Building a safety culture for infection prevention and control adherence at Howard Springs: A workplace survey

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Abstract

Background: Building a safety culture is essential to facilitate infection prevention and control (IPC) adherence in workplaces. We aimed to explore perceptions, barriers and facilitators to IPC procedures by the Australian Medical Assistance Team (AUSMAT) at Howard Springs International Quarantine Facility (HSIQF).

Methods: We performed a descriptive analysis of a cross-sectional survey administered to the AUSMAT employed at HSIQF from October 2020 to April 2021. We described motivation, training and compliance to IPC adherence and Likert scales described the level of agreement to the success of IPC procedures across the domains of communication, risk, trust, safety and environment, from the individual, team and organisational perspective.

Results: There were 101 participants (response rate 59%, 101/170) and 70% (71/101) were clinical. There was strong agreement to the success of IPC procedures, with a median 4 (agree) or 5 (strongly agree) across each domain and perspective of the 67 Likert items. Clinical staff reported slightly higher agreement than non-clinical staff across Likert items. To improve IPC compliance, most reported that daily training should be provided (77/97, 79%) and daily training was very or extremely effective (91/97, 93%). Participants were motivated by protecting self, friends, family and the community rather than workplace pressures. Barriers to IPC compliance were the ambient environment and fatigue.

Conclusions: A safety culture was successfully built at HSIQF to optimise IPC adherence whilst managing multiple hazards including prevention of COVID-19 transmission. Strategies implemented by AUSMAT at the quarantine facility may inform the development of safety culture in other settings.

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Highlights

- AUSMAT were motivated by protecting self, friends, family and the community rather than workplace pressures.
- Respondents strongly supported the IPC procedures implemented, including daily systemised immersive training.
- Ambient environment and fatigue were barriers to IPC adherence, however respondents felt safe in the workplace.
- A safety culture was built, despite acknowledgement of the workplaces high-risk environment.

Introduction

Workplace safety has become a critical component of effective health system response to mitigate the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission during the coronavirus disease (COVID-19) pandemic. A strong safety culture is founded on a consistent safety climate that addresses employee risk perception in the workplace [1,2]. In infectious diseases settings, a safety culture requires an understanding of barriers and facilitators to healthcare workers’ adherence with infection prevention and control (IPC) guidelines [3].

The COVID-19 pandemic created unprecedented challenges to safety culture, with employees experiencing high levels of psychological distress and safety challenges [4,5]. In this context, there is a need to prioritise safety to meet workplace challenges, particularly in high-risk, complex settings such as healthcare and quarantine facilities.

In the Northern Territory, Australia, the Australian Medical Assistance Team (AUSMAT) managed Howard Springs International Quarantine Facility (HSIQF) from October 2020 to April 2021. During this period, the operation quarantined 7105 repatriated Australians, including management of 205 confirmed COVID-19 cases. To meet the operations demands, AUSMAT employed a hybrid model combining existing highly skilled and trained experts, with new surge staff who were not required to complete the rigorous selection process of existing team members. The operation managed multiple hazards with competing safety challenges, including frequent new staff, inexperienced personnel, heat management in the tropical savanna environment, and preventing SARS-CoV-2 transmission whilst the national policy aimed for suppression and elimination and vaccination was unavailable. To address the safety challenges and build a cohesive team, novel strategies were adopted. Further details about the operation are detailed elsewhere [6,7].

Safety perceptions are well-described in the hospital setting, with employees describing the need for strong leadership, clear policies and procedures, open communication and feedback, continuous learning and training opportunities, workload management, non-punitive approach and teamwork with a collective accountability for safety [8]. In healthcare, motivation is often driven by reward and patient safety, whilst IPC compliance is motivated by a range of factors, including protecting self, family and community, hierarchical influence and prioritization according to perceived risk [9–14]. Understanding safety perceptions is important to maintain employee well-being, achieve operational outcomes and identify areas for improvement. However, we could not identify any peer-review publications that explore safety perceptions during COVID-19 emergency response operations or in quarantine facilities. Therefore, we aimed to understand safety perceptions, barriers and facilitators of IPC procedures of the AUSMAT at HSIQF.

Methods

Study design, setting and population

A cross-sectional survey was administered as part of AUSMATs routine engagement in quality assurance and continuous improvement activities. All AUSMAT personnel employed to support COVID-19 response activities at HSIQF between October 2020 and April 2021 were eligible for participation. Participation was voluntary and both participants and non-participants remained anonymous unless they expressed interest in discussing their survey. The sample size was determined pragmatically by the number of eligible participants that complete the survey.

Data collection

An online survey was created using SurveyMonkey (Momentive Inc - California, USA) and directly emailed to eligible staff by AUSMAT leadership in April 2021. The survey remained open for completion for one month.

Survey instrument

A search for a validated instrument was conducted prior to the development of this survey and none were found to be appropriate to evaluate staff perspectives of their IPC safety in an outdoor austere setting. Therefore, a survey was developed by AUSMAT leadership team members with expert advice provided from a public health physician, epidemiologist, occupational psychologist and psychiatrist and was piloted by senior AUSMAT and operational personnel with methodological qualifications. The survey was informed by a recent Cochrane review, followed the Checklist for Reporting Results of Internet E-Surveys [3,15]. The final survey instrument and included 22 questions and 67 Likert items.
Basic education and employment data were captured. Ranking scales assessed learning preferences and motivation for IPC adherence. Five-point Likert items (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree) were used to rate the level of agreement to the success of IPC procedures from three perspectives (individual, team and organisational) and across five domains (communication, risk, trust, safety and environment). We explored self-report IPC breaches and their cause, whereby 'breach' indicated a potential compliance error rather than an incident requiring 14-day furlough, but the terminology was used to standardise and simplify language in the operation [6,7]. Survey questions were not mandatory for completion. The survey, including each Likert items domain, is provided in Supplementary Material 1.

Domains
The five domains assessed different components of IPC safety culture. Communication included access, understanding, quality and adaptation. Risk included the identification, preparation and response of hazardous events. Trust included the reliability of procedural implementation adherence. Safety included risk perception and workload management. Environment included the physical environment and equipment availability and quality.

Data analysis
Descriptive analysis summarised continuous variables as median with interquartile range (IQR) and ordinal variables as count with percentage. Median ranking score was calculated as the weight of ranked position divided by the response count for answer choice. Likert items were assigned a numeric value from one (Strongly Disagree) to five (Strongly Agree) and each allocated to one perspective and domain. Likert items were reversed for five statements which were negatively worded towards the failure of IPC procedures rather than the success (Supplementary Material 2) [16,17]. Likert scales then summarised the level of agreement across each domain and perspective, as median [IQR]. Mann Whitney tests compared differences between clinical and non-clinical staff scores. As survey questions were not mandatory, the denominator for analysis was shifted according to the number of participants that responded to the respective question. Data analysis was performed using RStudio Version 4.0.2 [18].

Ethics
This investigation was conducted under the auspices of public health legislation and ethics committee approval was not required [19].

Results
Participants
There were 101 participants: a response rate of 59.4% (101/170) for eligible participants. The response rate of each question ranged from 82% to 100%, and 96% (97/101) of participants completed at least 80% of the survey. Most participants were clinical (71/101, 70.3%), including medical, nursing, paramedics, allied health and laboratory
scientists, and 29.7% (30/101) were non-clinical, including ground support officers, logistics, management, information technology, concierge and interpreters. Participants were most commonly onsite in February 2021 and for 3–4 weeks duration. Table 1 presents participant characteristics.

**Motivation**

Participants motivation for IPC compliance were protection of self, friends/family and the local community. Self-protection was ranked first for more than half of participants (59/101, 58.4%), and protection of friends/family was ranked second for more than half of participants (58/101, 57.4%). Keeping one’s job and avoiding conflict/confrontation in the workplace were mostly ranked either sixth, 39.6% (40/101) and 47.5% (48/101) respectively, or seventh 50.5% (51/101) and 41.6% (42/101) respectively. Table 2 presents the average ranking score for motivation to comply with IPC procedures.

**Training**

Most participants (77/97, 79.4%) reported daily training should be provided to ensure all team members comply with IPC, and that daily personal protective equipment (PPE) training is very effective (50/97, 51.6%) or extremely effective (41/97, 42.3%) at ensuring IPC compliance. Most participants agreed and strongly agreed there was access to quality PPE training for themselves (92/97, 93.9%) and their team (94/97, 96.9%). The preferred learning method of participants was visual and kinetic, with 46.5% (47/101) of participants equally ranking each as the most preferred method (Table 3).

**Compliance and reporting**

Half of participants self-reported one or more IPC ‘breach’ during their employment (51/101, 50.5%) and most were confident or very confident (85/101, 84.1%) their breaches would have been identified. Most participants attributed the self-reported IPC breaches to a combination of causes, the most common were; ambient environment (e.g., heat, wind or rain) (36/70, 51.4%) and fatigue (28/70, 40%). Most participants were aware how to report breaches (94/101, 93.1%) and three quarters (74/101, 73.3%) felt supported to report breaches all the time; 13.9% (14/101) most of the time, 10.9% (11/101) were neutral and two (1.98%) reported sometimes.

**Domains and perspectives**

There was overall strong agreement with Likert items on the success of IPC procedures at across all domains, and for each perspective (Fig. 1). Clinical staff reported slightly higher agreement than non-clinical staff ($p = 0.98$), including for communication (5 vs 4.5), risk (5 vs 4.5), trust (5 vs 4) and safety (5 vs 4), but scores were equal for environment (4 and 4). Clinical staff had a slightly higher level of agreement from an individual and team perspectives (5 vs. 4), however both scored 5 from an organisational perspective. Results of individual Likert items are provided in Supplementary Material 2. Fig. 1 presents the overall median Likert scores across domains and perspectives.

<table>
<thead>
<tr>
<th>Learning method</th>
<th>Weighted rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>3.40</td>
</tr>
<tr>
<td>Kinetic</td>
<td>3.23</td>
</tr>
<tr>
<td>Auditory</td>
<td>1.79</td>
</tr>
<tr>
<td>Reading/Writing</td>
<td>1.58</td>
</tr>
</tbody>
</table>

Fig. 1 Median Likert score responses for the level of agreement to the success of infection prevention and control procedures, across domains and perspectives.

![Fig. 1](image-url)
Communication

All communications statements regarding access, understanding, quality, and support had ≥85% of participants agree or strongly agree. When asked whether respondents felt there was participation in the development of IPC procedures, most participants were neutral from the individual (31/99, 31.3%) and team perspectives (38/99, 39.9%), however 12.1% (16/99) and 24.3% (24/99) disagreed or strongly disagreed regarding individual and team contributions, respectively.

Risk

All risk statements relating to the ability of IPC procedures to identify, prepare, and respond to hazardous events had ≥85% of participants agree or strongly agree. Over half of participants (55/97, 56.7%) rated there was high risk involved in running HSIQF, and 100% (97/97) agreed or strongly agreed that the organisation IPC procedures reduce the risk of exposure to SARS-CoV-2 in the workplace.

Trust

All trust statements relating to the reliability of IPC procedures to be implemented and adhered to had ≥90% of participants agree or strongly agree. Trust was high; most reported that if a team member reported an IPC breach, they would not trust them less. Teamwork was perceived to enhance IPC compliance; most participants strongly agreed (68/97, 70.1%) or agreed (28/97, 28.9%).

Safety

Most safety statements relating to risk perception and workload had ≥90% of participants agree or strongly agree. There was some variation for workload and in response to whether staffing levels were adequate to perform the IPC procedures, 32.0% (31/97) strongly agreed, 45.4% (44/97) agreed, 15.5% (15/97) were neutral, 6.2% (6/97) disagreed and 1.0% (1/97) strongly disagreed. Most participants felt safe (64/97, 66.0%) or safe (30/97, 30.9%) at HSIQF considering the risk of infection. Feeling safe was also reported when asked to select words used to describe IPC procedures at HSIQF; the most common word selected was ‘safe’ (97/101, 96.0%) and no participants selected 'unnecessary' or 'invasive'. The most common words reflecting IPC barriers were 'uncomfortable' (17/101, 16.8%) and 'hard' (16/101, 15.8%), however 'comfortable' (23/101, 22.8%) and 'easy' (25/101, 25.8%) were more commonly reported.

Environment

Environmental factors had the most variation in responses, ≥85% of agreed or strongly agreed with statement relating to availability and quality of equipment, however, the ambient environment was perceived as a barrier. Some participants agreed or strongly agreed the outdoor weather conditions made their job feel less safe from both the individual 43.3% (42/97) and team 30.9% (30/97) perspectives. Most participants agreed or strongly agreed (66/97, 67.0%) the organisations ambient environment management strategies improved safety and that heat management strategies on site were effective at managing their health (84/97, 86.6%) and their teams health (81/97, 83.5%).

Discussion

We demonstrate that AUSMAT at HSIQF developed a strong safety culture primarily driven by the desire of staff to protect self, friends, family and the community, superseding specific workplace obligations, though these were also met. There was strong support that a range of safety culture dimensions were achieved, despite perception that the workplace was a high-risk environment. The ambient environment and fatigue were the key barriers to IPC adherence; but facilitation of strong safety focused procedures, embraced by staff, enabled a feeling of safety in the workplace despite the perceived and overt personal risk.

In our survey, IPC procedures were reported to be clear, accessible and of high quality, and training was of adequate frequency and quality, despite communication and training reported in existing literature as key barriers to safety culture and IPC adherence [3,6,20]. Visual and kinetic learning methods were preferred, and daily training was perceived to be essential. Interactive multimodal education and training interventions can improve IPC confidence, competence and adherence [21,22]. At the time of deployment, the multimodal interventions implemented at HSIQF went beyond national and international recommendations and are likely to have reduced risk perception and contributed to the safety culture [23,24].

We report that a cohesive team was built through high levels of trust and strong agreement that IPC procedures were successful from a team perspective. There was consensus by respondents that teamwork enhanced and facilitated IPC compliance, despite use of a hybrid workforce model, which has not been previously done by AUSMAT. Whilst multi-disciplinary teams may be more fragmented in IPC adherence, this was not reflected in our results, despite the use of a hybrid workforce [14]. Respondents felt supported to report PPE breaches, which represents that a core component of safety culture, a non-punitive approach, was perceived. Whilst half of participants self-reported a PPE ‘breach’, there were no true PPE protocols requiring staff to be furloughed for 14 days [6].

We note similarities with existing literature, including that heat and fatigue are barriers to IPC adherence [13,25]. Ambient environment was a major barrier in our outdoor setting, which increased risk perception, however respondents perceived workplace operations as manageable, management strategies improved safety, and that staffing was mostly adequate. Other IPC barriers commonly reported in literature of inadequate infrastructure and equipment were not reported by participants, potentially due to AUSMATs prioritization of stockpiling and safe physical environments for the operation [11–13,25,26]. In our survey, facilitation of IPC adherence was motivated by
protecting self, friends, family and the community, compared to previously reported influences of workplace hierarchy or fear [12–14]. The motivators may further the success of team cohesion as motivators for IPC adherence often reflect the attitudes and practices of surrounding staff [11,26].

Our study has some limitations. First, this survey was implemented as part of routine quality assurance and continuous improvement activities rather than as research, therefore there was no power calculation. However, there was a 60% response rate which is higher than the average health care professional response rate [27]. Second, the sample was restricted to AUSMAT staff, despite the operation also involving local contractors, local and federal police and the defence force. Therefore, results are not generalisable to all staff at HSIQF. Third, we utilised a non-validated survey instrument, however there is no single method or tool to measure all dimensions of safety culture, or specifically from an IPC perspective, and our survey was based on a recent Cochrane review and validated checklist with expert advisory.

Overall, our study has contributed to understanding safety perceptions, barriers and facilitators from both clinical and non-clinical staff in a high-risk environment where there was a COVID-19 zero goal. Our findings highlight the importance of adapting procedures according to the context and strategies implemented at HSIQF may inform mechanisms to build a safety culture in similar emergency response operations or quarantine settings. Future research can explore input from additional employment groups in multidisciplinary operations and combine qualitative interviews to provide further insights.

Conclusion

At HSIQF, AUSMAT strategies focussed on building a safety culture to overcome barriers to IPC adherence whilst managing multiple hazards, including preventing transmission of COVID-19. Despite operating in a high-risk environment, AUSMAT staff felt safe and supported the procedures implemented, which represents an alignment with the operations prioritisation of collective safety and staff empowerment. Our findings can improve understanding on mechanisms to create a safety culture and highlight the importance of implementing a range of strategies to support staff managing emerging diseases.

Authorship statement

Conceptualisation — SC and AT. Survey design and implementation — SC, AT, LM, KW, KM and NW. Formal Analysis — SC. Manuscript writing — SC and AT. Supervision — ; NW. SC and AT contributed equally to this manuscript. All authors reviewed, edited and approved the final version of the manuscript.

Data accessibility

Data are available from the corresponding author on reasonable request, and subject to permission.

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Provenance and peer review

Not commissioned; externally peer reviewed.

Ethics

This investigation was conducted under the auspices of public health legislation and ethics committee approval was not required [19].

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.idh.2022.07.004.

References


