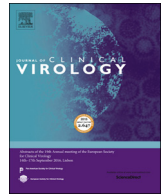




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Short communication

## Respiratory syncytial virus testing capabilities and practices among National Respiratory and Enteric Virus Surveillance System laboratories, United States, 2016

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## ARTICLE INFO

## Keywords:

National Respiratory and Enteric Virus Surveillance System (NREVSS)  
Respiratory syncytial virus (RSV)  
Laboratory surveillance  
Diagnostic testing

## ABSTRACT

**Background:** Laboratory tests to detect respiratory syncytial virus (RSV) vary in sensitivity and specificity. Diagnostic testing practices can impact RSV disease diagnosis and burden estimates.

**Objectives:** We surveyed a sample of laboratories that participated in the National Respiratory and Enteric Virus Surveillance System (NREVSS) in 2015–2016 to understand RSV testing, diagnostic capabilities, and practices. **Study design:** We distributed surveys in fall 2016 to NREVSS laboratories using an internet survey platform. We conducted a descriptive analysis of survey responses and stratified results by self-identified children's hospital laboratories (CHL, i.e. laboratories affiliated with or in a children's hospital) or general hospital laboratories (GHL, i.e. laboratories that performed analysis on specimens from only adults or adults and children).

**Results:** We sampled 367 (82.5%) of 445 eligible NREVSS laboratories with a 35.7% response rate; 11.5% (n = 15) were CHLs. All CHLs had PCR-based assay capability to test for RSV compared to 48.7% of GHLs (p < 0.001), and it was the most frequent method used by CHLs (n = 9, 75.0%). GHLs used rapid antigen detection tests most frequently (n = 65, 60.2%) to detect RSV compared to CHLs (p = 0.02, n = 3, 25.0%). Almost half (n = 41, 48.2%) of GHLs reported specimen submission from adults ≥ 50 years for RADTs.

**Conclusions:** Laboratory testing and diagnostic capabilities differed by whether laboratories self-identified as a CHL or GHL. Many GHLs reported use of RADTs in adults ≥ 50 years, a less sensitive diagnostic method for this population compared to PCR-based assays. RADT use in adults might miss RSV cases and affect diagnoses and disease burden estimates.

### 1. Background

Respiratory syncytial virus (RSV) is a common virus that often causes mild respiratory symptoms, but can present as more serious disease in young infants, older adults, and persons of all ages with certain underlying medical conditions [1]. In young children < 5 years, RSV is responsible for approximately 57,527 hospitalizations and 2.1 million outpatient visits in the United States [2]. Older adults, those with underlying chronic cardiopulmonary disease, and immunocompromised individuals are also at higher risk of severe infection [3,4]. In the United States, RSV accounts for approximately 177,000 hospitalizations and 14,000 deaths among adults ≥ 65 years [3].

The timing and duration of RSV circulation varies by region of the country and year. Healthcare providers and public health practitioners use RSV seasonality data to inform when to perform diagnostic testing, when to administer RSV immunoprophylaxis for high-risk children, and the timing of clinical trials and future evaluations of vaccine products. The National Respiratory and Enteric Virus Surveillance System (NREVSS) is a voluntary, passive, laboratory-based system that receives reports of weekly aggregate diagnostic tests and detections of multiple respiratory pathogens, including RSV, in order to monitor seasonality [2,5].

Multiple tests are used to detect RSV including rapid antigen detection tests (RADTs), immunofluorescence assays (IFA), viral isolation, and polymerase chain reaction (PCR)-based assays. These RSV

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<https://doi.org/10.1016/j.jcv.2018.08.009>

Received 28 March 2018; Received in revised form 21 August 2018; Accepted 27 August 2018

1386-6532/ Published by Elsevier B.V.

diagnostic tests vary in sensitivity and specificity. PCR-based assays are generally more sensitive and specific than other assays and perform better in adults, [6–13] while RADTs are less sensitive (29%) in adults compared to children (81%) [14]. Because there are many different assays available for RSV detection, clinicians may order one or multiple assays from laboratories [15,16].

## 2. Objectives

The purpose of the survey was to understand the current RSV testing and diagnostic capabilities and practices among laboratories that report to NREVSS.

## 3. Study design

Four hundred and forty-five laboratories in 50 states and the District of Columbia voluntarily participate in NREVSS. We selected a targeted sample of 367 (82.5%) laboratories to survey based on previous participation in a NREVSS laboratory survey, being classified as a pediatric hospital laboratory, and laboratories that reported to NREVSS at least 1 antigen test for 30 or more weeks in the 2015–2016 season. We distributed surveys through an email link using an internet survey platform. Respondents completed the survey during August 26, 2016–September 26, 2016. The survey contained 49 questions pertaining to RSV diagnostic capabilities and laboratory practices.

Respondents self-identified as children's hospital laboratories (CHL, defined as laboratories that are affiliated with or in a children's hospital) or general hospital laboratories (GHL, defined as laboratories that performed analysis on specimens from only adults or a combination of adults and children; comprised of community hospitals, privately owned hospitals, university hospitals, Veteran's Affairs hospitals, reference, medical school-associated hospitals, privately funded research, commercial, and other laboratories). We conducted a descriptive analysis of survey responses and stratified results by the aforementioned groups. Frequencies were calculated using the number of responses for each question as the denominator. Analyses were completed using SAS 9.4 (Cary, NC) and significant differences from chi-square tests ( $p < 0.05$ ) between CHL and GHLs are denoted in the text.

## 4. Results

The survey achieved a 35.7% (131/367; representing 46 states) response rate; 11.5% ( $n = 15$ ) were CHLs (Table 1). Individuals completing the survey on behalf of the laboratory self-identified as microbiology/virology supervisor ( $n = 58$ , 44.3%); laboratory supervisor ( $n = 39$ , 29.8%); medical technologist/laboratory technician ( $n = 26$ , 19.8%); infection control practitioner ( $n = 3$ , 2.3%); and other categories ( $n = 5$ , 3.8%).

All laboratories except one GHL tested for RSV on-site ( $n = 130$ /

**Table 1**  
Self-identified laboratory type.

Lab Type (N = 131)	n (%)
Community hospital laboratory	68 (51.9)
Privately owned hospital laboratory	18 (13.7)
Children's hospital laboratory	15 (11.5)
University hospital laboratory	10 (7.6)
Reference laboratory	7 (5.3)
Medical school laboratory	1 (0.8)
Veteran's Affairs hospital laboratory	0 (0)
Privately funded research laboratory	0 (0)
Commercial laboratory	0 (0)
Other <sup>a</sup>	12 (9.2)

<sup>a</sup> County/state/public health laboratory (9), integrated healthcare system laboratory (1), non-profit hospital (1), hospital system owned clinic (1).

**Table 2**

Patient populations tested for RSV by general hospital laboratory (GHL) and children's hospital laboratory (CHL)<sup>a</sup>

Patient Population	n (%)		
	GHL N = 111	CHL N = 15	Overall N = 126
Emergency department	104 (93.7)	14 (93.3)	118 (93.7)
Hospitalized	102 (91.9)	15 (100)	117 (92.9)
Outpatients affiliated with hospital	96 (86.5)	12 (80)	108 (85.7)
Private physician offices	83 (74.8)	7 (46.7)	90 (71.4)
Other <sup>b</sup>	8 (7.2)	2 (13.3)	10 (7.9)

<sup>a</sup> Laboratories selected all that applied; therefore, percentages might exceed 100%.

<sup>b</sup> GHL: county medical examiner's office (1), outbreaks (1), all respiratory specimens submitted from local medical community (1), public health centers (1), referred specimens and outbreaks (1), sentinel flu surveillance and outbreaks (1), all departments (1), specimens referred from other hospitals (1); CHL: outpatients in hospital clinic (1), employee health (1).

131, 99%). Among 126 GHLs and CHLs who reported on populations tested for RSV, patients in the emergency department ( $n = 118$ , 93.7%) and hospitalized patients ( $n = 117$ , 92.9%) were highest, followed by outpatients seen in clinics affiliated with the hospital ( $n = 108$ , 85.7%) and private physician offices ( $n = 90$ , 71.4%). Findings were similar between GHLs and CHLs except that fewer CHLs reported testing patients for RSV in private physician offices (7/15, 46.7%) than GHLs (83/111, 74.8%,  $p = 0.02$ ; Table 2).

RADTs were available in 73.7% ( $n = 84$ ) of GHLs and 80.0% ( $n = 12$ ) of CHLs (Table 3). About half ( $n = 55$ , 48.7%) of GHLs and all of the CHLs reported being able to test for RSV by a PCR-based assay ( $p < 0.001$ , Table 3). The number of laboratories who reported submitting specimens for RADT was highest for children less than 5 years (GHL: 84/85, 98.8%; CHL: 12/12, 100.0%) and children 5–17 years (GHL: 54/85, 63.5%; CHL: 11/12, 91.7%; Table 4). Almost half ( $n = 41$ , 48.2%) of GHLs also reported using RADTs to test specimens from adults 50 years and over (Table 4).

All of the CHLs and 97.4% ( $n = 110$ /113) of the GHLs tested for RSV year-round. Eleven percent ( $n = 14$ ) of all laboratories used a specific algorithm based on age, season, or clinical setting to determine the type of test used for RSV detection, but only eight (57%) described these in further detail (Table 5). Among all types of RSV diagnostic tests used by laboratories, RADTs were reported the most among GHLs ( $n = 65$ , 60.2%), while PCR-based assays were reported the most among CHLs ( $n = 9$ , 75.0%; Table 6). Only 36% ( $n = 39$ ,  $p = 0.01$ , compared to CHLs) of GHLs used PCR-based assays as the most frequent test method for RSV detection.

## 5. Discussion

Among a sample of laboratories that report RSV detections to a

**Table 3**  
RSV testing capabilities by general hospital laboratory (GHL) and children's hospital laboratory (CHL).

Test Type	n (%)		
	GHL	CHL	Overall
Rapid antigen detection test	N = 114	N = 15	N = 129
	84 (73.7)	12 (80.0)	96 (74.4)
Immunofluorescence assay	N = 114	N = 15	N = 129
	16 (14.0)	3 (20.0)	19 (14.7)
Viral isolation	N = 113	N = 15	N = 128
	18 (15.9)	7 (46.7)	25 (19.5)
PCR-based assay	N = 113	N = 15	N = 128
	55 (48.7)	15 (100)	70 (54.7)

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