American Journal of Infection Control 53 (2025) 188–195

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Infection Prevention and Control Response and Escalation Framework: Evaluation and application beyond a pandemic

Kathy Dempsey MNSc, CICP-E [a,b,*], Susan Jain MIPH, PhD, CICP-E [a,b], Patricia Bradd PhD [a,c], Kate Clezy MBBS, FRACP [a], David Greenfield PhD [b]

[a] Infection Prevention and Control and HAI, Clinical Excellence Commission, Sydney, New South Wales, Australia
[b] School of Population Health, UNSW Sydney, Sydney, New South Wales, Australia
[c] School of Public Health, UTS Sydney, Sydney, New South Wales, Australia

Key Words:
Infection Prevention and Control Practitioner
IPAC Framework
IPAC risk matrix

Background: The COVID-19 pandemic resulted in constant changes to Infection Prevention and Control (IPAC) recommendations, impacting clinician capacity to stay up to date. The COVID-19 IPAC Response and Escalation Framework (IPAC Framework), rarely reported or evaluated was developed to provide scalable IPAC guidance during the pandemic to health care in New South Wales (NSW), Australia.
Methods: Using a thematic analysis approach, a qualitative study using an online, cross-sectional survey comprising 27 questions was sent to 248 key stakeholders. Participants were health workers with broad clinical and system representation with responsibilities for risk assessment, communicating, implementing, or monitoring the IPAC Framework.
Results: The IPAC Framework provided a useful IPAC tool for the management of COVID-19 as perceived by 93% of respondents. The overwhelming majority (91%) reported the Framework provided enough information on IPAC strategies needed for COVID-19 that were aligned with transmission risk. Resources supporting the IPAC Framework were reported by most respondents (84%) as being widely accepted as the authoritative guidance.
Conclusions: An IPAC Framework is perceived as invaluable by clinicians and administrators to manage IPAC requirements in health care during a pandemic. The IPAC Framework can be applied more generally to support ongoing IPAC requirements.

BACKGROUND

Over 2020 to 2023, the COVID-19 pandemic challenged and overwhelmed health systems around the world. Governments and health systems responded following Infection Prevention and Control (IPAC) Frameworks, policies, and guidelines, attempting to contain and minimize spread, illness, and deaths.[1,2] The health impact and outcomes internationally varied considerably, from low impact in places such as New Zealand through to high impact in countries such as Italy, India, and Argentina.[2] Given the familiarity with managing infectious disease outbreaks, seasonal influenza, and previous threats of novel infections, most countries turned to established IPAC strategies used for outbreak management.[3,4] However, control and preparedness policies historically focused on influenza pandemic management.[5,6] These plans with technical, centralized processes and decisions designed to serve professionals in health care proved inadequate for the management of the COVID-19 pandemic.[4,6,7]

IPAC refers to evidence-based practices and procedures that, when applied consistently in health care settings, can prevent, or reduce the risk of transmission of microorganisms to patients, clients, health care providers, residents, and visitors.[8-10] Throughout the pandemic, it became increasingly challenging to translate IPAC strategies equally within the health care context let alone beyond into community environments. Interventions and risk assessment steps used in outbreak management are often unclear to clinicians outside of IPAC. IPAC Frameworks are a method used to pull

* Address correspondence to Kathy Dempsey, MNSc, CICP-E, 1 Reserve Road, St Leonards, NSW 2065, Australia.
E-mail address: Kathy.dempsey@health.nsw.gov.au (K. Dempsey).
Conflicts of interest: None to report.

https://doi.org/10.1016/j.ajic.2024.10.036

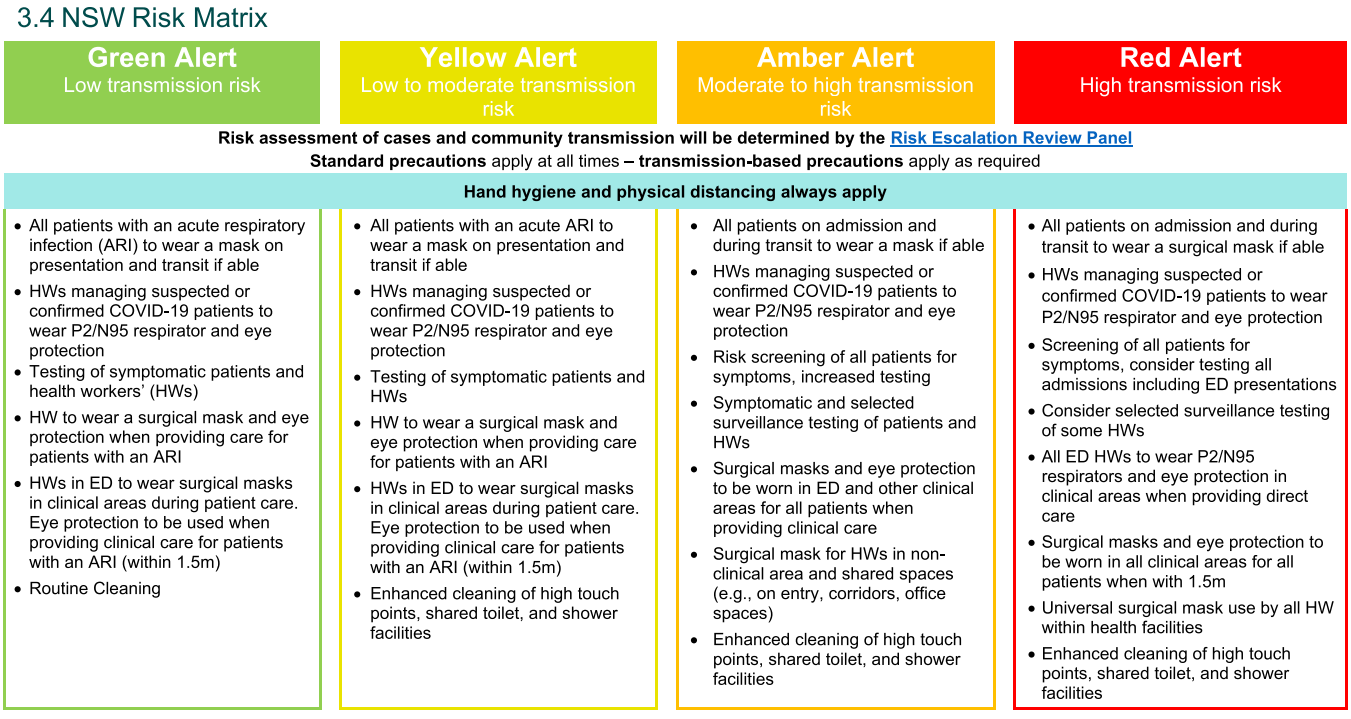
recommendations together, minimizing IPAC risks to different types of settings and conditions as part of the decision-making.[8,11,12]

During situations of increased risk to the community or health settings, it was necessary to escalate and provide a proportionate response with specific IPAC precautions and actions. This, in addition to ensuring IPAC was applied consistently, transparently, and highly visible to the community to ensure confidence in the IPAC response. Globally, success in IPAC varied considerably across, and within countries.[13-15] There were multiple reasons for this, including the lack of nationally applied IPAC Frameworks. However, from a health policy perspective, the key issues were 2-fold: firstly, that the focus of IPAC Frameworks was within health care facilities and services, not community contexts; and secondly, the material was a set of principles or broad strategic approach and less of a set of detailed actions and requirements.

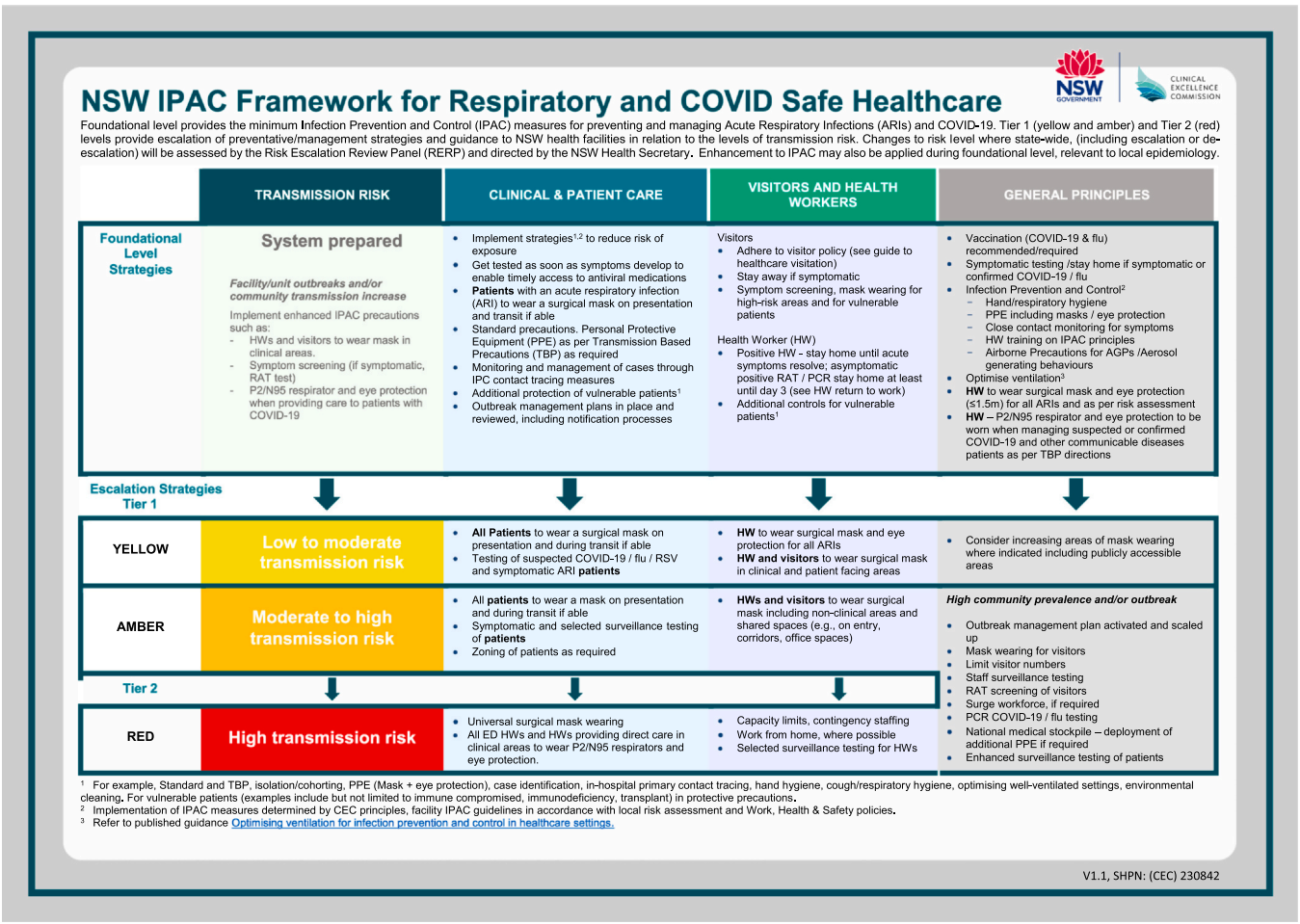
In many instances, countries were developing their own IPAC Frameworks for acute and public health responses in real time as the pandemic unfolded.[14-20] This included countries such as Canada, England, Singapore, France, the United States, and Australia.[14,15,17,21-24] While internationally COVID-19 alert frameworks varied, they all included the following features: a schematic system, usually colors or numbers; different risk levels as defined by specific indicators; measures that corresponded to the intensity of control needed to maintain the epidemiological situation at each level of community control strategies; and indicators, usually updated weekly to trigger moving up or down a level usually based on cases and hospitalizations/health system capacity.[14,15,17,25]

In Australia, in the State of New South Wales, the Clinical Excellence Commission (CEC) developed an IPAC Framework. The IPAC Framework streamlined communication and the escalation pathway between policy and operational arms, thereby aligning pandemic risk and the public health care system (NSW COVID-19 IPAC Framework). The CEC is responsible and accountable for the delivery of NSW Government and NSW Health priorities, to lead, support, and promote improved safety and quality in clinical care as the lead agency for IPAC across the NSW health system.[26] The IPAC Framework incorporated 3 elements for implementation: the COVID-19 Risk Escalation Framework (set of principles on how to implement the risk matrix) (Frameworks 1 and 2); the Risk Matrix (IPAC strategies for management of varying levels of risks); and Risk Escalation Review Panel (selected group of clinicians and key stakeholders across the breadth of the health service). Key elements were transmission (alert) levels; transmission-based precautions; application of personal protective equipment; staff safety; visitor restriction/supporting visitors; service delivery; and IPAC testing and surveillance.

The IPAC Framework's primary aim was to provide guidance to NSW health facilities on risk levels of COVID-19 transmission risk and scalable IPAC mitigation strategies. The IPAC Framework described risk levels (risk matrix) associated with COVID-19 transmission risk and the IPAC precautions required using a traffic light system.[11] That is, nil to low risk—Green, low to moderate risk—Yellow, moderate to high risk—Amber, and high risk—Red. The purpose of the risk matrix was to support NSW health facilities to respond to the changes to transmission risk of COVID-19. Changes to risk levels were determined at the State level, by the Risk Escalation Panel, led by IPAC and in consultation with the Ministry of Health (MoH); Population (Public) Health; Communicable diseases; Infectious diseases, Agency for Clinical Innovation, the lead agency for innovation in clinical care; Workforce, HealthShare, centralized support services such as procurement, environmental services, and



Framework 1. NSW Risk Matrix Framework—archived.



Framework 2. NSW IPAC Framework for Respiratory and COVID Safe Healthcare. NSW IPAC Framework for Respiratory and COVID Safe Healthcare, v1.1 (accessed 2/6/2024).

transport; clinical services and other key stakeholders such as NSW Ambulance. A COVID-19 Risk Monitoring Dashboard was developed and published from December 2, 2020. The dashboard outlined and communicated the alert levels and aligned IPAC measures for preventing and managing COVID-19 to the entire NSW health care system (COVID-19 Risk Monitoring Dashboard). The IPAC Framework incorporated IPAC strategies usually used by the clinical services Infection Prevention and Control Practitioner packaged in a transparent and visible format.

Evaluating health policy interventions is necessary to understand their impact, identify and mediate unintended consequences, and prepare for the future.[27,28] A key component of implementation outcomes is the perceptions of people delivering and utilizing the intervention.[29] Hence, we aimed to evaluate the IPAC Framework's impact in providing effective IPAC advice for health professionals' management of COVID-19 pandemic response. Additionally, we sought to understand the experiences of key stakeholders using the IPAC Framework so that the knowledge can be used to inform future pandemic preparation.

METHODS

Design

A cross-sectional study was conducted between March 29 and October 3, 2023. The study used a purpose-designed online survey questionnaire targeting key stakeholders of the NSW health system.

Participants

Participants were selected based on their role and responsibilities for implementation and monitoring of the IPAC Framework across the NSW health system. Invited participants were members of NSW IPAC networks and committees. There was a broad representation of clinicians, IPAC practitioners, clinical specialties, and governing agencies for COVID-19. Key stakeholder groups targeted for participation included the NSW IPAC network, The Healthcare Associated Infection specialty taskforce, LHDs Directors of Clinical Governance, and the NSW COVID-19 Clinical Council. Participant roles involved promoting the application, education, and advice about the IPAC Framework and associated resources, implementation and monitoring activities, and compliance tasks. Potential participants were sent an initial and a follow-up reminder e-mail. Participation was online, voluntary, and anonymous. A total of 248 participants were invited to complete the survey.

Ethics approval was obtained from the relevant research ethics committee (2022/ETH01489). Consent was implied through participation.

Variables and instruments

A purpose-designed questionnaire survey was developed. The survey content was identified and selected with reference to the IPAC literature, informal discussions with stakeholders, and aligned to the IPAC Framework. The survey questionnaire draft was

distributed to an expert group that consisted of 10 Infection Prevention and Control Professionals and 2 infectious disease specialists. Based on the feedback, questions were modified for clarity. The survey questions were developed with the consideration to expose any challenges with interpretation, application, and implementation, Table 2 elaborates on the challenges and limitation by scoring the feedback with a scale of strongly agree to strongly disagree.

The survey comprised 27 questions, divided into 4 sections, with multiple-choice and open-end questions. On average, the survey required 20 minutes to complete. First, the survey had 3 questions on participants' work demographics, clinical specialty, and organizational environments.

Second, 16 questions focused on the IPAC Frameworks: implementation and impact. Questions covered multiple issues, including exploring IPAC Framework usefulness in providing IPAC guidance; adequacy of information provided in the IPAC resources (COVID-19 IPAC Manual, IPAC Guidelines, factsheets, and tools); and the mitigation strategies needed to prevent and manage COVID-19. In addition to assessing whether the level of detail of each of the key elements of IPAC when aligned with transmission risk was successful in achieving short-, medium-, and long-term goals.

Third, participants were asked 5 questions in relation to the IPAC Framework itself and their views on continuing with the current alert levels, 2 prepopulated alternative options, or an option described by the respondent.

Finally, participants were asked 3 questions for additional comments. The focus being to improve the IPAC Framework beyond pandemic management and actions to improve future IPAC pandemic preparedness.

Data analysis

Responses to multiple-choice questions were collated and analyzed using simple descriptive statistics, displayed in number and percentage of responses. Open-ended responses were collated and examined using thematic analysis.[30] An inductive content analysis was used to analyze the open-ended questions and general comments. The descriptions consisted of single words or short sentences. All responses were carefully read through in full to get an overall impression of the answers. Microsoft Excel was used to code and track the themes to analyze the qualitative data. Similar descriptions received the same open code, and these codes were further grouped, followed by the generation, and categorizing of data into subcategories. These codes were entered into Power BI to generate common themes. Multiple discussions were held by the researchers to reach consensus to ensure reliability and credibility of the outcome.

RESULTS

There were 102 (41%) respondents, noting all invited networks and committees were represented (Table 1). The IPAC network contributed the majority of responses followed by the Taskforce and then professionals in clinical roles. The responses covered metropolitan and rural/regional settings, with more from the former. Responses were received from professionals across all service settings, including acute care, disability, aged care, community and primary care, and mental health and corrections health.

The results showed that participants strongly agreed the IPAC Framework provided the health system with a useful, effective, and sufficient IPAC management tool (Table 2). IPAC resources, such as the COVID-19 IPAC Manual, IPAC Guidelines, factsheets, and tools, were reported as being the reference for IPAC guidance by an overwhelming majority of participants (82%). Information in the IPAC COVID-19 manual and the IPAC Framework was reported by the majority of participants (84%) as providing effective additional guidance supporting the IPAC Response and Escalation Framework.

Overwhelmingly, participants (86%) reported the guidance and the IPAC Framework being implemented in their workplace, with only a minority disagreeing (10%). Similarly, 80% of respondents indicated updates of the guidance and the IPAC Framework were timely. When asked to review the future format of the IPAC Framework or IPAC risk assessment, less than half of respondents (43%) supported retaining the existing IPAC Framework. Whereas, just over half of the participants (56%) requested amendments in response to pandemic changes. Participants were able to provide free-text input resulting in a revised IPAC Framework version (Framework 2).

Participants agreed there were detailed instructions in the IPAC elements with the exception being advice for visitor restrictions support. The advice relating to visitor restrictions although not further explored here lacked detail in comparison to the other IPAC elements.

Participants (41%) identified the positives and challenges with the IPAC Response and Escalation Framework guidance in reference to the IPAC Framework and supporting resources (COVID-19 IPAC Manual, IPAC Guidelines, factsheets, and tools). On the positive side, the guidance was considered beneficial, consistent, highly valued being from the lead organization in one place, and provided a clear direction but with flexibility to respond to local context. The information was trusted, seen as evidence based and extremely useable by those at the frontline. The challenges were noted as having 2 components, that is, the amount of detail provided and being able to absorb and use the information in a timely manner; and the advice conflicting with other authorities in the field. Areas for improvement

Table 1
Study participants, services, and specialties

Study participants—demographics		
Participant group	Member numbers (N = 248)	Response numbers (N = 102)
Infection Prevention and Control Network	144	71
CEC IPAC/HAI Specialty Taskforce representing the following specialties: public health; infectious diseases; emergency; occupational medicine; and nursing	28	14
Directors of Clinical Governance	51	10
NSW COVID-19 Clinical Council	25	7
Health services		Distribution
Metropolitan		65%
Rural/regional		35%
Specialty		
Acute care		66%
Community and primary care; aged care; disability; mental health; corrections health		34%

CEC, Clinical Excellence Commission; *HAI*, Healthcare Associated Infection; *IPAC*, Infection Prevention and Control.

Table 2
Questions and response rate

Questions	Strongly agree/Agree
Investigation around guidance	
1. The Response and Escalation Framework comprised different alert levels (Red, Amber, Yellow, and Green) and was developed to provide IPAC guidance to NSW health facilities on the various levels of COVID-19 transmission risk. The Framework provided a useful IPAC management tool	93%
2. The Framework provided enough information on the IPAC strategies needed for COVID-19 that were aligned with the transmission risk	91%
3. The Framework provided detailed instructions on each of the key Infection Prevention and Control (IPAC) elements*	78%-96%
4. The Framework improved implementation of relevant IPAC strategies in assisting my organization or community of practice (COP) in fostering clinician engagement through adherence to IPAC	77%
5. The IPAC Response and Escalation Framework improved the adherence to IPAC through increase of clinician engagement and interest in IPAC in each of the key elements	67%-82%
6. Overall, the CEC resources* related to COVID-19 Infection Prevention and Control were accepted as the guidance to follow	84%
Management and implementation	
7. My workplace was aware of the IPAC Response and Escalation Framework and each of its key elements	87%
8. The IPAC Response and Escalation Framework and each of its key elements was able to clearly inform guidance for the clinical setting	85%
9. The IPAC Response and Escalation Framework and each of its key elements was able to clearly inform guidance for the nonclinical setting	65%
10. In my workplace, the application and implementation of the IPAC Response and Escalation Framework and each of its key elements was clear (LIST)	78%-90%
11. The resources† and additional risk matrices provided effective additional guidance supporting the IPAC Response and Escalation Framework	85%
12. The CEC Framework and resources were implemented in my workplace	86%
13. The Framework and resources were frequently updated as information and the pandemic evolved. The provision of the Framework and resources to my organization was timely	80%
Comments on the Framework and supporting resources exemplar comments	41%

Positive	Challenges	Improvement opportunity
• One source of truth • The ability to refer NSW health care workers to 1 centralized repository for all IPAC guidance • Clear and strong governance structure for IPAC • The IPAC Framework enabled health organizations to coordinate varying response needs based on local risks/demand/circumstance/culture • Brilliant with current and latest advice—unique and effective for rural and regional areas • Providing a level of trust, confidence, and reassurance • Evidence-based and well- considered information • Showing coordinated support and leadership for IPAC from the statewide lead agency—CEC • Excellent and extremely resourceful	• Sometimes were too much at times while the system was under pressure • A little overly detailed sometimes • Conflicting advice at times between Public Health orders, CEC IPAC guidelines, and Local Health District guidelines • Resources were timely but took a long time for district implementation	• More engagement and collaboration with the private sector being more beneficial • Improving relatability of the IPAC Framework specifics to other settings such as oral health • Improvement for implementation, communication, and updates between government departments

CEC, Clinical Excellence Commission; *PPE*, personal protective equipment.
*Key elements: Transmission (Alert) Levels; Transmission-Based Precautions; Application of PPE; Staff Safety; Visitor Restriction/Supporting Visitors; Service Delivery and IPAC; Testing and Surveillance.
†Resources refer to the COVID-19 IPAC Manual, IPAC Guidelines, factsheets, and tools found on the CEC COVID-19 IPAC Web site (https://www.cec.health.nsw.gov.au/keep-patients-safe/COVID-19).

covered a different set of issues, that is, need for enhanced communication and collaboration between agencies across government and frontline service delivery—across public-private organizations; and retaining and expanding the use of the IPAC Framework beyond the pandemic.

Participants ranked predefined actions to improve IPAC preparedness for the next pandemic (Table 3). The top-5 actions received between 50% and 74% endorsement (being ranked in first-fourth place by respondents). Whereas the other 3 actions received 56% to 76% identifying them as lower priorities.

DISCUSSION

This study aimed to evaluate the IPAC Framework's impact in providing effective IPAC advice for health professionals' management of COVID-19 pandemic response. Additionally, we sought to understand the experiences of key stakeholders using the IPAC Framework so that the knowledge can be used to inform future pandemic preparation.

Since the emergence of COVID-19 in Australia in early 2020, the support from the CEC IPAC and the Response and Escalation Framework provided the core elements of the NSW Health pandemic response. The key stakeholder feedback overwhelmingly supported the idea of a centralized and lead agency for supporting and providing IPAC guidance. The CEC's central position and subject matter credibility positioned them for this role. They provided clear governance and subject matter expertise for an effective pandemic response.

The CEC's response was based on the collective efforts of the NSW IPAC networks and committees, comprising broad representation of clinicians, IPAC practitioners, relevant specialties, and high-level system COVID-19 response stakeholders.

While the process for consultation to inform the IPAC Framework and supporting resources was broad and conducted around 3 years into the pandemic, there is clear support in this evaluation to expand

Table 3
Actions ranked in order of importance for future pandemic preparedness

Actions	Rank (percentage %)							
	1	2	3	4	5	6	7	8
1. Increase to IPAC resourcing	40	13	14	7	11	10	4	2
2. Inclusion of IPAC-specific information at state health and emergency response strategic planning	14	8	11	19	15	16	8	10
3. Standardization and clear IPAC governance structures	13	20	13	15	17	13	8	2
4. Standardized IPAC program and staff structure across all local Health Districts and Specialty Health Networks better supported by local executive	10	28	18	10	7	10	13	5
5. Improve communications	8	12	13	17	16	17	14	4
6. Improve access to useful IPAC data for safety intelligence (systems and databases)	8	13	14	11	12	19	16	8
7. Increase collaboration	8	3	7	12	16	14	20	21
8. Standardization through credentialing of classification of Infection Prevention and Control Professionals	0	4	11	10	7	2	18	49

IPAC, Infection Prevention and Control.

this further to ensure greater applicability of IPAC strategies beyond that of health care. The learnings from this study have shown that the principles of this framework can be applied to any future communicable diseases' outbreaks. IPAC Frameworks such as this found to be critically important for future pandemic preparedness and IPAC in general.[31] Keeping current with frequent changing of recommendations was seen by participants as challenging and so future pandemic planning should consider how this could be mitigated. Adequately resourcing IPAC ranked as the highest-needed strategy for future pandemic preparedness is not surprising as resources are shown as an issue in normal periods, let alone during a pandemic.[32-36]

Frameworks for IPAC are not foreign to the IPAC community or practitioners and these guides were extrapolated to align consistently with the hierarchy of controls. What was uncommon was the requirement to detail the operationalizing of IPAC risk assessment and application aligned with transmission risk and overall epidemiology of COVID-19. The use of traffic light systems is common in many risk management Frameworks and the application of this approach to the NSW IPAC response was a natural evolution.[11] Applying this in the Framework provided clinicians and health services with the ability to view risk of transmission and overlay IPAC intervention and risk mitigation strategies.

The Green, Amber, and Red Framework developed early on in the NSW IPAC pandemic response with the subsequent addition of a yellow level allowed a gradual and staged approach to aligning community transmission risk with impact on the health care system. The NSW IPAC response for COVID-19 was delivered by the existing lead agency responsible for supporting IPAC in NSW. This approach was an effective and highly regarded approach based on feedback seen in this study.

NSW developed and adopted an IPAC Framework that evaluation shows was an effective management tool for IPAC and pandemic response. The additional feedback from the survey informed enhancements to the IPAC Framework and the development of the "NSW IPAC Framework for Respiratory and COVID Safe Healthcare." This IPAC Framework enables local application in response to outbreak management for COVID-19 and other acute respiratory infections. With additional applicability to other communicable disease outbreaks across individual units, organizations, different health services, or larger jurisdictional IPAC requirements. The IPAC Framework provides a foundational level of IPAC incorporating standard and transmission-based precautions with the ability to escalate to different levels as risk assessed to implement enhanced IPAC risk mitigation strategies as required (IPAC Framework 2).

The IPAC Framework was supported by sophisticated metrics and identifiers known as the response and escalation dashboard (COVID-19 Risk Monitoring Dashboard).[19] The NSW Response and Escalation Framework first released July 2020, with many other jurisdictions across Australia adopting similar approaches. Internationally, many countries similarly had a staged and risk-assessed IPAC approach. Most references to these resources are no longer utilized or available having been predominantly removed from official Web sites with little reported in the literature. Lack of retaining such records of system responses in the literature makes it difficult to create or influence translational research for pandemic response and an important question for future research.

Pandemic preparedness for NSW and Australia and in fact globally prior to COVID-19 heavily focused on influenza pandemics.[4,6,7,37,38] The foundations for IPAC requirements for health care were strongly supported globally with available resources. Resources were available from the World Health Organization (WHO), the US Centers for Disease Control and Prevention (CDC), and other CDCs across the world. Nationally Australia is supported by the Australian National Guidelines for Infection

Prevention and Control in Healthcare and warrants further research for countries related to governance, roles of CDCs, the importance of inclusion of IPAC, and how to incorporate this in a structure globally focused on public health.

Strategies to inform future pandemic preparation are multifaceted, including increasing IPAC resourcing; inclusion of IPAC at state health and emergency response strategic planning; standardization of program and staff structures; and improving communications, access to IPAC data, and increasing collaboration. In essence, there are no shortcuts to future pandemic preparation—resources and collaboration are necessary, without which lives remain at risk.

The development and publication of the IPAC Framework, and supporting resources, has shown to be an extremely successful strategy for IPAC across the NSW health system. The experience of key stakeholders evaluated the IPAC Framework and supporting resources as efficient and applicable, with insights to optimizing IPAC practices beyond COVID-19 pandemic. The model and IPAC Framework have the potential to be adapted across different settings to support IPAC management.

Frameworks that can be easily applied and translated operationally to frontline clinicians should be considered outside of pandemics to ensure a system is well versed on the risk assessment and IPAC application. This IPAC Framework has been shown to be viewed as an effective tool to support and facilitate those required actions. The development of global frameworks that remain visible will ensure a transparent and consistent approach to IPAC risk mitigation strategies for future pandemics in addition to business as usual, outbreaks, and emerging pathogen risks.

Limitations

The study that is a small sample size of 1 jurisdiction however provides the foundations for ongoing research. The other key limitation is understanding the impact of the IPAC Framework not able to be assessed here. Limitations to the IPAC Framework itself were drawn from questions highlighting effectiveness and implementation, with additional free-text comments related to challenges and improvements.

CONCLUSIONS

The evaluation of the NSW IPAC Framework demonstrated overall acceptance, perceived accuracy, and implementation of this tool with some insightful suggested improvements. These improvements to embed a system responsive to future pandemics and the provision of IPAC Escalation Framework for changes in disease activity and outbreak management. The IPAC Framework also provides a detailed, written and transparent approach to the granular mitigation steps of IPAC outbreak management seldom captured in guidance or literature. It can be translated as a template and adapted for use in any setting requiring IPAC outbreak risk mitigation strategies.

The findings support the use of a risk framework for implementing IPAC strategies. Additional recommendations from the survey detailed elements for improvements, IPAC enhancements, and inbuilt flexibility for local implementation. This resulted in a future IPAC Framework model that supports both IPAC system preparedness and pandemic management for COVID-19, acute respiratory infection, and outbreak management (IPAC Framework 2). This revised version of the IPAC Framework has embedded a system responsive to future pandemics with the provision of an inbuilt IPAC escalation Framework for changes in disease activity and outbreak management. The IPAC Framework provided a proportionate IPAC response that can be scaled as transmission risk changes. It provides specific IPAC precautions aligned with the level of community transmission and burden of COVID-19-related disease in health care facilities. The IPAC Framework can be adapted for use and applied for disease control and outbreak management seldom documented.

Acknowledgment

Thank you to my original supervisors and mentors Prof Mary-Louise McLaws, AO, PhD, Epidemiologist, and Dr Annette Pantle, AM, MBBS, MPH, FRACMA, Medical Director, Medical Council of NSW, Sydney, Australia. Both sadly passed away in 2023 and were true health care advocates until the end, you are missed dearly with many heavy hearts but never forgotten. The paths you both paved for those who follow will forever be your legacy. Thank you also to the support of all but especially NSW Infection Prevention and Control Practitioners (ICPs) not only during COVID-19 but for their work before, during, and long after, often under-resourced and under-acknowledged! Thank you to the team at the Clinical Excellence Commission for your unwavering commitment.

References

1. Loveday H, Wilson J. *Pandemic Preparedness and the Role of Infection Prevention and Control–How Do We Learn?* SAGE Publications Sage UK; 2021:55–57.
2. Thomas Hale NA, Goldszmidt R, Kira B, et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nat Hum Behav.* 2021;5:529–538.
3. World Health Organization. *Improving Infection Prevention and Control at the Health Facility: Interim Practical Manual Supporting Implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes.* World Health Organization; 2018.
4. Lockett JC, Nelson K, Hales C. Pre COVID-19 emergency department nurses' perspectives of the preparedness to safely manage influenza pandemics: a descriptive exploratory qualitative study. *Australas Emerg Care.* 2021;24:280–286.
5. Williams BA, Jones CH, Welch V, True JM. Outlook of pandemic preparedness in a post-COVID-19 world. *npj Vaccines.* 2023;8:178.
6. Kirlin J. COVID-19 upends pandemic plan. *Am Rev Public Adm.* 2020;50:467–479.
7. Ghanchi A. Adaptation of the national plan for the prevention and fight against pandemic influenza to the 2020 COVID-19 epidemic in France. *Disaster Med Public Health Prep.* 2020;14:805–807.
8. World Health Organization. *Infection Prevention and Control Assessment Framework at the Facility Level.* World Health Organization; 2018.
9. World Health Organization. Minimum requirements for infection prevention and control programmes; 2019.
10. ICGA Committee. Australian Guidelines for the Prevention and Control of Infection in Healthcare; 2019.
11. Paroni L, D'Apice C, Ussai S, et al. The traffic light approach: indicators and algorithms to identify Covid-19 epidemic risk across Italian regions. *Front Public Health.* 2021;9:650243.
12. Li Z, Li C, Wu X, Li G, Li G, Tian J. Development and application of a new framework for infectious disease management at the early stage of new epidemics: taking COVID-19 outbreak in China as an example. *Int J Clin Pract.* 2021;75:e14174.
13. Zhao L, Jin Y, Zhou L, et al. Evaluation of health system resilience in 60 countries based on their responses to COVID-19. *Front Public Health.* 2023;10:1081068.
14. Yang H, Sürer Ö, Duque D, et al. Design of COVID-19 staged alert systems to ensure healthcare capacity with minimal closures. *Nat Commun.* 2021;12:1–7, 3767.
15. Prevent Epidemics. Alert-Level Systems for COVID-19 [internet] United States: Prevent Epidemics; [Grey Literature]. Internet: Resolve to save lives-Prevent Epidemics; 2020 [updated 20 May 2022; accessed 21 October 2022]. https://preventepidemics.org/covid19/resources/levels/.
16. NZ Government. About the Alert System [Internet] New Zealand: NZ Government; 6 October 2021 [2021]. https://info.health.nz/assets/Proactive-Releases/Alert-levels-and-restrictions/7-April-2022/AU08-18082021-Alert-Level-Boundary-Options-for-Consideration.pdf. Accessed 21 October 2021.
17. UK Government. UK COVID-19 alert level methodology: an overview [Internet] United Kingdom: UK Government; 6 August 2021; 2021.
18. Quebec Government. Progressive regional alert and intervention system (COVID-19) [Internet]. Canada: Quebec Government; 8 July 2021. Web; 2021.
19. Swiss National C-STF. Considerations for an alert system for infectious diseases, focus on COVID-19: a scoping review of tier systems used in other countries and current data [Internet]. Switzerland: Swiss National COVID-19 Science Task Force 2021 [accessed 21 October 2022]. https://sciencetaskforce.ch/en/policy-brief/considerations-for-an-alert-system-for-infectious-diseases-focus-on-covid-19-a-scoping-review-of-tier-systems-used-in-other-countries-and-current-data/.
20. Peng Y, Li C, Rong Y, Chen X, Chen H. Retrospective analysis of the accuracy of predicting the alert level of COVID-19 in 202 countries using Google Trends and machine learning. *J Glob Health.* 2020;10:1–8.
21. Occupational Health Clinics for Ontario Workers Inc. Escalating Advice Based on Your Region's COVID-19 Infection Experience for Communicating, Cleaning, Handwashing, Ventilating, Distancing, Screening, and Masking [Internet]. Canada: Occupational Health Clinics for Ontario Workers Inc.

22. The Local. Explained: How does France's Covid-19 alert system work? [Internet]. France: The Local; 8 October 2020. https://www.thelocal.fr/20200923/explained-how-does-frances-new-five-step-alert-system-work/.2020. Accessed 21 October 2022.
23. Singapore Government. What do the different DORSCON levels mean [Internet]. Singapore: Singapore Government; 2021. https://www.gov.sg/article/what-do-the-different-dorscon-levels-mean. Accessed 21 October 2021.
24. Herbert GGR. Utah Leads Together, Utah's plan for a health and economic recovery. In: Force ERT, ed. Utah Governor's Office of Economic Development; 2020.
25. Department of Health South Africa. COVID-19 Risk Adjusted Strategy [Internet]. South Africa: Department of Health; 28 June 2021.
26. Dempsey K, Jain S, Clezy K, Bradd P. Implementation of a successful infection prevention and control governance structure and capacity building strategies during COVID-19 pandemic–a brief report. *Am J Infect Control.* 2022;50:1278–1279.
27. Kaczmarek K, Romaniuk P. The use of evaluation methods for the overall assessment of health policy: potential and limitations. *Cost Eff Resour Alloc.* 2020;18:1–12, 43.
28. Oliver K, Lorenc T, Tinkler J, Bonell C. Understanding the unintended consequences of public health policies: the views of policymakers and evaluators. *BMC Public Health.* 2019;19:1–9.
29. Klaic M, Kapp S, Hudson P, et al. Implementability of healthcare interventions: an overview of reviews and development of a conceptual framework. *Implement Sci.* 2022;17:1–10.
30. Ayton D., Tsindos T., Berkovic D. Qualitative Research: A Practical Guide for Health and Social Care Researchers and Practitioners: Council of Australian University Librarians, Open Educational Resources …; 2023.
31. Basseal J, Bennett C, Collignon P, et al. Key lessons from the COVID-19 public health response in Australia. *Lancet Reg Health West Pac.* 2023;30:1–8.
32. Shaban RZ, Macbeth D, Vause N, Simon G. Documentation, composition and organisation of infection control programs and plans in Australian healthcare systems: a pilot study. *Infect Dis Health.* 2016;21:51–61.
33. Shaban RZ, Sotomayor-Castillo C, Macbeth D, Russo PL, Mitchell BG. Scope of practice and educational needs of infection prevention and control professionals in Australian residential aged care facilities. *Infect Dis Health.* 2020;25:286–293.
34. Mitchell BG, Shaban RZ, MacBeth D, Russo P. Organisation and governance of infection prevention and control in Australian residential aged care facilities: a national survey. *Infect Dis Health.* 2019;24:187–193.
35. Hall L, Halton K, Macbeth D, Gardner A, Mitchell B. Roles, responsibilities and scope of practice: describing the 'state of play' for infection control professionals in Australia and New Zealand. *Healthc Infect.* 2015;20:29–35.
36. Mitchell BG, MacBeth D, Halton K, Gardner A, Hall L. Resourcing hospital infection prevention and control units in Australia: a discussion paper. *Infect Dis Health.* 2017;22:83–88.
37. Holloway R, Rasmussen SA, Zaza S, Cox NJ, Jernigan DB, Influenza Pandemic Framework Workgroup. Updated preparedness and response framework for influenza pandemics. *Morb Mortal Wkly Rep Recomm Rep.* 2014;63:1–18.
38. Qualls N, Levitt A, Kanade N, et al. Community mitigation guidelines to prevent pandemic influenza—United States, 2017. *MMWR Recomm Rep.* 2017;66:1–34.