

Background

- Nosocomial respiratory viral infections (NRVI) are transmitted through direct contact from infected visitors or healthcare providers to patients.¹
- Influenza (Flu) and Respiratory Syncytial Virus (RSV) contribute significantly to the burden of acute lower respiratory infection in healthcare settings along with increasing duration of hospitalization and increased morbidity and mortality.²
- There is limited literature on epidemiologic risk factors of NRVI.
- This study aims to describe the epidemiology of nosocomial flu and RSV at an academic medical center.

Methods

Inclusion Criteria

- Patients with a positive Influenza or RSV result among those admitted to Northwestern Memorial Hospital (NMH) between April 1, 2009 to March 31, 2018.

Definitions

- Flu or RSV case:** a positive laboratory result on a reverse transcriptase-polymerase chain reaction (RT-PCR) assay (BioFire Respiratory Pathogen Panel, Salt Lake City, UT) utilizing either a nasopharyngeal (NP) or bronchoalveolar lavage (BAL) specimen.
- Community-acquired (CA) flu/RSV:** a positive result collected <72 hours of presenting to NMH.
- Hospital-acquired (HA) flu/RSV:** a positive result collected ≥72 hours after presenting to NMH.

Data Extraction and Analysis

- Data was collected from Northwestern Medicine Electronic Data Warehouse (EDW) and through chart review.
- Baseline patient characteristics and demographics of Influenza and RSV cohorts were analyzed and compared by Chi Square, Fisher Exact, and Mann-Whitney U tests for categorical and continuous variables (Stata Statistical Software: Release 17, College Station, TX).

Results

Distribution of NRVI

- There were 93/1,317 (7.1%) HA-flu cases and 76/617 (12.3%) HA-RSV cases detected (Table 1).

Table 1: Distribution of NRVIs

Respiratory Virus	N (%)
Influenza	93 (7.1)
Influenza A	67 (72)
Influenza B	26 (28)
Respiratory Syncytial Virus (RSV)	76 (12.3)
RSV A	7 (9.2)
RSV B	13 (17.1)
RSV Unspecified	56 (73.7)

Table 2: Underlying Medical Conditions Among Patients with CA- and HA-RVI

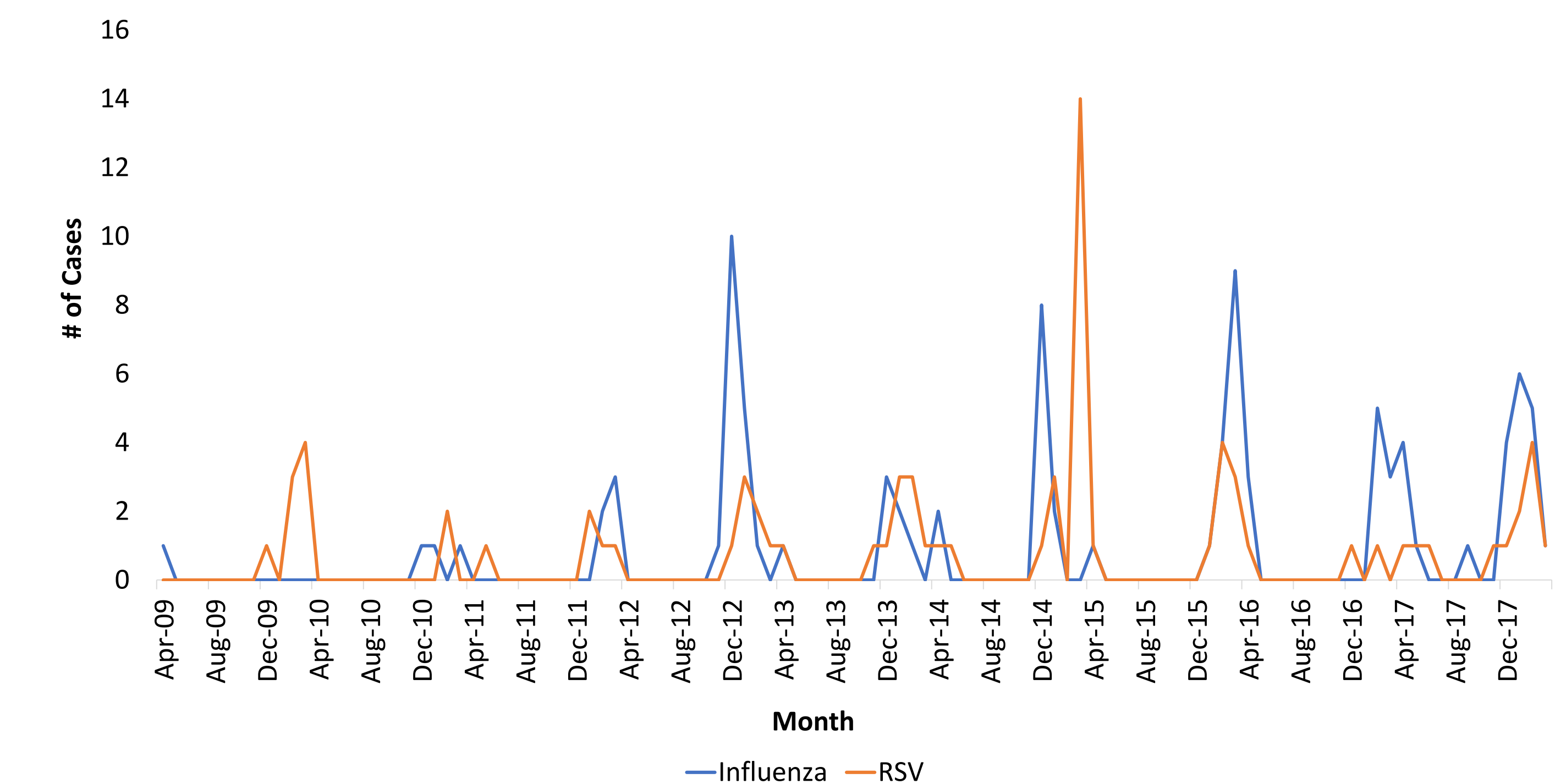
Medical Condition	CA-Flu N = 1,224	HA-Flu N = 93	p-value	CA-RSV N = 541	HA-RSV N = 76	p-value
Male sex	553 (45.2%)	42 (45.2%)	0.072	221 (40.9%)	35 (46.1%)	0.389
Age at diagnosis Mean [95% CI]	59.2 [58.7, 60.9]	57.7 [57.7, 64.3]	0.564	61.8 [60.3, 63.3]	59.7 [55.9, 63.4]	0.319
LOS (days) Mean [95% CI]	5.0 [4.7, 5.4]	25.9 [20.1, 31.8]	0	7.1 [6.4, 7.8]	20.6 [17.1, 24.1]	0
Obesity	395 (32.3%)	32 (34.4%)	0.671	189 (34.9%)	33 (43.4%)	0.149
Lung disease	280 (22.9%)	14 (15.0%)	0.081	122 (22.5%)	17 (22.4%)	0.972
Immunosuppressed	163 (13.3%)	14 (15.1%)	0.636	75 (13.9%)	17 (22.4%)	0.051
Cancer diagnosis	144 (11.7%)	21 (22.6%)	0.009	85 (15.7%)	32 (42.1%)	0
Stem Cell Transplant within 1 year	30 (2.5%)	6 (6.5%)	0.023	36 (6.7%)	18 (23.7%)	0
Chemotherapy within the past 30 days	58 (4.7%)	9 (9.7%)	0.037	65 (12.0%)	27 (35.5%)	0
Diabetes	181 (14.8%)	13 (14.0%)	0.832	45 (8.3%)	5 (6.6%)	0.603
Cardiac disease	279 (22.8%)	22 (23.7%)	0.849	86 (15.9%)	8 (1.1%)	0.223
Rheumatological Disease	84 (6.9%)	4 (4.3%)	0.34	30 (5.5%)	5 (0.1%)	0.715
Chronic Kidney Disease	118 (9.6%)	14 (15.1%)	0.094	62 (11.5%)	7 (9.2%)	0.56
Solid Organ Transplant	50 (4.1%)	3 (3.2%)	0.684	41 (7.6%)	4 (5.3%)	0.467

Results

NRVI Seasonality

- Few nosocomial transmissions (15%) occurred outside the typical winter respiratory viral season (Fig 1).

Figure 1: Distribution of NRVIs over time assessing for transmission seasonality



Discussion

- Nosocomial infections account for 7% of hospitalized flu cases and 12% of hospitalized RSV cases.
- NRVIs are more common in patients at high risk of complications such as patients with a cancer diagnosis, stem cell transplant recipients within one year, and patients who have undergone chemotherapy in the prior 30 days.
- Infection control and prevention efforts need to be directed towards approaches to reduce the risk of nosocomial RVI transmission.
- Future studies are needed to assess the impact of interventions such as universal masking, which has become standard practice in the healthcare setting, on the rate of nosocomial RVIs.

References

¹Chow EJ and Mermel LA. Hospital-Acquired Respiratory Viral Infections: Incidence, Morbidity, and Mortality in Pediatric and Adult Patients. *Open Forum Infect Dis* 2017; 4(1): ofx006.

²Johnson EK, Sylte D, Chaves SS, et. al. Hospital utilization rates for influenza and RSV: a novel approach and critical assessment. *Popul Health Metrics* 2021; 19(31).