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Pandemic planning: plotting a course through the coronawars

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Abstract

The biological motor behind the current coronavirus pandemic has placed microbiology on a global stage, and given its practitioners a role among the architects of recovery. Planning for a return to normality or the new normal is a complex, multi-agency task for which healthcare scientists may not be prepared. This paper introduces a widely used military planning framework known as the Joint Military Appreciation Process, and outlines how it can be applied to deal with the next phase of the COVID-19 pandemic. Recognition of SARS-CoV-2's critical attributes, targetable vulnerabilities, and its most likely and most dangerous effects is a necessary precursor to scoping, framing and mission analysis. From this flows course of action development, analysis, concept of operations development, and an eventual decision to act on the plan. The same planning technique is applicable to the larger scale task of setting a microbiology-centric plan in the broader context of social and economic recovery.

INTRODUCTION

For those who have reached the tail end of the COVID-19 epidemic curve, this is a time to pause and reconsider the task ahead. A recent editorial described this stage of the pandemic as the endgame [1]. Few microbiologists would describe what they have just been through as a game, but in one sense the word conveys a strategic perspective on the next phase of pandemic management. As the global experience of COVID-19 diversifies into different patterns, according to the relative success of national countermeasures, it is clear that the global struggle has turned into a series of campaigns or small wars [2]. Little wonder then that civil authorities describe each setback, advance and victory in military language. For the microbiologists who have been caught up in SARS-CoV-2 work from the beginning, their deep understanding of their wily molecular adversary enables them to speak science to power. This is a rare opportunity to set medical microbiology at the heart of plans for community recovery. We therefore need to understand the broader planning processes that connect strategic priorities with local action.

The joint planning process

In many parts of the world the COVID-19 pandemic has forced civil authorities to use military personnel to maintain basic services. These Defence Force community support tasks have been planned with a structured framework known as the military appreciation process (MAP). Previously, this journal has argued that the MAP could be applied to planning a laboratory response to the West African Ebola epidemic of 2014–5 [3]. Now, as we enter the next phase of the COVID-19 pandemic response, there is a strong case for using a version of the MAP to coordinate the multiple agencies contributing to community-wide recovery from the COVID-19 pandemic. One such version of the MAP is the Joint Military Appreciation Process (JMAP) [4], which is used to connect local (tactical) action with broad strategic objectives in a single coherent operational plan. Microbiologists should not be dissuaded by the veneer of military terminology, and be confident that the JMAP's methodical, stepwise process can be applied to planning the next stage of the recovery from COVID-19.

The steps of the JMAP are: Intelligence Preparation of the Operational Environment, Scoping and Framing, Mission Analysis, Course of Action Development, Course of Action Analysis, Decision and Concept of Operations Development, Development and Execution (Fig. 1).

Understanding the adversary

The Intelligence Preparation of the Operational Environment is a summary of what we know already. It comprises a systematic review of our assets: their strengths, weaknesses,

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Abbreviations: COA, course of action; COG, centre of gravity; JMAP, Joint Military Appreciation Process; MAP, military appreciation process.

Fig. 1. Steps in the Joint Military Appreciation Process.

time constraints, mobility, how they operate and how they might be affected by the pandemic, before consideration of the threat itself. Analysis of a conventional adversary covers its disposition, capability and intent. The complex interplay of biological cause and effect that links SARS-CoV-2 with COVID-19 has been summarized previously [5]. SARS-CoV-2 is far from a conventional adversary, because it can weaponize its victims and turn them into a reinforced threat to the uninfected population. This feature is close to the heart of the problem of uncontrolled contagion. The one attribute that gives a belligerent its hold on power is known as its centre of gravity (COG) [6]. Identification of an adversary's COG leads to recognition of its critical capabilities, requirements and targetable vulnerabilities. Knowledge of SARS-CoV-2's critical factors can then be used to oppose it with an economy of effort. The last step in the intelligence preparation step is a risk analysis, taking note of SARS-CoV-2's most probable and most dangerous courses of action: for example, respectively, residual pockets of sustained local transmission, and outbreaks that take hold and get out of control.

During the peak of the local epidemic curve, SARS-CoV-2's COG was identified as its transmissibility, derived from its critical capabilities of stealth, passive travel as a microscopic passenger, and an ability to move farther and faster than the administration's public health response [7]. Targetable critical vulnerabilities that emerged from this analysis were: accurate disease intelligence based on reliable laboratory tests, physical and functional population dispersal, and agile health administration. In this next phase of the COVID-19 pandemic, SARS-CoV-2's COG has not changed. However, additional critical capabilities can now be identified and, consequently, more targetable vulnerabilities. The new critical capabilities are: immunity to SARS-CoV-2 infection, which has proved technically difficult to confirm by using the first generation of serology tests [8]; PCR-detectable virus which may persist after clinical recovery [9]; and a combination of differences in national epidemiology and frustration with the slow return of economic activity, which strain the global political consensus [10].

Global dissemination of SARS-CoV-2, with further intermittent waves of COVID-19, is becoming a plausible coronavirus end state [11]. In a remarkably short time the SARS-CoV-2 threat has escalated from a local outbreak to an epoch-defining pandemic. We have now reached a point where the different stages of local epidemics raise difficult questions about when, where and how to reintroduce lost freedoms. Laboratory evidence-based decisions remain out of reach in many parts of the world, even in wealthy countries. Uncertainty over the significance of persistent viral shedding and the variable SARS-CoV-2 immune response are problematic for policy-makers [12, 13]. The lack of affordable, reliable and easy-to-use laboratory tests to measure residual transmission risk and lasting immunity leave us ill-prepared for a laboratory-driven restoration of pre-pandemic normality.

Mission analysis

The most labour-intensive step in the planning process is determination of the mission, because it contains the greatest breadth of issues, and requires flexible, creative and critical thinking. Mission analysis begins with a review of the situation, our own and the SARS-CoV-2 COGs, and their respective critical factors. Determination of our phase-two pandemic preparedness mission, objectives and tasks will identify operational milestones or decisive points, objectives and corresponding lines of operation against COVID-19. Having worked out the purpose, method and strategic end-state of our mission, we will be well placed to develop and test our options.

Roadmap for recovery

After completing the Mission Analysis, it is possible to map out a series of alternative paths to the overarching, strategic end-state. These courses of action (COAs) should each be feasible, acceptable, suitable, sustainable, distinguishable and ready for subsequent analysis. In Australia, a collaborative academic group came up with a *COVID-19 Roadmap to Recovery* [14], which described two main options: COVID-19 elimination, and adaptation to COVID-19 persistence. A third COA, letting COVID-19 run its course unchecked, was dismissed as unacceptable and was not developed for further analysis.

Wargames

Before selected COAs can be developed into a campaign plan, they need to be tested in a realistic simulation of opposing belligerents. In the case of COVID-19, this needs to recognize that while SARS-CoV-2 is not a human adversary, it has the ability to weaponize our own population, rapidly escalating the risk to the wider community. Tabletop simulation of battlefield conditions, known as wargaming, seeks to expose flaws, and refine and improve the original COAs through impartial, independent assessment of the simulation and its outcomes.

Decision time

Comparison and selection of the preferred course of action is used to identify the strengths and weaknesses of all candidate COAs. If the two options under consideration are, for example, COVID-19 elimination and adaptation, it is possible that elements from both COAs could be combined in a hybrid plan that adapts to changing COVID-19 epidemiology by targeting elimination efforts to achieve the greatest economy of effort. Alternatively, flaws common to both options might need buttressing with specific additional details before a concept of operations can be finalized. Once this is ready, specific instructions are issued and the plan is executed.

The shape of things to come

Noting the different stages of pandemic response that prevail in different locations necessitate variations in COVID-19 control methods, we can expect common features in most plans after reviewing the list of themes in the standard JMAP aide memoire [4].

- High-volume SARS-CoV-2 testing is a key feature of many plans, taking on new significance in detecting pockets of local virus transmission, infected healthcare workers, and for use in border protection.
- Accurate laboratory-based diagnosis is needed to support targeted use of any novel antiviral therapy, to monitor disease progression, for infection control risk assessment, and to identify populations for future vaccine introduction.
- Low-, medium- and high-throughput SARS-CoV-2 RT-PCR workflows need to align results from different populations thorough cross validation including pre- and post-analytical components.
- Where demand is high, test capability is low and public health is weak, COVID-19 diagnostic and surveillance efforts need to be targeted effectively.
- Public information campaigns are needed, devoid of political agendas, to build confidence in laboratory-assured COVID-19 data. Recognized scientific authorities are required to ensure a consistent and competent public health message.
- Additional specimen collectors and clinical laboratory staff need access to a reliable supply of personal protective equipment, a seasonal influenza vaccination and, if COVID-19-vulnerable, they will need to stay out of harm's way.
- Accurate laboratory-based disease intelligence takes on a new significance in the next phase of the pandemic, to counteract the twin threat of complacency and conspiracy theories.
- Be prepared to raise, train and sustain additional clinical microbiology laboratory staff in order to rest, replace and reinforce the clinical microbiology workforce during a lengthy pandemic campaign.
- Laboratory information systems will continue to face non-routine demands for results, analysis and laboratory-based

surveillance. Information managers should prepare for clinical confidentiality challenges, requests to interface geospatial information systems, and personal proximity applications.
- Disruption of standard laboratory workflows can be anticipated during introduction of new countermeasures such as antiviral agents for treatment of COVID-19 and SARS-CoV-2 vaccine trials. These trials are likely to alter molecular and serology test indications, result analysis and report content.

A world at war

Previous coronavirus epidemics had a less dramatic effect on the global population than the influenza pandemic at the end of the First World War [15]. Medical microbiology made significant gains during both world wars and contributed to the rise of public health microbiology. Unfortunately, public health services have suffered from political neglect or interference in many parts of the world [16]. If a single lesson is to be learned about pandemic preparedness from COVID-19, it should be that no amount of planning is a substitute for decisive communicable disease control, underpinned by a strong public health laboratory network and community-wide respect for science.

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