemic preparedness, particularly in relation to stockpiling because of its reliance on just-in-time supply chains.¹⁵ Organisations were able to find PPE or other essential IPC supplies from outside normal supply streams and in future, plans should where possible identify potential sources for emergency use.

Providing advice on PPE usage had the highest impact on IPC services workload. Insufficient supplies of PPE exacerbated the demands on IPC services to find more, and both training and reassuring staff in using PPE consumed large amount of IPC resource, which had not been considered in plans. Many organisations reported IPC service time being spent on fit testing staff for FFP3 respirators. This is a key area for prior planning to ensure that there is an established ongoing programme of fit testing, and it does not consume IPC resources during a pandemic when they are spread so thinly.

The release of policy updates by national authorities caused difficulties. New guidance would commonly be released at the end of the week, and IPC teams would have to review changes and incorporate into local guidance often over the weekend. Frequent changes made it difficult for organisations to implement consistent practice and assure staff of their safety. Cycles of rapidly changing guidance have previously been reported as a source of anxiety for frontline staff, leading to a feeling of unpreparedness.¹⁶ Also creating challenges for IPC services in terms of providing information to healthcare workers, developing training materials, and creating evidence-based policies.¹⁷

Service commissioners experienced unique challenges, particularly a lack of planning regarding support for social care settings. Commissioners identified that collaborative working across a range of services and providers was crucial to their response. This included the removal of the usual organisational barriers, which enabled working across systems, demonstrating the importance of co-ordinating plans with other organisations. The creation of ICSs, which combine both acute and community services, should improve cross-system working and facilitate the response to future pandemics. New plans should incorporate new configurations and ensure that roles and responsibilities are clearly defined and lines of communication established.

Around one-third of organisations did not review the response they provided during the first wave. This missed a key opportunity to gain key learnings and adapt the ongoing response. Pandemic plans need to consider the capability and capacity of IPC services to ensure they can contribute their critical knowledge and expertise to the pandemic response and minimise the risk of transmission to both staff and patients. This survey provides detail of how IPC services were impacted by the first wave of the pandemic and identifies key areas which need to be addressed in plans to better manage the potential impact on IPC services.

Limitations

The response rate was low, although typical of this type of survey method. It must therefore be noted that the findings presented in this article may not be representative of all healthcare organisations during the first wave of the pandemic. One potential reason for low uptake could be because of the survey running in autumn 2021 when the COVID-19 case load was high. The potential for further surge in cases and pressure to return healthcare services to pre-pandemic levels at this time may have meant IPC service leaders did not have time to participate. Some respondents left questions blank; in future, survey questions could be set as mandatory to increase response rates, although this may increase overall attrition. Respondents completed the survey around 21 months following the emergence of COVID-19; therefore, there may have been a degree of recall bias, however, as this was such a unique time for IPC services responses are likely to capture their experiences accurately.

Conclusions

Obtaining the views, experiences and expertise of IPC service leaders is vital in designing and deploying an effective pandemic

response in future. All IPC services will play a central role in any future pandemics, with particular focus on maintaining provision of healthcare services and the workforce needed to deliver care. The established command and control structures worked well with IPC services during the COVID-19 pandemic. However, future plans particularly need to consider how to manage communication of changing guidance, the impact of increased demand on IPC teams and PPE supplies, working collaboratively across services, managing massive demand for isolation and cohorting and establishing local laboratory testing.

Author statements

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Ethics statement

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Competing interests

A.L. is co-Editor in Chief for Public Health, he was blinded to this submission in the journal's editorial management system and had no role in the peer review or editorial decision-making.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhe.2023.01.028>.

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