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Project Report

Expert Perspectives on Implementing Rapid Molecular Point-of-Care Testing for Respiratory Infections in Emergency Care: A CFIR-Informed Project Report

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Abstract

Background/Objectives: Rapid molecular point-of-care testing (mPOCT) can provide respiratory pathogen results within clinically actionable timeframes, yet implementation in emergency departments remains inconsistent. This project report aimed to examine the perceived clinical, operational, and organizational value of rapid mPOCT in emergency respiratory care and to identify key barriers and enablers to its implementation. **Methods:** A multidisciplinary group of point-of-care testing experts from Germany, France, Saudi Arabia, and the United Kingdom participated in sounding-board discussions, interviews, and questionnaires. Consultation outputs were synthesized from structured notes, descriptive questionnaire summaries, and facilitated discussion, and were then mapped deductively to the Consolidated Framework for Implementation Research to structure implementation-related findings. **Results:** Experts identified rapid mPOCT as a potentially valuable tool for supporting timely diagnosis, targeted treatment, infection-control decisions, patient flow, cohorting, and resource utilization. However, implementation was considered to be limited by insufficient awareness of clinical and economic value, the absence of standardized pathways,

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logistical and information-technology challenges, and fragmented integration into hospital workflows. The group emphasized the need for clearer implementation guidance, stronger evidence generation, improved communication of health-economic value, and closer collaboration among clinical, laboratory, industry, and policy stakeholders. **Conclusions:** Rapid mPOCT may support emergency respiratory care by providing clinically actionable results within shorter timeframes, but its value depends on local implementation context. Its wider adoption may depend not only on test performance, but also on standardized pathways, organizational readiness, stakeholder engagement, and practical implementation support.

Keywords: point-of-care testing; rapid molecular testing; respiratory infections; emergency care; patient management

1. Introduction

1.1. Respiratory Diseases Bring a Significant Burden to Emergency Departments

Respiratory illnesses represent a significant and growing challenge for emergency departments (EDs) worldwide [1,2]. Seasonal surges of influenza, respiratory syncytial virus (RSV), alongside COVID-19 and Group A Streptococcus (GAS) place significant pressure on frontline services, often leading to overcrowding, delayed triage, and strained resources [3]. These pathogens have a high transmissibility, can cause severe outcomes, and may require timely therapeutic or infection control interventions [4]. They come with a high risk of causing healthcare-acquired infections, which leads to added length of stay, morbidity and mortality, as well as impact on workforce and staff sickness [5].

The emergency department is a critical point of entry for these patients, making it a pivotal setting for early diagnosis, risk stratification, and containment. This is especially relevant during peak respiratory seasons, when simultaneous outbreaks of multiple pathogens can overwhelm emergency care capacity and intensify diagnostic bottlenecks [3]. Moreover, these conditions frequently present with overlapping clinical features, such as cough, fever, and sore throat, which complicates differential diagnosis and underscores the need for rapid and accurate diagnostic tools to support effective clinical decision-making [6].

1.2. Traditional Laboratory Testing of Respiratory Disease Has a High Specificity and Sensitivity, but Also a Long Turnaround Time, Which Can Result in Several Disadvantages

Traditional laboratory molecular testing, e.g., real-time polymerase chain reaction (RT-PCR), is used in most hospitals for detecting respiratory infections, due to its high specificity and sensitivity. However, these laboratory-based molecular assays can have analytical run times of several hours, and end-to-end clinical turnaround time—from sample collection to availability of an actionable result—varies substantially between institutions, with reported times ranging from 24–72 h in some settings. Transport, batching, laboratory operating hours, staffing, prioritization, and result reporting may extend turnaround, whereas established on-site workflows can return results within the same day [7,8]. Such delays may lead to prolonged patient isolation, increased healthcare costs, and inappropriate prescriptions [9]. Moreover, laboratory RT-PCR requires specialized laboratory infrastructure and trained personnel [7], making it resource-intensive and less feasible in decentralized or resource-limited settings. Many of these limitations may be mitigated by molecular POCT solutions.

1.3. Rapid mPOCT Has the Transformative Potential to Test Patients with Suspected Respiratory Disease Directly at Their Site of Care

Rapid molecular point-of-care testing (mPOCT) offers a transformative approach to respiratory diagnostics by enabling highly sensitive and specific pathogen detection, such as influenza, RSV, GAS, and SARS-CoV-2, directly at the patient's bedside [10]. Rapid mPOCT refers to diagnostic tests that provide results directly or near the site of patient care, ideally in less than 15 min, but up to 1 h. Examples of rapid mPOCT technologies include isothermal amplification, RT-PCR, nested multiplex PCR, microfluids-based PCR and lab-on-a-chip platforms.

As with many major technological innovations, the adoption of rapid mPOCT is influenced not only by technological challenges but also by a range of non-technical barriers and systemic uncertainties. These challenges are closely linked to the structures and demands of existing healthcare technologies and practices. Consequently, innovations such as rapid mPOCT cannot easily build upon established hospital routines and standards for reaching patients; rather, substantial system-level adjustments are required for their successful integration into healthcare delivery.

In addition, the introduction of rapid mPOCT to the market faces several persistent difficulties. Development trajectories are often long and resource-intensive; rapid mPOCT technologies frequently lack legitimacy among end-users, particularly medical professionals; and integration into existing clinical infrastructures remains complex and fragmented. In addition, delivering large-scale, comprehensive POCT solutions to hospitals poses considerable logistical and organizational challenges.

To systematically explore the factors influencing the adoption of POCT within hospital settings, this project report uses the Consolidated Framework for Implementation Research (CFIR) as an analytical lens. The CFIR provides a comprehensive structure for examining implementation dynamics across five key domains or broad categories: (1) intervention characteristics, including perceived evidence strength, adaptability, complexity, and cost; (2) outer setting, encompassing external policies, reimbursement conditions, and patient needs; (3) inner setting, such as hospital culture, leadership engagement, resource availability, and internal communication; (4) characteristics of individuals, referring to staff knowledge, self-efficacy, and beliefs about the technology; and (5) the implementation process, including planning, engagement, execution, and reflection [11].

2. Materials and Methods

A multidisciplinary group of point-of-care testing experts (physicians, nurses, researchers from specialized faculties and consultants) from the EMEA region was asked to share views on the value, challenges, and requirements for successful rapid mPOCT implementation. These experts represented diverse healthcare systems in Saudi Arabia, France, Germany, and the United Kingdom. The author group comprised sixteen experts with experience in point-of-care testing, emergency or acute care, clinical microbiology/virology, paediatrics, nursing, health-services research, and/or guideline development. Participation varied across consultation activities and was documented as follows: sounding board 1, n = 9; sounding board 2, n = 11; sounding board 3, n = 11; digital meeting, n = 12; individual interviews, n = 5; questionnaire 1, n = 9; questionnaire 2, n = 10. Several participants have expertise spanning multiple clinical and scientific disciplines, reflecting the interdisciplinary nature of point-of-care diagnostics and their implementation in emergency care settings.

To explore the values, challenges, and potential solutions surrounding the implementation of rapid mPOCT in EDs, a structured expert consultation was conducted with a multidisciplinary group of point-of-care testing experts. The group comprised healthcare researchers and clinical practitioners, including professors, laboratory specialists, a

consultant nurse, and a consultant healthcare scientist, with specialties including clinical virology, microbiology, paediatrics, and emergency care. Several participants were actively involved in developing national guidelines. Participants were selected purposively to provide complementary experience in emergency/acute care, clinical microbiology or virology, point-of-care governance, paediatrics, nursing, health-services research, and guideline development. Experience with a specific manufacturer's device or methodology was not required. Screening initially covered six target countries: Saudi Arabia, the United Kingdom, Germany, France, Italy, and Spain. The final panel reflected experts who were available and willing to participate in the full consultation programme and included participants from Saudi Arabia, the United Kingdom, Germany, and France. No standardized screening instrument was applied, and no formal exclusion criteria were defined. The objective was breadth of expert perspective rather than statistical or national representativeness.

To support independent expert contribution, all participants were engaged under written contract and received honoraria at fair market value for time contributed to the consultation activities; honoraria were not contingent on the content or direction of their input. Participants also provided declarations of interest prior to participation. Standardized ground rules were presented at the start of each session and emphasized that the purpose was to elicit participants' own views, opinions, and experiences, including critical or differing perspectives. Findings were reported in anonymized and aggregated form. Sessions were framed at disease and health-system level; no company product was promoted, and no branded material was used. Abbott representatives attended in limited numbers in an observer capacity and contributed only in response to direct factual questions from the panel. They did not participate in deliberation or prioritization, did not determine the conclusions, and had no veto over the content or decision to publish.

The consultation process comprised three consecutive full-day sounding board sessions to elicit collective insights on clinical, operational, and organizational dimensions of mPOCT deployment. A two-hour digital meeting was convened between the first and second sounding board sessions to facilitate interactive discussion and refine perspectives on emerging challenges. Five in-depth individual interviews were conducted to capture nuanced views and contextual variation. In addition, two questionnaires were distributed to all experts, designed to capture preliminary perspectives on the perceived value and challenges of implementing rapid mPOCT. As these questionnaires primarily served to surface early insights and stimulate discussion, questionnaire responses were aggregated descriptively and used to structure subsequent discussion. Consultation materials were captured through structured notes taken by the facilitation team. Audio recordings were used only to verify and complete contemporaneous notes and were not transcribed verbatim for formal coding. Findings were established through facilitated discussion, playback of emerging themes to the panel for confirmation or correction, prioritization within sessions, and iterative validation across subsequent consultation activities. Agreement was established discursively rather than through a formal Delphi process or predefined consensus threshold. CFIR was not used to design the consultation instruments; it was applied deductively during analysis to organize the identified barriers and enablers into implementation domains. Because the project was an expert consultation rather than a formal Delphi study, no claim of statistical representativeness or formal consensus is made.

3. Results

This project report presents findings from a structured, multinational expert consultation. Its purpose was to identify expert-perceived barriers, enablers, potential value propositions, and implementation priorities for rapid mPOCT in emergency respiratory care. It was not designed to estimate diagnostic accuracy, clinical effectiveness, patient

outcomes, or cost-effectiveness. In addition, the findings are not intended to be nationally representative. They reflect the perspectives of a small, purposively selected expert group and may be transferable only to settings with comparable organizational and diagnostic contexts. Country-specific validation involving a broader range of emergency clinicians, laboratory professionals, nurses, administrators, patients, and payers is required.

3.1. Assessment of Domain 1: Intervention Characteristics

Experts agree that rapid mPOCT delivers meaningful clinical, operational, and organizational value across emergency care settings.

Expert consultation identified several potential clinical, operational, and organizational benefits of using rapid mPOCT, which can be categorized into three domains:

- Clinical potential benefits: the rapid delivery of test results allows for timely, targeted treatment and improved infection control through accurate isolation and outbreak prevention, including a reduction in diagnostic uncertainty [12].
- Operational potential benefits: mPOCT enhances process insight, streamlines patient flow and triage, and supports efficient cohorting, which shortens hospital stays and optimizes resource allocation [13].
- Organizational potential benefits: rapid mPOCT increases capacity by freeing up isolation rooms and staff, reduces costs associated with delayed laboratory testing, and strengthens disease awareness through real-time data [10]. Its financial benefits are underlined in the study by Brachmann and colleagues [14], showing an average reduction of diagnostic costs of €41.52 per patient compared with laboratory-based PCR, or traditional PCR, for patients with a negative diagnosis.

Although experts initially held differing views on the added value of rapid mPOCT in emergency departments, the consultation process facilitated convergence of perspectives and fostered a more positive outlook over time.

In emergency departments, where rapid decision-making is essential, experts considered rapid mPOCT potentially advantageous over laboratory molecular testing or antigen testing in time-critical scenarios in which the result is expected to alter management. This was due to its ability to deliver accurate results at the point-of-care, that is, near the patient, enabling prompt treatment and efficient patient management. Collectively, the potential benefits of rapid mPOCT's are seen to support faster decisions, better outcomes, and more resilient healthcare systems.

Experts identified a gap in the clinical and health-economic evidence supporting rapid mPOCT. There is a clear need for coordinated international studies to better demonstrate the technology's benefits across healthcare systems.

3.2. Assessment of Domain 2: Outer Setting

Experts perceive a lack of regional or national standardized workflows for rapid mPOCT.

Experts identified a key barrier to implementing rapid mPOCT as the lack of national or regional standardized clinical pathways and organizational frameworks. Implementing rapid mPOCT, and downscaling traditional laboratory testing, may cause a significant change in the organization of emergency departments. A shift of laboratory testing to point-of-care testing impacts laboratory personnel, practitioners, and space availability, amongst others. Without clear guidance on when and how to use rapid mPOCT, hospitals can be reluctant to implement the technology.

Experts considered that this inconsistency disrupts coordination, delays decisions, and prevents rapid mPOCT from being fully integrated into patient care. Establishing structured, evidence-based workflows is essential to unlock its potential across clinical settings.

Proposed solutions: Industry, hospitals and other stakeholders in healthcare need to ensure that, for different scenarios, there is clarity on how and when rapid mPOCT adds the most value. Scenarios can differ depending on hospital organization, including ED and laboratory organization. These implementation guides should contain standardized pathways and recommendations for the organization of an ED with rapid mPOCT. Including best practices will demonstrate how implementation can be successfully achieved.

A first proposal of a patient pathway was drafted by the expert group to further guide discussions around standardized clinical pathways for patients in EDs presenting influenza-like symptoms (Figure 1). This framework is conceptual and is not a validated clinical decision rule. The decision to test and the selection of test modality should follow pathogen-specific guidelines and local protocols, considering illness severity, age, comorbidities, immunocompromise, epidemiological context, expected impact on treatment or infection prevention, assay performance, and local laboratory capacity. Importantly, the pathway is not intended to prescribe an antigen-first approach or a universal sequential testing strategy; depending on the clinical scenario, local epidemiology, and expected impact on management, rapid mPOCT may be used as the initial test where this is supported by local protocols.

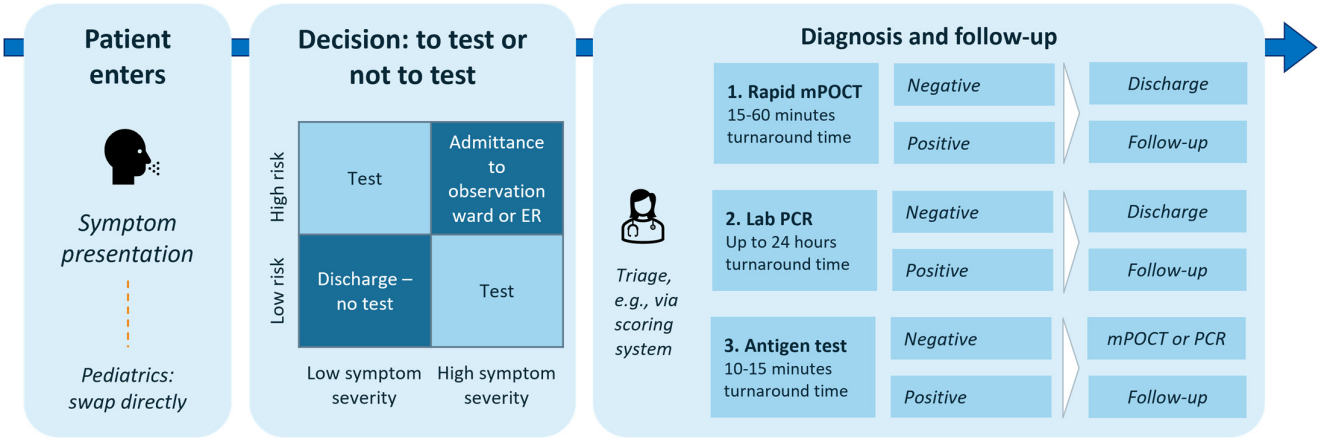


Figure 1. Conceptual patient pathway drafted by the expert group for patients presenting to the emergency department with influenza-like symptoms. This pathway is a discussion aid and is not a validated clinical decision rule; it does not prescribe an antigen-first or universal sequential-testing strategy. Test selection should follow pathogen-specific guidelines and local protocols.

3.3. Assessment of Domain 3: Inner Setting and Domain 4: Characteristics of Individuals

The awareness of the clinical utility and cost-effectiveness of rapid mPOCT is regarded as low.

Despite its clinical and operational advantages, awareness of the clinical utility and health-economic impact of rapid mPOCT remains limited among healthcare professionals and decision-makers. For example, the perceived cost of rapid mPOCT is still viewed as more expensive than traditional laboratory testing. However, despite the higher reagent costs of rapid mPOCT compared to conventional PCR, there may be economic advantages. Selected economic evaluations suggest potential savings with rapid mPOCT in specific settings. Although transferability depends on local pathways and expenditure, savings include reducing unnecessary treatments, shortening hospital stays, and optimizing resource use. Experts consider that in large healthcare centers with a central laboratory, the additional use of rapid mPOCT during off-peak hours can reduce the working hours of highly qualified personnel and thus reduce personnel costs.

This knowledge gap often results in underutilization, fragmented adoption, and resistance to investment, particularly in resource-constrained settings. Without clear understanding of its role in improving patient flow, reducing hospital-acquired infections and potential transmission events, and optimizing antimicrobial use, implementation efforts may stall or fail to achieve scale. Bridging this awareness gap is essential to unlock the full value of rapid mPOCT within secondary care pathways.

Proposed solutions: Industry stakeholders should develop clear, evidence-based guidance outlining the current clinical utility of rapid mPOCT, along with tailored recommendations for its implementation in various hospital contexts. Guidance will be especially valuable for hospitals with different budget holders in different departments. Another solution to the challenge is that healthcare providers should have access to practical frameworks for collecting and interpreting their own rapid mPOCT data, as well as strategies to harmonize data quality and reporting standards across institutions, ensuring consistency, comparability, and broader impact. In addition, to support broader adoption, industry stakeholders must actively promote economic advantages and provide hospitals with clear, data-driven business cases that justify investment and highlight long-term value.

3.4. Assessment of Domain 5: Implementation Process

Logistical challenges are seen to hinder a quick and successful implementation of rapid mPOCT.

Experts consider that hospitals may face logistical challenges while using rapid mPOCT. Integrating devices with existing IT systems can be technically complex and financially burdensome, especially in legacy infrastructures. Space constraints within clinical areas often limit where rapid mPOCT can be deployed, while staff training requirements add further strain to already stretched resources.

Such barriers can significantly slow rollout and reduce long-term sustainability, even when the clinical value is clear. Addressing these practical issues is vital to ensure rapid mPOCT can be embedded seamlessly into routine hospital workflows.

Proposed solutions: Early involvement of device providers in the implementation process is essential to ensure rapid mPOCT can be deployed efficiently and sustainably across clinical environments. There should be increased cooperation between stakeholders, i.e., different hospital stakeholders, policymakers, and industry, to address logistical barriers.

4. Discussion

Coordinated implementation efforts are key to unlocking the full value of rapid mPOCT in emergency care.

According to experts, the implementation of rapid mPOCT in emergency departments is constrained by multiple systemic barriers, resulting in inconsistent adoption across countries and delays in hospital decision-making. As a consequence, healthcare systems are unable to fully realize rapid mPOCT's clinical, operational, and organizational benefits [15].

The successful implementation of rapid mPOCT is perceived to be essential for advancing respiratory care in emergency departments. To unlock its full clinical, operational, and organizational value, healthcare systems must prioritize the development of standardized regional and national patient pathways, establish supportive organizational frameworks, and actively raise awareness of rapid mPOCT's benefits among healthcare professionals and decision-makers. Addressing logistical challenges, particularly IT integration, is equally critical to ensure sustainable and scalable adoption.

With coordinated efforts across stakeholders, rapid mPOCT may form one component of a broader diagnostic and infection-prevention pathway to efficiently diagnose respiratory infections in acute care settings.

The CFIR framework helps explain the structural, individual, and organizational requirements for successful rapid mPOCT implementation.

The expert-acknowledged requirements align closely with the Consolidated Framework for Implementation Research (CFIR), which provides a structured approach to understanding and guiding the adoption of complex healthcare interventions [11].

- Analysis of the intervention characteristics shows that the experts agree on the added value of rapid mPOCT, although they see a gap in scientific literature internationally analyzing these values.
- The need for standardized implementation guidance reflects CFIR's emphasis on the outer setting, where clarity around evidence strength, adaptability, and organizational readiness is critical.
- The call for increased awareness of clinical and financial value corresponds to the inner setting and characteristics of individuals domains, highlighting the importance of stakeholder knowledge, beliefs, and engagement.
- Logistical support, particularly around IT integration, maps to the implementation process domain, underscoring the role of infrastructure and coordinated execution.

Applying CFIR helps contextualize these requirements within a broader implementation science framework, offering a pathway for more consistent, scalable, and sustainable integration of rapid mPOCT in emergency departments.

Limitations of this project include a limited regional scope, sample size and economics.

This project is based on qualitative input from a selected group of experts across four countries, which may limit the transferability of the findings to other healthcare systems or regions. While the diversity of roles and backgrounds enriched the insights, the group remained relatively small. In addition, no standardized screening instrument was applied, and no formal exclusion criteria were defined; therefore, the participant selection process cannot be independently verified and may have introduced selection bias. Additionally, the consultation relied on self-reported perspectives, which may be influenced by individual experience or institutional context. Future research could expand the scope by incorporating quantitative data, broader geographic representation, and longitudinal evaluation of mPOCT implementation outcomes. The industry-sponsored nature of the project is an additional limitation. Although procedural safeguards were used to support independent expert contribution, sponsorship and facilitation arrangements may have influenced participant selection, topic framing, discussion dynamics, synthesis, or interpretation. These measures reduce but do not eliminate the risk of selection, framing, or pro-innovation bias. The findings should therefore be interpreted as expert perspectives requiring independent empirical evaluation.

Although no original health-economic data were collected, the experts did identify country-specific economic evaluations as an important future research priority. Published economic findings cannot be assumed to transfer directly across healthcare systems because reagent prices, staffing models, laboratory availability, reimbursement, isolation capacity, and patient pathways differ. Future evaluations should use country- and institution-specific cost-consequence or budget-impact models and should report sensitivity analyses for prevalence, test performance, staffing, and downstream management.

Rapid mPOCT is expected to expand across emergency care and integrate into primary care, transforming how respiratory infections are diagnosed and managed.

Looking ahead, adoption of mPOCT may expand, subject to evidence, resources, governance, and local priorities. As the technology continues to evolve, its speed and accuracy become increasingly relevant in the face of mounting pressures on healthcare systems and the rising demand for timely diagnosis. Nevertheless, the clinical and operational value of any testing pathway depends on disease prevalence, specimen quality,

assay performance, and pre-test probability. False-positive results may lead to unnecessary treatment, isolation, or cohorting, whereas false-negative results may delay targeted therapy or infection-prevention measures. Implementation pathways should therefore specify quality-control procedures and the circumstances in which confirmatory testing or clinical reassessment is required.

Beyond acute care, integration into primary care settings offers the potential to decentralize diagnostics, enable earlier clinical intervention, and strengthen continuity of care within communities, ultimately reshaping how and where infectious diseases are detected and managed [16].

5. Conclusions

Rapid molecular point-of-care testing has the potential to support faster, more targeted decision-making in emergency respiratory care while improving infection control, patient flow, and resource use. Realizing these potential benefits will require standardized clinical pathways, stronger awareness of clinical and health-economic value, and practical support for logistical and information-technology integration. Coordinated action across clinical, laboratory, industry, and policy stakeholders will be essential for sustainable implementation at scale. Given the existing body of evidence supporting the diagnostic performance of molecular POCT, future studies should also prioritize the generation of operational evidence in real-world settings. Research should focus on evaluating the impact of molecular POCT on testing pathways, hospital budgets, workflow efficiency, patient throughput, resource utilization, and downstream clinical decision-making. Country-specific implementation and budget-impact studies will be important to assess whether and how these technologies may deliver operational value and support more efficient healthcare delivery in different health-system contexts.

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Informed Consent Statement: Not applicable. The project did not involve patients or the collection of patient-level data. The experts participated in professional discussions and reviewed and approved the manuscript and its submission.

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Abbreviations

The following abbreviations are used in this manuscript:

CFIR	Consolidated Framework for Implementation Research
ED	Emergency department
GAS	Group A Streptococcus
mPOCT	molecular point-of-care testing
PCR	polymerase chain reaction
POCT	point-of-care testing
RSV	respiratory syncytial virus
RT-PCR	reverse-transcription polymerase chain reaction
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2

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