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Barriers to investigating and reporting nosocomial outbreaks to health authorities in São Paulo, Brazil: a mixed methods approach

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SUMMARY

Background: Not all nosocomial outbreaks (NOs) are reported to health authorities (HAs).
Aim: To identify barriers to investigating and reporting NOs to HAs.
Methods: A mixed methods approach was performed with a convergent parallel design. The quantitative and qualitative branches of the study were a statewide (electronic) survey and focus groups (FGs), respectively. Infection control practitioners (ICPs) working in the State of São Paulo, Brazil were recruited.
Findings: Eighty-five ICPs were enrolled in the survey and 22 ICPs were enrolled in the FGs. Barriers to investigating and reporting NOs included: (i) difficulty in translating outbreak investigation knowledge into practice; (ii) weak planning in outbreak investigation process; (iii) organizational culture and context; (iv) lack of awareness about reporting; and (v) lack of autonomy of ICPs to report outbreaks to HAs.
Conclusion: HAs could overcome these barriers by revising their strategies to work with healthcare services, as well as delivering translational educational programmes to support improvement in knowledge and skills for NO investigation.

Introduction

Nosocomial outbreaks (NOs) may increase morbidity and mortality, and may incur additional costs in terms of material and human resources.[1] These events occur frequently, and it is estimated that there will be at least one NO per year in a hospital with 150 beds.[2] Outbreak investigations can contribute to improvement in the quality of health care.[1] Reporting of NOs is important to understand their incidence and severity, and to allow identification of NOs that affect more than one healthcare facility, which may represent a public health problem. This information can help health authorities (HAs) to implement measures to reduce the incidence and severity of these events.[3] Despite its importance, this remains challenging due to dependency on the expertise of infection control practitioners (ICPs) in epidemiological techniques, on the availability of material resources, and on the assistance of public health departments.

Reporting NOs is mandatory in some countries (e.g. Germany, USA, Brazil, England), but actual compliance is not known.[3–6] In the states of the USA where NO reporting is mandatory, only half of the NOs investigated were reported to HAs.[4] Under-reporting was also observed in Germany with norovirus NOs.[7]

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Reasons for under-reporting have been identified, including fear of exposure to the media, fear of criminal prosecutions, belief that there is no value in reporting NOs, and ICPs' fear of consequences for their own healthcare facility.[3,8,9] HAs in Germany implemented a national NO surveillance system aiming to overcome barriers to reporting, and to promote the early detection of NOs affecting more than one administrative district.[3]

In Brazil, ICP nurses or physicians have been responsible for conducting NO investigations and reporting them to local authorities since 1996. The national definition of an NO is 'A case or a cluster of infections acquired after admission to the healthcare facility, or associated with healthcare assistance'. It is mandatory in Brazil to report NOs caused by multi-drug-resistant agents or new pathogens in the country; NOs affecting immunocompromised patients resulting in permanent disability, death or prolonged hospitalization; and NOs resulting in inpatient death.[10] A previous study found that only 17% of all published NO investigations in São Paulo State were reported to HAs.[11]

This study aimed to identify barriers to investigating and reporting NOs to HAs in São Paulo State.

Methods

Study design

A mixed methods approach was performed with a convergent parallel design.[12]

Data collection

The quantitative and qualitative branches of the study used a statewide survey (electronic questionnaire) and focus groups (FGs), respectively. Data from both branches were collected and analysed concurrently, and then compared to assess which results were convergent or divergent. Data collected from ICPs in both branches included formal education, years of experience in the field, characteristics of the healthcare institution, and characteristics of the infection prevention and control department. The Brazilian definition of NOs was adopted as the background of the study.

Survey

A questionnaire was used for the survey, which was constructed and validated using a Delphi technique.[13,14] Thereafter, the questionnaire was delivered as an electronic survey using a governmental Brazilian free web tool 'FormSUS' (http://formsus.datasus.gov.br). The responses to the online survey were anonymous. Requirements for ICP and healthcare institution identification were not included.

Focus groups

An interview guide with semi-structured questions was developed, which was piloted in a preliminary FG session and adjusted based on feedback from participants. The final interview guide focused on four topics: ICPs' experiences of NO investigations; elements that ICPs considered to be essential for investigating NOs; elements that might interfere with NO investigation; and barriers to reporting NOs to HAs.

Population, sample and recruitment

The study was undertaken in São Paulo, the most populous state in Brazil with 40 million inhabitants. The State Health Department includes centres for epidemiology services (responsible for epidemiological monitoring and prevention of diseases), sanitary services (responsible for sanitary audits) and the public health laboratory. A convenience sample enrolling ICPs working in hospitals in São Paulo State was used for the survey. ICPs were invited to participate in the study by e-mail. The source of e-mails was the São Paulo State Association of ICPs. E-mails were sent in December 2014, at least twice, two weeks apart. ICPs based in the cities of São Paulo, Ribeirão Preto and Campinas were invited to participate in FGs. These cities were selected based on the authors' previous study which identified them as relevant for the occurrence of NOs.[11] Four sessions were planned with four to eight ICPs.[15] ICPs who participated in FGs were asked not to answer the survey. The FGs were undertaken between May 2014 and August 2014. The sessions were recorded digitally with the participants' consent, and transcribed verbatim. A coordinator (ALPM) held the session, and facilitators were present throughout sessions to help with organization and to write field notes about interaction between participants.

Data analysis

Descriptive analysis was used to interpret the survey data. For the FGs, the transcribed data were analysed using a content analysis approach.[16] All FG transcripts were read twice, and significant statements were selected. These statements were grouped into subcategories, and these were further organized into main categories. After the individual analysis of both branches, the survey and FG data were compared using the side-by-side comparison technique: (i) the main categories from the FG findings were used to establish the dimensions for data comparison; (ii) the data from the FGs and survey that converged to answer the objectives of the study were identified; and (iii) the merged data are shown in Figure 1.[12] The divergent data were also identified and discussed to guide other potential studies aiming at a better understanding of the phenomenon.

Results

Participant characteristics

In total, 3895 e-mails were sent for the electronic survey; 99 ICPs completed the survey (response rate 2.5%), and the final sample was 85 ICPs. For the FGs, 224 ICPs were contacted and 22 agreed to participate. Two sessions were conducted in São Paulo (seven ICPs in each), one session was held in Campinas (four ICPs) and one session was held in Ribeirão Preto (four ICPs). The distribution of physicians and nurses was similar in both branches (40% and 60%, respectively). Groups were also similar in terms of years of experience in infection control and prevention (average 6 years). The majority of ICPs worked in public hospitals, mainly in large hospitals that care for

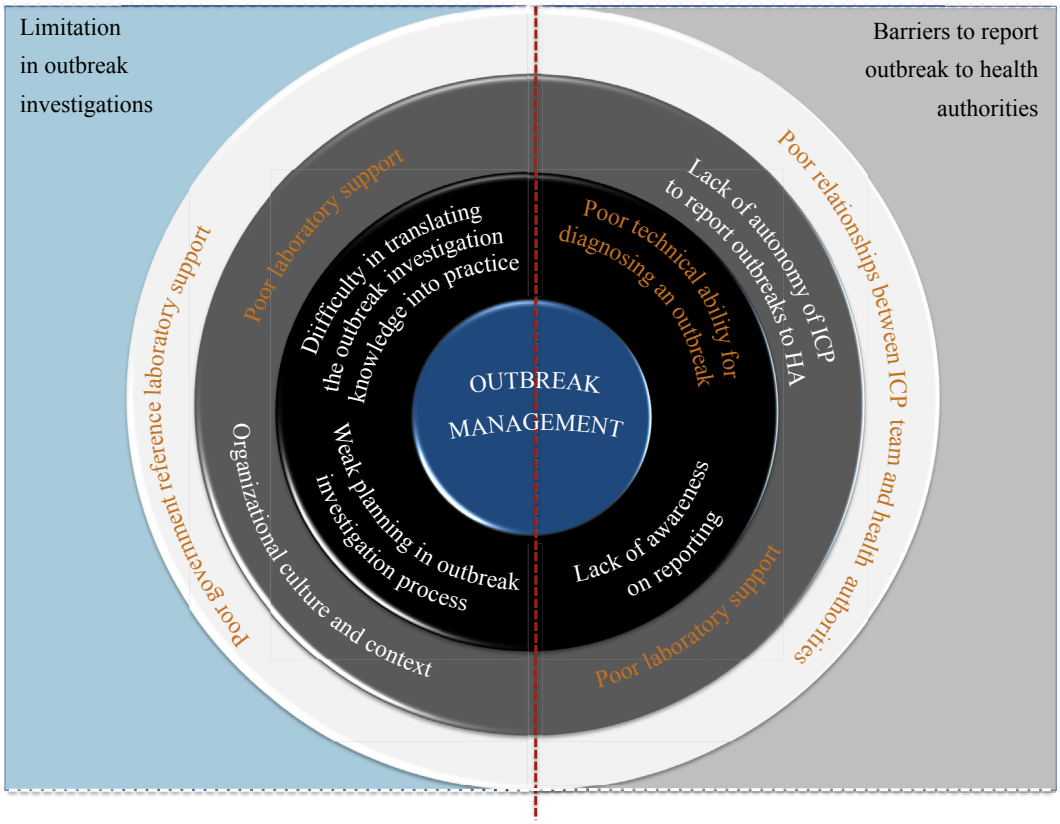

Figure 1. Schematic representation of merged data from electronic survey and focus groups regarding limitations in outbreak investigations and barriers to reporting outbreaks to health authorities. The black circle represents data integrated in the infection control team service; the grey circle represents data related to the healthcare facility; and the white circle relates to other services outside the healthcare facility. Convergent data are in white and divergent data are in orange. ICP, infection control practitioner; HA, health authority.

critically ill patients. In addition, the majority of ICPs (90%) had professional education in healthcare-associated infections (HAIs). The composition of the ICP team was similar in both groups, but the proportion of ICPs per 100 beds was higher in the survey group compared with the FGs (1.9 and 1.0, respectively). Both groups spent 33% of their working time on surveillance activities.

Barriers to NO investigation and reporting

Thirty-six survey respondents (42.3%) had reported at least one NO, and in 32 reports (88.8%), there was HA participation in NO management. The merged data related to barriers to NO investigation generated three convergent themes (difficulty in translating outbreak investigation knowledge into practice; weak planning in outbreak investigation process; and organizational culture and context) and one divergent theme (poor laboratory support) (Figure 1).

Regarding barriers to NO reporting, the merged data generated two convergent themes (lack of awareness about reporting; and lack of autonomy of ICPs to report outbreaks to HAs) and three divergent themes (poor technical ability for diagnosing an outbreak; poor laboratory support; and poor relationship between ICP teams and HAs) (Figure 1).

Similar results were reported by both nurses and physicians concerning barriers to investigating and reporting NOs in quantitative and qualitative data. As such, data were not separated by profession.

Barriers to NO investigation

Difficulties in translating outbreak investigation knowledge into practice

The majority of ICPs had complementary education on HAIs. In the survey and in FG sessions, ICPs considered their epidemiological knowledge to be sufficient (Table I). In the FGs, ICPs also felt confident about their knowledge of investigation techniques, but reported difficulties in translating this knowledge into practice. Participants reported particular difficulties in achieving prompt outbreak diagnoses during routine surveillance, and difficulties in using epidemiological tools that affected their ability to diagnose and manage outbreaks (Table II).

Weak planning in outbreak investigation process

Findings from both the survey and the FGs showed that ICPs considered their routine surveillance to be sufficient for early detection of an NO (Tables I and II). However, participants described that they were constantly experiencing demands to

Table I
Perceptions of infection control practitioners (ICPs) about barriers to nosocomial outbreak investigation and reporting, according to survey data

Statements	Agree *N* (%)	I am undecided *N* (%)	Disagree *N* (%)
Barriers to nosocomial outbreak investigation			
Difficulty in translating outbreak investigation knowledge into practice			
1) I believe that my knowledge about epidemiology is insufficient to conduct an outbreak investigation.	14 (16.4%)	11 (12.9%)	60 (70.6%)
Weak planning in outbreak investigation process			
2) The surveillance performed in my healthcare institution is not adequate to detect an outbreak early.	21 (24.7%)	3 (3.5%)	61 (71.8%)
Organizational culture and context			
3) The human resources are insufficient to conduct an outbreak investigation.	36 (42.3%)	6 (7.1%)	43 (50.6%)
4) The infection control team does not have sufficient material resources to conduct an outbreak investigation.	25 (29.4%)	7 (8.2%)	53 (62.4%)
Poor laboratory support			
5) The laboratory service in my healthcare institution is insufficient to give adequate support during an outbreak investigation.	30 (35.3%)	5 (5.9%)	50 (58.8%)
Barriers to nosocomial outbreak reporting			
Poor technical ability for diagnosing an outbreak			
1) There is a lack of knowledge about outbreak investigation among ICPs, and this is the reason for low compliance in reporting.	53 (62.4%)	6 (7.1%)	26 (30.6%)
Lack of awareness about reporting			
2) The workload of the ICP team is the reason for low compliance with reporting, because they do not have time for this activity.	42 (49.5%)	3 (3.5%)	40 (47%)
3) The non-identification of source of transmission influences low compliance in reporting.	37 (43.6%)	5 (5.9%)	43 (50.7%)
4) ICPs do not know the outbreak reporting process.	8 (9.4%)	5 (5.9%)	72 (84.7%)
5) ICPs do not know the instruments used to report an outbreak.	24 (28.2%)	14 (16.5%)	47 (55.3%)
Lack of autonomy of ICPs to report outbreaks to health authorities			
6) Some ICPs do not report because they are concerned about potential punishment from hospital managers.	55 (64.8%)	2 (2.4%)	28 (33%)
7) ICPs are concerned about possible damage to the institutional image, and this influences low compliance in outbreak reporting.	44 (51.7%)	4 (4.7%)	37 (43.4%)
Poor laboratory support[a]			
8) The laboratory service in my healthcare institution is insufficient to give adequate support during an outbreak investigation.	30 (35.3%)	5 (5.9%)	50 (58.8%)
Poor relationships between the ICP team and health authorities			
9) Health authorities' performance is based on punishment during outbreak investigations.[b]	1 (3.1%)	2 (6.3%)	29 (90.6%)

[a] This category was used for merging data in both themes of barriers to outbreak investigation and reporting.
[b] Only ICPs who had experience of an outbreak investigation in partnership with health authorities (N=32) answered this affirmatively.

prioritize other activities during the NO investigation process, and thus the development of detailed analysis of epidemiological data was frequently interrupted, resulting in a poor understanding of the outbreak (Table II).

Organizational culture and context

ICPs reported having sufficient resources for NO investigation (Table I), but described experiencing barriers to high-quality NO investigation that arose from the organizational culture and context (Table II). When hospital directors were perceived as not being committed to the management of outbreaks, this had a negative influence on the engagement of other professionals. Lack of support from unit coordinators, nurses and physician chiefs also influenced the compliance of the wider healthcare professional team with control measures.

The type of unit affected influenced how outbreaks were dealt with. For example, ICPs perceived that it was easier to investigate NOs in paediatric units compared with adult units.

Table II
Perceptions of infection control practitioners (ICPs) about barriers to nosocomial outbreak investigation and reporting, according to focus group findings

Barriers to nosocomial outbreak investigation
Difficulty in translating outbreak investigation knowledge into practice
[...] We have this difficulty, not difficulty in understanding the outbreak definition, but in looking at the epidemiologic data and identifying if we are having clusters. (ICP18)
[...] We have limitations in performing an epidemiologic chart, in conducting case–control or cohort studies. (ICP19)
Weak planning in outbreak investigation process
For reporting the outbreak, we have to describe the outbreak, we have to do the epidemiologic charts, and calculate the attack rate, we also have to make a report [...], but we abandoned it because we have such a high workload. (ICP18)
I think that we have so many activities on our routine, and for this reason we do not prioritize the outbreak investigation. (ICP16)
Organizational culture and context
If you are in a healthcare institution in which the hospital manager does not support the ICP team, it is really impossible to do any kind of work, even in an outbreak situation. (ICP19)
I think that when the unit coordinator is involved [...] it is much easier to have compliance with infection control recommendations. (ICP19)
Sometimes, in adult units, it is more difficult to conduct outbreak investigations and control [...]. (ICP10)
[...] in private hospitals during an outbreak [...]. You say: "I need thousand gowns today to stop the outbreak" [...]. The hospital can buy these gowns in the same day, but if you are in a public hospital you cannot do this. There is a bureaucratic way of working in public hospitals, according to Brazilian laws. (ICP19)
Poor laboratory support
[...] the laboratory limitation is due to understaffing and poor (microbiological) technical quality [...] in an outbreak of Kpc [carbapanem-resistant *Klebsiella pneumoniae*], they did not perform patient surveillance screening because they said that it was not possible to do this. (ICP15)
[...] we have a government recommendation which said that we had to send Kpc strains to a reference laboratory to confirm the pathogen identification. I think ... we did not have a rapid return of this result. [...] Do we have or not a Kpc? We had to say: "We do not know!"... because we did not have these results during our investigation [...].(ICP14)
Barriers to nosocomial outbreak reporting
Poor technical ability in diagnosing an outbreak
[...] when *A. baumannii* increases in a setting, is it an outbreak? [...] Do I have to report it as an outbreak? [...] We know the outbreak definition [...] We have doubts about the outbreak definitions in these situations [...] We do not think about that, we only work to prevent other cases. (ICP18)
Lack of awareness about reporting
[...] We report outbreaks caused by scabies, mumps, polio, hepatitis or emergent diseases because they affect the community. Some outbreaks, such as multi-drug-resistant bacteria, are important only in the healthcare facility and you will solve this problem locally [...].(ICP15)
It is wrong, I know, but we do not report outbreaks. (ICP18)
[...] Health authorities do not care about that. I really do not know what health authorities do with the outbreak report information. (ICP18)
I am sure that health authorities know that we have an outbreak, it is in the chart, and we send healthcare association infection data monthly [...]. They have to look and interpret these data to diagnose an outbreak. (ICP13)
Lack of autonomy to report outbreaks to health authorities
If you have an outbreak caused by chickenpox or dengue, you can report because it is an outbreak from the community [...] but you can never report a nosocomial outbreak, because it is difficult to talk about failures in infection prevention processes."It is a healthcare problem!", this is the hospital managers' thinking. [...]. (ICP14)
[...] For the ICP team there is no problem in reporting an outbreak, we believe that it is important to do that! [...] but the hospital managers do not think like that! They are concerned about repercussions from the media. (ICP10)
Poor laboratory support
[...] So, as we do not have confirmation that it is the same strain, we cannot say that it really is the same organism that is being transmitted from one patient to another. We take infection control actions, but we do not report, because we are not sure about the outbreak. (ICP19)
Poor relationships between the ICP team and health authorities
I think they want to help when we report, but they have a limited knowledge of outbreak investigation [...].(ICP15)
All my experience on reporting outbreaks to health authorities was not good, because they did not help me.[...] So why do I have to report to them? (ICP2)
[...] I do not report, because my perception is that the health authorities' professionals [...] behave punitively [...] (ICP2)

The type of hospital (public or private) also affected outbreak management. Public hospitals are under legal restrictions about how resources can be purchased (both medical products and personnel) which may impair dealing with outbreaks (Table II).

Poor laboratory support

Laboratory support was considered to be sufficient by the survey participants (Table I), but in the FG sessions, all the ICPs described this support to be unsatisfactory in hospital and governmental reference laboratories, suggesting that clinical laboratories often did not have the capacity or resources to deal with the larger number of analyses required during an NO investigation. The majority of hospital laboratories only had basic microbiological tests for the identification of pathogens. In cases where molecular techniques were required, support from the governmental reference laboratory was necessary. However, feedback from the reference laboratory usually took so long that it was not helpful for decision making (Table II).

Barriers to reporting NOs to HAs

Poor technical ability for diagnosing an outbreak

The majority of ICPs agreed that lack of knowledge regarding diagnosis or management of an outbreak was a reason for under-reporting (Table I). FG participants identified the aforementioned difficulty in diagnosing an outbreak with under-reporting (Table II).

Lack of awareness about reporting

Overall, ICPs knew about the process of NO reporting (Table I), but FG participants showed varying levels of awareness about the importance of reporting outbreaks to HAs. In general, ICPs defined which NOs they should report to HAs based on their own perceptions of the severity of the event. Perceived national relevance of the NO also influenced reporting decisions. Some NOs were seen to be solely a local 'hospital problem'. For example, NOs caused by endemic multi-drug-resistant micro-organisms were not necessarily seen as important to report as ICPs believed that this type of problem was only of local interest. Many ICPs had never reported an NO, despite the fact that they knew they should. Other ICPs thought that the routine data from HAI surveillance reported to HAs were sufficient to give all the information required for public health purposes (Table II).

Lack of autonomy to report NOs to HAs

The majority of ICP survey respondents reported concern about possible hospital punishment or damage to the institution's image as barriers to NO reporting (Table I). FG participants believed that hospital managers influenced the decision to report NOs to HAs; indeed, some participants said that managers did not allow reports to HAs. Suggested reasons for this were concern about damage to the institution's image, and potential repercussions from the media after an NO report. These findings indicate that despite NO reporting being an ICP responsibility, hospital managers have significant power to decide whether or not NO reporting actually happens (Table II).

Poor laboratory support

As the lack of laboratory support limited outbreak definition, it also affected the decision to report it to HAs (Table II).

Poor relationship between ICP teams and HAs

In the survey, participants did not tend to report that HAs took a punitive approach to investigating NOs, but this did arise as a concern in FGs (Table I and II). ICPs in the FGs did not recognize HAs as helpful providers of technical support during NO investigations. ICPs described HA behaviour as punitive, with HA audits at healthcare facilities during an outbreak mainly focused on finding the 'culprit' rather than helping to find ways to resolve the outbreak. Therefore, relationships remained poor, which inhibits further NO reporting.

Discussion

The barriers to investigating NOs were: difficulty in translating outbreak investigation knowledge into practice; weak planning in outbreak investigation process; and organizational culture and context. The key barriers to reporting these events were: lack of awareness about reporting; and lack of autonomy to report outbreaks to HAs.

Barriers to NO investigation

Outbreak management is one of the core competencies for ICPs. Accordingly, if an ICP cannot translate knowledge into practice, this competency is not actually well established.[17] The gap between knowledge and practice has been discussed, and translational research has been presented as a resolution for this problem. Training programmes based on translational strategies could be a helpful approach to enhance ICPs' capabilities in NO management.[18]

Weakness in planning skills increases workload and interferes with the NO investigation as ICPs prioritize other activities, and interrupt the process of detailed data analysis of the NO. It is well known that prioritization is essential for good planning in any process. Management skill is a required competency for ICPs; therefore, it is important that ICPs learn how to balance demands and priorities. Leadership and management skills are essential for ICPs in conducting an NO investigation, as well as consideration of how to ensure the prioritization of NO investigation and reporting. Strategies to improve ICPs' skills, including planning, negotiation, critical thinking and communication, are desirable.[17]

Efforts in dealing with NOs without full managerial support increased ICPs' workloads, leading to their potential burnout. The findings of this study suggest a need to consider the ways in which effective HAI control can be made a priority and integrated within hospital management systems in Brazil, instead of being the exclusive responsibility of ICPs.[19] In an NO caused by *Clostridium difficile* in the UK, lack of leadership, accountability and support by hospital managers were identified as the reasons for failure in controlling the event.[20] Thereafter, the UK National Health Service reinforced institutional accountability for NOs, and described the role of each healthcare professional in its management.[21]

Barriers to reporting NOs to HAs

Under-reporting may be influenced by a lack of understanding by hospital staff about NOs as a public health problem. The dissemination of NO information by HAs for other facilities or regions can benefit ICPs regarding future NO investigations, and can promote better compliance with reporting.[3] For example, a large Brazilian NO caused by rapid growing mycobacterium led to the delivery of new regulations and guidance by the Ministry of Health which aimed to prevent new cases.[22] This event highlighted that NOs are not an exclusive problem of a single isolated facility, but are a public health concern.

Lack of autonomy of ICPs in reporting NOs was influenced by concerns about potential punishment and damage to the institution's image. This was also reported as a reason for under-reporting in other study.[8,9] Ideally, HAs should improve their relationships with the media in order to reach a compromise position, assuring the right to information combined with responsibility related to public concern.

The work of the ICP team on NO prevention, preparedness, detection and management is still underestimated and undervalued.[23] NO management problems occur in most countries, yet few countries have robust strategies in place to overcome them.[3,5,7] Recognizing the barriers to NO management and reporting is the first step in the development of new strategies to improve this activity.

These findings are related to the Brazilian context. However, under-reporting of NOs is known to be a global problem.[4,7] In spite of current demands for a more intensive role of HAs in patient safety, few studies have explored how to overcome this gap in the communication between healthcare settings and HAs.[24] This study has shown that lack of awareness about the importance of reporting to national bodies, and lack of autonomy to report outbreaks to HAs are significant barriers to reporting NOs. In this sense, these data are generalizable internationally as these issues also occur in other countries,[3,7,8] and highlight relevant issues that can benefit other countries, particularly those with a similar cultural context.

The mixed methods design provided deep understanding of the barriers to investigating and reporting NOs to HAs. The integration of survey and FG data maximized the strengths and minimized the weaknesses of each type of data.[12]

Among the limitations of this study, recruitment using a list from an ICP association may have introduced bias, as these individuals were more likely to have a higher level of formal training in the field. The response rate in the survey was lower than in other studies with similar methods.[4] The topic 'nosocomial outbreaks' may have influenced participation, as this theme is frequently associated with medical errors or safety breakdowns in healthcare facilities.

Interventional studies with new strategies to improve NO investigation, such as translational education about outbreak investigation, and essential skills to conduct this activity can now be designed. A further study could be conducted in order to better understand why poor technical ability for diagnosing an outbreak, poor laboratory support and poor relationships between ICP teams and HAs were divergent between survey and FG data.

In conclusion, the barriers to NO investigation and reporting to HAs are lack of translational knowledge, insufficient skills, lack of support of hospital managers, lack of awareness among ICPs about the importance of NOs for public health, and lack of autonomy of ICPs in reporting. HAs can overcome these barriers by reforming their strategies to build collaborative relationships with healthcare services, as well as delivering translational educational programmes to support ICPs in NO management.

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