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Project: The utility of a multiplex PCR assay for the detection of respiratory viruses in children

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Introduction:
Apart from during the neonatal period, acute respiratory tract infections are the most common cause of both illness and mortality in children under 5 years.

In the winter months [June, July, August] a large proportion of paediatric admission and workload is due to respiratory viruses. There are no guidelines in Christchurch Public Hospital [CPH] for testing these children and it is currently done at the discretion of the admitting paediatrician. For the past 4 years, clinicians have had the option of taking a nasopharyngeal swab [NPS] and sending it to the laboratory for multiplex-PCR analysis. This is done to identify a possible respiratory pathogen from a panel of up to 19 different viruses and one bacterium, mycoplasma pneumoniae.

Aim:
Describe the use of multiplex-PCR testing on NPS samples in children admitted to CPH in winter months of 2012-2015. Investigate whether or not the use of an NPS impacts on the clinical management of these children. Specifically, does it reduce the use of unnecessary antibiotics?

Method:
A retrospective audit using databases with discharge coding as well as laboratory records and clinical notes.

Two groups of children admitted to children's wards in winter months of 2012-2015 were included:

1. Infants [<3 months] admitted with fever without a focus
2. Children [3 months-5 years] admitted with a lower respiratory tract infection [LRTI] coded as pneumonia or influenza. Children were counted as separate cases if there were more than 2 weeks between their admissions.

Results:
Seventy five infants with fever without a focus were admitted in winter months of 2012-2015. Forty four (59%) had an NPS as part of their initial investigations. Of these, thirty one (70%) had at least one virus detected on the respiratory multiplex PCR assay. 90% of infants had a septic screen on admission and of these, two thirds also had an NPS. [Septic screen = 2 of CSF, blood, or urine cultures].

A higher proportion of infants who had an NPS received either ≤48hrs (empiric) antibiotics or ≥5 days (continued) antibiotics compared to infants who did not have an NPS (89% vs 68%).

Two hundred and thirty seven children with LRTI were admitted in the winter months of 2012-2015. One hundred and forty six had an NPS as part of their initial investigations. Of these, one hundred and thirty seven (94%) had at least one virus detected on the respiratory multiplex PCR assay.

A significantly smaller proportion of children who had an NPS received empiric or continued antibiotics compared to children who did not have an NPS (60% vs 89%).For both the infants and children in the audit there was no disparity in the use of NPS between ethnicities. Just less than two thirds had an NPS in each ethnic group (P-value; 0.87 infants and 0.55 children). Infants/children who had an NPS were significantly more likely to have a longer stay in hospital and be transferred to a ward other than Children's Acute Admissions (CAA).

Length of stay and ward for duration of admission were used as surrogate markers of illness severity. Therefore, the sicker children of those in the audit tended to be the ones to have an NPS and a longer hospital stay.
Further analysis of the strains of viruses detected by NPS and their corresponding management was done to see whether the type of virus detected influenced clinicians use of antibiotics.

It was observed that when Influenza A/B were detected, both infants and children were less likely to be given continued antibiotics than for the other strains of viruses [Respiratory Syncytial Virus, Human Metapneumovirus, Parainfluenza virus.] None of the infants with PCR detected influenza had continued antibiotics and 23% of children had continued antibiotics. Additionally, 46% of children with PCR detected influenza were given no antibiotics at all.

Conclusion:
Approximately 60% of both infants and children in the audit had an NPS with respiratory multiplex PCR as part of their investigations on admission to hospital. There was no disparity in the use of NPS between ethnicities. Sicker children were more likely to be admitted to a ward other than CAA, have a longer stay in hospital and receive an NPS. Infants who had an NPS were more likely to also receive some form of empiric or continued antibiotics. In contrast, children who had an NPS were less likely to receive empiric or continued antibiotics.

Of all the findings, most encouraging is the reduction in the use of antibiotics observed when Influenza viruses were detected on the NPS samples in both groups of children. This suggests that clinicians are confident in stopping antibiotics in children whose multiplex-PCR assay has detected influenza as likely causing their symptoms. This is clinically relevant because antibiotic stewardship is of ever increasing importance.