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Short report

Targeted management of influenza A/B outbreaks incorporating the cobas® Influenza A/B & RSV into the virology laboratory

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SUMMARY

During the 2017/18 influenza season, the authors' virology laboratory implemented the cobas® Influenza A/B & RSV (Roche Molecular Diagnostics, Pleasanton, CA, USA) for influenza outbreak management in two scenarios: initial outbreak investigation or at outbreak conclusion to avoid prolonged measures. Twenty-seven investigations were conducted, including declaration of 11 influenza A/B outbreaks. Thirty percent of investigations would have missed the standard batched daily laboratory-developed respiratory polymerase chain reaction (PCR), and delayed outbreak confirmation until the following day. The average reduction in turnaround time for influenza A/B testing was 10.2 h. A rapid molecular PCR in specific outbreak scenarios improved timely management of influenza outbreaks.

Introduction

Influenza is highly transmissible within the community and within healthcare facilities, and can result in serious complications in patients with risk factors (e.g. pregnant, young children, elderly or underlying medical condition). It also represents a significant burden to the healthcare system, accounting for an estimated 12,200 hospitalizations per year in Canada [1]. In the 2017/18 influenza season, 1520 influenza A/B outbreaks were reported to the Public Health Agency of Canada [2].

Prevention of influenza transmission within healthcare facilities requires a multi-pronged approach including general precautions (hand hygiene, respiratory etiquette), patient-specific precautions (contact/droplet), vaccinations (patients and staff), antiviral medications (treatment or chemoprophylaxis) and surveillance (clinical presentation and laboratory confirmation) [3]. Rapid detection and implementation of chemoprophylaxis for a unit has been identified as one of the

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most important interventions to contain an influenza outbreak [4]. A challenge to rapid implementation of unit-wide prophylaxis is the availability of laboratory testing and confirmation, particularly in residential care facilities (RCFs) where residents may be afebrile with non-specific symptoms. Rapid influenza A/B diagnostics are also an important component of antimicrobial stewardship, and can reduce the prescription of unnecessary antibiotics for community-acquired pneumonia [5].

Traditionally, antigen-based rapid diagnostic tests have suffered from poor sensitivity [6]. New rapid molecular assay based tests have improved sensitivity and specificity for influenza A/B, with results available within 20 min [7]. With the increasing availability of rapid molecular assays, this study sought to assess their clinical impact on influenza outbreak management.

Methods

During the 2017/18 influenza season, the authors' virology laboratory, which serves five RCFs, one community hospital and one academic tertiary care hospital, utilized the cobas® Influenza A/B & RSV (Roche Molecular Diagnostics, Pleasanton, CA, USA) on the Liat® system to test nasopharyngeal swabs for assessment of potential influenza A/B outbreaks. Outbreak management conducted by the infection prevention and control team (IPCT) has been described previously [8]. If an outbreak was suspected by a unit, an infection control practitioner would assess the suspected residents/patients and consult with the medical microbiologist for testing with the cobas. The cobas was accessible for two scenarios: (1) investigation of a potential influenza outbreak; and (2) for confirmed outbreaks, assessment of possible cases within 24 h of the anticipated discontinuation of influenza outbreak precautions. Confirmation of outbreaks was based on two or more cases of influenza A/B within a one-week period [3]. The turnaround time was compared with the expected turnaround time for the current in-house laboratory developed test (LDT) [5], which is batched daily with a noon cut-off time for sample receipt in the virology laboratory. The standard LDT would routinely be reported at 4 pm daily. Research ethics board approval was obtained for this study from the UBC-Providence Health Care Research Institute.

Results

Over the 2017/18 influenza season, there were 27 requests for investigation ($N = 22$) or discontinuation ($N = 5$) of influenza outbreak precautions within the network of healthcare facilities. In total, 54 residents or patients were tested as a part of these investigations on the cobas. The average turnaround time from collection to reporting on the cobas was 3.0 h. In total, four influenza A outbreaks and seven influenza B outbreaks were declared in two acute care units and nine RCFs. In 70% (19/27) of investigations, nasopharyngeal swabs were received in the virology laboratory before noon and could be tested on the same day. The remaining 30% (8/27) of test requests would have missed the daily LDT run, delaying testing until the next day. Overall, turnaround time for influenza A/B testing was reduced by an average of 10.2 h. For all requests which were tested on the same day, the average reduction in turnaround time for the cobas compared with the LDT was 4.1 h, but increased to 24.8 h if samples missed the daily LDT run. Figure 1 describes the reduction in turnaround time with the use of the cobas in outbreak investigations. Figure 2 outlines the impact of the cobas for situations in which influenza outbreaks were planning to be discontinued.

Discussion

Implementation of the cobas for the rapid diagnosis of influenza A and B during the 2017/18 influenza season reduced the turnaround time for laboratory testing in outbreak situations. Early declaration and management of an influenza outbreak is essential for rapid resolution. In situations in which the IPCT was consulted in the afternoon for a possible outbreak, the benefit is intuitive with a 24.5-h delay in confirmation. Management of the outbreak would either need to be started empirically while awaiting confirmation based on

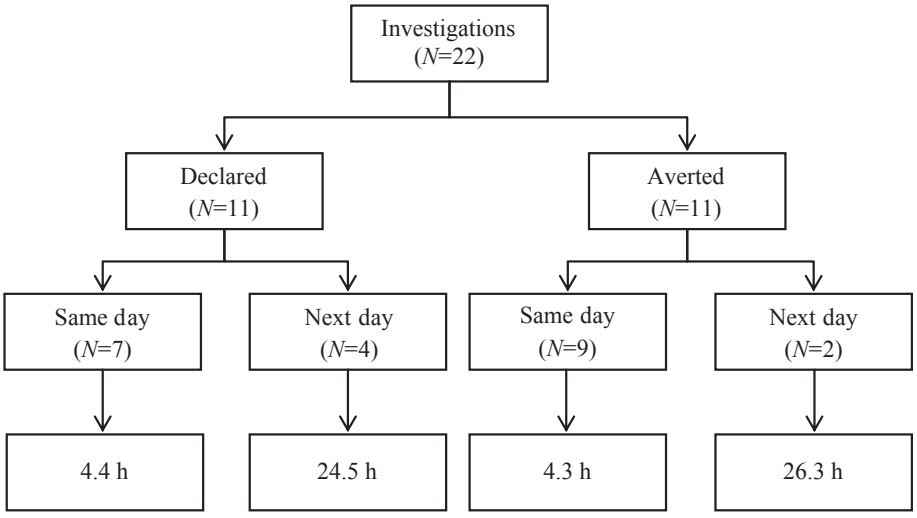

Figure 1. Average reduction in turnaround time for the investigation of potential influenza A/B outbreaks with a rapid polymerase chain reaction.

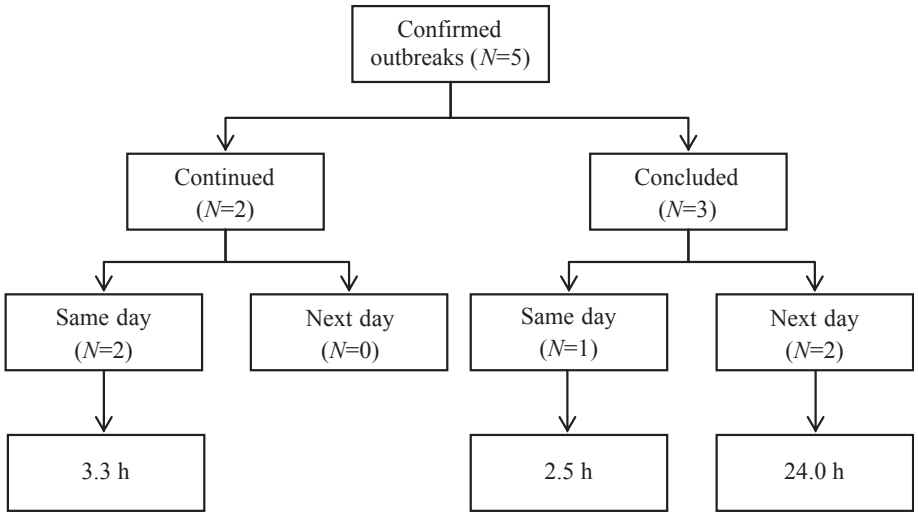

Figure 2. Average reduction in turnaround time for the investigation of newly symptomatic patients/residents within 24 h of the anticipated discontinuation of influenza outbreak precautions.

resident/patient clinical presentation, or declaration of an outbreak held until the following day awaiting laboratory confirmation. The former strategy bears the risk of over-utilizing oseltamivir chemoprophylaxis, while the latter may delay this vital component of influenza outbreak management [4]. By fostering collaboration between the virology laboratory and the public health teams/IPCTs managing potential outbreaks, implementation of rapid polymerase chain reaction (PCR) for influenza A/B can avoid over (or under) utilization of chemoprophylaxis, unnecessary patient isolation, premature closure of units/facilities and delayed treatment of confirmed influenza cases.

In 70% of situations encountered this influenza season, testing either on the cobas or LDT would have resulted in same-day reporting of influenza A/B testing. Although same-day reporting could be achieved in a majority of cases, the turnaround time differential of 4.4 h in outbreak investigation scenarios is significant. From the practical perspective, the differences in turnaround time translate to reporting at noon for the cobas and 4 pm for the LDT. Laboratory reporting of influenza A/B at 4 pm for outbreaks means: (1) ward/unit nursing leads no longer on the unit to coordinate outbreak measures; (2) limited registered nurses covering at night to administer the oseltamivir chemoprophylaxis; and (3) difficulty accessing the most responsible physicians to initiate chemoprophylaxis, as physician rounds are typically already completed by 4 pm. An additional issue within the authors' healthcare network is that oseltamivir pharmacy stock for RCFs is centralized at one location, and coordination of medication transport to the outbreak sites needed to be decided empirically in the past when testing was performed on the LDT. These practical challenges associated with reporting at the end of the day may represent a sufficient barrier to prevent chemoprophylaxis from being administered on the night of outbreak declaration.

From the laboratory perspective, rapid PCR tests such as the cobas may be more costly than rapid antigen testing or LDT, but they enable laboratories to provide higher sensitivity (compared with the antigen testing) and shorter turnaround times (compared with the LDT). Laboratories can potentially mitigate costs by utilizing this rapid PCR centrally, rather than placing an instrument at each site. The turnaround time for reporting clinically actionable results to the IPCT can still be achieved, while reducing costs associated with machines on site (capital costs, training of non-laboratory staff, maintaining quality control/assurance outside of the laboratory, troubleshooting). From the perspective of the healthcare system, rapid and highly sensitive results for influenza A/B can potentially translate to cost savings by preventing incorrect influenza outbreak declarations due to non-influenza viruses, and the associated chemoprophylaxis, personal protective equipment, ward/unit closures (particularly for acute care hospitals) and environmental cleaning resources. Data regarding healthcare costs associated with influenza outbreak interventions in Canada have been limited, but one study estimated that it costs an additional 313.85 CAD per resident in a nursing home outbreak with influenza A [9]. However, the costs may have been underestimated as this study was conducted prior to use of oseltamivir chemoprophylaxis [10].

There are limitations to this study in that the rapid PCR testing was conducted at a central virology laboratory serving multiple healthcare facilities. This model may not be representative of all sites, particularly with respect to turnaround time for existing influenza A/B assays and availability of such testing for RCFs. Targeted use of rapid molecular testing may also yield greater benefit for healthcare facilities with laboratories which have implemented earlier cut-off times for batched influenza testing, or when testing is not offered seven days a week. The authors believe that utilizing the rapid PCR in this manner can potentially balance the competing measures of healthcare costs and clinical need. Only one rapid PCR was utilized in this study, and similar technologies with comparable test performance are becoming increasingly available to healthcare facilities [7]. Further study is needed to formally assess resource implications of utilizing rapid PCR testing for outbreak management. Specifically, comprehensive cost-effectiveness analyses are needed to address the relative impact on healthcare facilities, infection control and laboratories.

During the 2017/18 influenza season, the implementation of a rapid PCR technology such as the cobas Influenza A/B & RSV contributed to a reduction in turnaround time for confirmation of suspected influenza A/B outbreaks and discontinuation of outbreak precautions in confirmed outbreaks. The emerging evolution of rapid molecular testing enables the virology laboratory to provide reporting at relevant times to optimize infection prevention and control management. This collaboration between IPCTs and the laboratories can translate to improved patient care in influenza outbreak situations.

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Conflict of interest statement
None declared.

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