Poster P0122

Similar proportions and temporal patterns of influenza, RSV and hMPV among ESKD patients tested between 2020 and 2023

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Why did we perform this research?

- End-stage kidney disease (ESKD) is the result of irreversible decline in kidney function, requiring dialysis and/or kidney transplant[1]
- Patients with kidney disease are at high risk for severe respiratory tract infections (RTIs),[2] likely due in part to underlying immune dysfunction and compromised lung barrier function[3,4]
- Although infections are one of the main causes of hospitalisation in patients with ESKD,[2] little is known about the relative burden of seasonal respiratory viruses in patients with ESKD

Objective: To describe the clinical characteristics and temporal trends of patients with ESKD requiring maintenance dialysis (MD) and testing positive for influenza, respiratory syncytial virus (RSV) and human metapneumovirus (hMPV)

***E-poster and supplementary materials**

How did we perform this research?

Data source

Loopback Analytics electronic medical records (EMR) database[a]

Electronic records from >30 million US patients spanning 30 health systems (>500 US hospitals)

Study population and analysis

- Patients with a diagnosis of ESKD requiring MD[b] recorded between 1 January 2020 and 31 December 2023
- Aged ≥12 years at initial ESKD diagnosis
- Follow-up was 12 months post-ESKD diagnosis[c]

Outcomes

- ✓ Testing proportions and positivity results for influenza, RSV and hMPV[d]

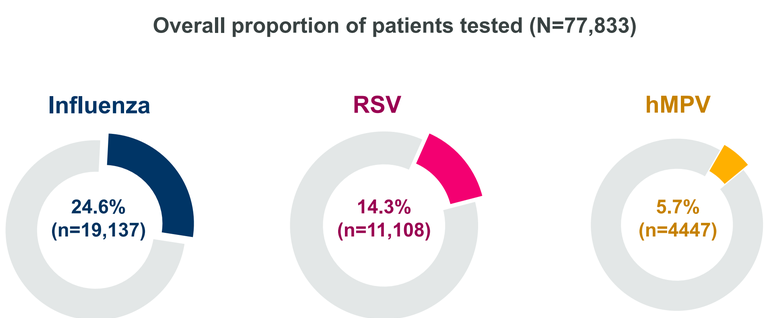
Additional outcomes

- ✓ Patient characteristics and comorbidities
- ✓ Dialysis characteristics
- ✓ Proportion of patients with pneumonia and sepsis

[a]Structured EMR data elements included: diagnosis, treatment administration, laboratory data and procedures; [b]At least one inpatient or outpatient diagnostic code for ESKD requiring MD (ICD-10-CM codes N18.6 and/or Z99.2) recorded in EMRs. [c]Follow-up continued for 12 months post-ESKD diagnosis, or until lost to follow-up, whichever occurred first. [d]Select infections within 12 months of ESKD diagnosis were defined by positive laboratory test results

What did we find?

Figure 1. Seasonal respiratory viral testing among patients diagnosed with ESKD requiring MD[a] between 1 January 2020 and 31 December 2023



- **2.3% (n/N=437/19,137) were positive for influenza**
- **2.1% (n/N=228/11,108) were positive for RSV**
- **1.9% (n/N=83/4447) were positive for hMPV**

[a]Included patients captured in the Loopback Analytics EMR database with ≥1 IP/OP EMR diagnostic code for ESKD requiring MD and aged ≥12 years at initial diagnosis; [b]Positivity proportions are calculated among patients with a laboratory test recorded for the specified pathogen within 1 year after ESKD diagnosis

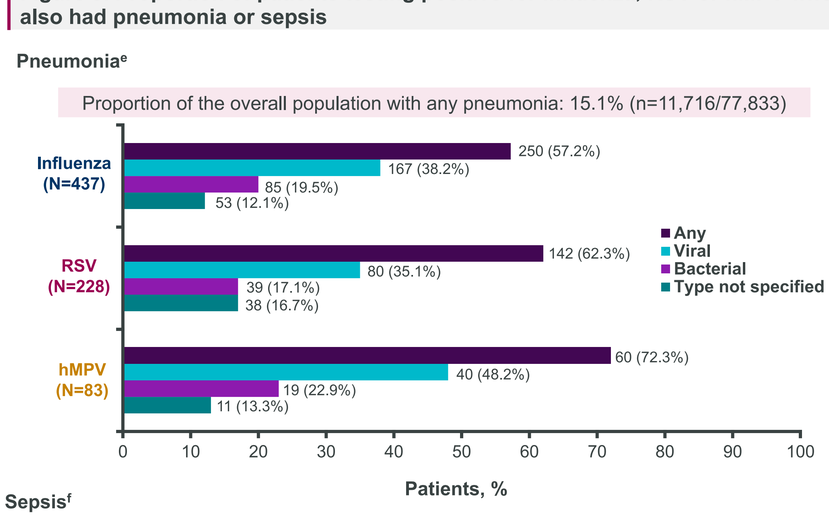
- Overall, 77,833 patients were identified as diagnosed with ESKD requiring MD using EMRs
  - 24.6% underwent testing for influenza, 14.3% for RSV and 5.7% for hMPV; 2.3%, 2.1% and 1.9%, respectively, were found to be positive (**Figure 1**)
  - Among patients who were tested for both RSV and hMPV (n=4,404) at any time during follow-up, 2.5% (n=109) and 1.8% (n=81) had an RSV and hMPV positive test result, respectively
- ESKD patients with positive test results presented with high comorbidity burden, including congestive heart failure and chronic pulmonary disease (**Table 1**)
- A higher proportion of patients who were positive for a viral respiratory infection received haemodialysis via central venous catheter; 47.7% among those with a positive test result vs. 27.2% in the overall study population (**Table 2**)
- Overall and yearly testing rates were highest for influenza and lowest for hMPV; testing for both RSV and hMPV were highest in 2023. The proportion of tests that were positive varied over time with the lowest positivity for all respiratory viruses observed in 2021 (**Figure 2**)
- Overall, 15.1% and 15.3% of patients had any type of pneumonia and sepsis, respectively. Among patients who tested positive for influenza, RSV or hMPV, rates were ≥57.2% for pneumonia and ≥43.7% for sepsis (**Figure 3**)

Table 2. Type of dialysis received by patients with ESKD requiring MD and with a positive test result for influenza, RSV, or hMPV

Dialysis type, n (%)	Patients with ESKD (N=77,833)	Influenza Positive (N=437)	RSV Positive (N=228)	hMPV Positive (N=83)
Haemodialysis	36,117 (46.4)	321 (73.5)	169 (74.1)	61 (73.5)
Central venous catheter	21,197 (27.2)	202 (46.2)	114 (50.0)	41 (49.4)
Arteriovenous fistula	5087 (6.5)	43 (9.8)	24 (10.5)	7 (8.4)
Arteriovenous shunt/graft	1075 (1.4)	21 (4.8)	4 (1.8)	3 (3.6)
Catheter (type missing)	8758 (11.3)	55 (12.6)	27 (11.8)	10 (12.0)
Peritoneal	3941 (5.1)	36 (8.2)	10 (4.4)	4 (4.8)
Unknown (data missing)	37,775 (48.5)	80 (18.3)	49 (21.5)	18 (21.7)

For information on the type of dialysis received by patients with ESKD who were tested for influenza, RSV, or hMPV see **supplementary materials**

Figure 3. Proportion of patients testing positive for influenza, RSV or hMPV who also had pneumonia or sepsis



[e]Viral/bacterial pneumonia was determined by the first occurrence during follow-up. Percentages are calculated among total patients with pneumonia and a positive test for the specified pathogen within 1 year of ESKD diagnosis. Patients were counted more than once if both viral and bacterial pneumonia were identified on the same date; [f]Level of sepsis was determined by the occurrence of the highest severity during follow-up. Percentages are calculated among total patients with sepsis and a positive test for the specified pathogen within 1 year of ESKD diagnosis

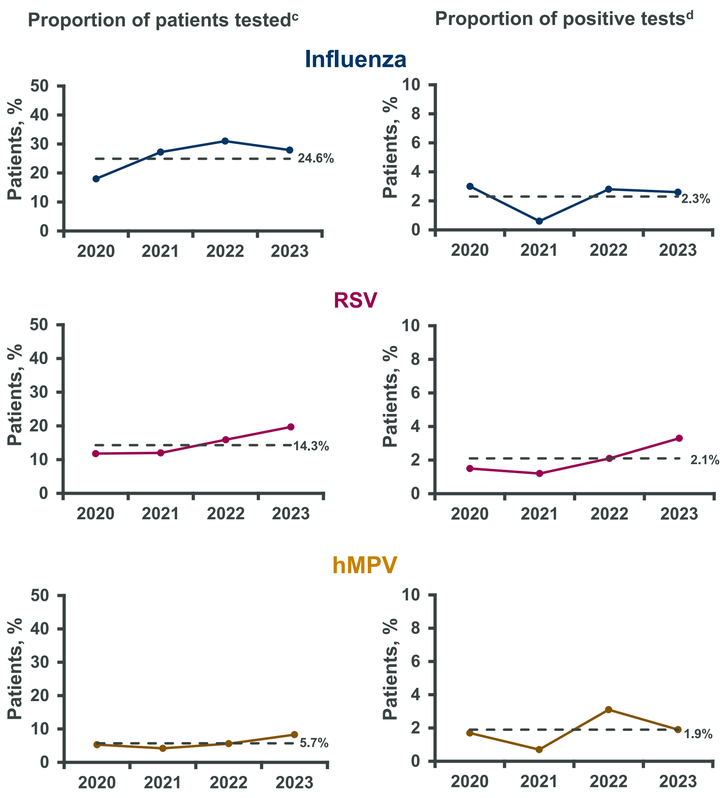
For information on the proportion of patients ESKD who were tested for influenza, RSV, or hMPV and had pneumonia or sepsis see **supplementary materials**

Table 1. Demographic and clinical characteristics of patients with ESKD requiring MD and testing positive for influenza, RSV or hMPV

Characteristics	Patients with ESKD (N=77,833)	Influenza Positive (N=437)	RSV Positive (N=228)	hMPV Positive (N=83)
Age at prevalent diagnosis, years				
Mean (SD)	60.7 (15.1)	60.4 (16.1)	63.5 (15.1)	62.3 (16.0)
Median (Q1–Q3)	62.4 (51.3–71.6)	62.1 (51.7–71.8)	65.8 (54.0–74.5)	65.2 (50.3–74.2)
Min, max	12.0, 89.0	12.8, 89.0	22.3, 88.9	18.1, 88.8
Sex, n (%)				
Female	31,040 (39.9)	215 (49.2)	117 (51.3)	41 (49.4)
Male	45,302 (58.2)	211 (48.3)	110 (48.2)	35 (42.2)
Other or missing	1491 (1.9)	11 (2.5)	1 (0.4)	7 (8.4)
Race, n (%)				
White	33,882 (43.5)	210 (48.1)	122 (53.5)	43 (51.8)
Black or African American	11,583 (14.9)	83 (19.0)	49 (21.5)	6 (7.2)
Asian	6114 (7.9)	27 (6.2)	12 (5.3)	5 (6.0)
Other or unknown	26,254 (33.7)	117 (26.8)	45 (19.7)	29 (34.9)
Hispanic or Latino, n (%)	11,689 (15.0)	52 (11.9)	27 (11.8)	16 (19.3)
Facility type, n (%)				
Academic	60,900 (78.2)	269 (61.6)	177 (77.6)	56 (67.5)
Community	16,933 (21.8)	168 (38.4)	51 (22.4)	27 (32.5)
Common comorbidities,[c] n (%)				
Diabetes with chronic complications	34,744 (44.6)	229 (52.4)	136 (59.6)	48 (57.8)
Congestive heart failure	22,413 (28.8)	221 (50.6)	137 (60.1)	52 (62.7)
Peripheral vascular disease	15,284 (19.6)	137 (31.4)	69 (30.3)	34 (41.0)
Chronic pulmonary disease	12,452 (16.0)	159 (36.4)	90 (39.5)	31 (37.3)
Myocardial infarction	10,799 (13.9)	122 (27.9)	70 (30.7)	22 (26.5)
Cerebrovascular disease	9994 (12.8)	97 (22.2)	50 (21.9)	15 (18.1)
Any malignancy, including leukaemia and lymphoma	6746 (8.7)	43 (9.8)	41 (18.0)	12 (14.5)
Charlson comorbidity index score				
Mean (SD)	4.5 (2.5)	5.7 (2.8)	6.3 (2.5)	6.1 (2.4)
Median (Q1–Q3)	4.0 (2.0–6.0)	5.0 (4.0–7.0)	6.0 (4.0–8.0)	6.0 (4.0–7.0)
Min, Max	0.0, 19.0	0.0, 19.0	1.0, 14.0	0.0, 13.0

For clinical characteristics information on patients with ESKD who were tested for influenza, RSV or hMPV see **supplementary materials**

Figure 2. Testing and positivity patterns over time in patients with ESKD requiring MD who were tested for influenza, RSV, or hMPV



Dashed lines indicate the overall testing and positivity rates. [c]Included patients tested for the specified pathogens within 1 year after ESKD diagnosis; [d]Positivity proportions were calculated among total patients tested for the specified pathogen within the time-period specified

Limitations

- Notable reductions in the circulation of seasonal respiratory viruses were reported during the study follow-up period, which occurred during the COVID-19 pandemic.[5] This likely led to a lower detection of non-SARS-CoV-2 respiratory viruses until more typical seasonal fluctuations were re-established post-pandemic
- Testing rates and results in patients with ESKD captured in the EMR database may not be generalisable to the US population with ESKD
- These results may only apply to RTIs of sufficient severity to result in laboratory testing or healthcare encounters

How do these real-world data inform clinical practice?

- **Although ESKD patients were most frequently tested for influenza, followed by RSV and then hMPV, the proportion positive for each virus was similar**
- **The relative proportion of positive test results and testing patterns were consistent across respiratory viruses from 2020 to 2023**
- **While influenza and RSV are recognised as causative agents for RTIs in ESKD patients, these data suggest hMPV may also contribute to infection burden and warrant targeted preventative measures**

Abbreviations

COVID-19, coronavirus disease-2019**, EMR**, electronic medical record; **ESKD**, end-stage kidney disease; **hMPV**, human metapneumovirus, **MD**, maintenance dialysis; **max,** maximum; **min,** minimum; **n/N**, number of participants; **Q**, quarter; **RSV**, respiratory syncytial virus; **RTI**, respiratory tract infections; **SARS-CoV-2**, severe acute respiratory syndrome coronavirus 2; **SD**, standard deviation; **US**, United States

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Disclosures

- **SA** was contracted to Graticule, Inc. from Landmark Science for this study
- **SM** reports receiving honoraria or consulting fees from Graticule, Inc
- **JRD**, and **YK** are/were employees of/may hold stock in Graticule, Inc
- **CF, LG, SV, CT** and **DV** are employees of/may hold stock in AstraZeneca

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