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Paper Poster Session
Influenza - clinical epidemiology

Computational modelling of influenza outbreaks as a tool to predict the impact of epidemics

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Background: Rapid identification of influenza virus infection is crucial during epidemics, allowing a rapid management of patient treatment and hospital epidemiology interventions. However, classical surveillance models can only describe the status quo of an outbreak and do not allow predicting the future dynamics.

Material/methods: We used rapid Influenza-specific PCRs (GenXpert, Cepheid) to determine the type of influenza infection (A or B) at the University Hospital Basel over two seasons. We analysed the cases per week in a cumulative way. We fitted a transmission model to the case data from the first 4 weeks in a season to predict the severity of the 2013/2014 and 2014/2015 outbreak.

Results: During the influenza epidemic 2013/2014, we performed 695 tests and detected 131 cases of Influenza A (96.3% of total positive) and 5 cases of Influenza B (3.7%). During the influenza epidemic 2014/2015 we performed 1567 tests and detected 335 cases of Influenza A (65.3% of total positive) and 178 cases of Influenza B (34.7%). The cumulative cases over the year indicated a clear different replication dynamic between the two epidemics (see Figure). We calculated the R0 with 1.2 and 1.8 for 2013/2014 and 2014/2015, respectively. The estimated R0 was stable 4 weeks after the first registered cases and could help to predict the overall severity of the current season.

Conclusions: Real-time computational analysis of the replication dynamics of influenza cases over time has the potential to reliably determine the expected R0 of an influenza epidemic within four weeks. This information can be great value for organisation of health resources in hospitals and public health authorities.

Figure. (A) Cumulative cases during influenza epidemics. (B) Calculation of R0. The reproduction number estimated after four weeks is robust towards including data from later weeks and assumptions on the total number of cases: the points at four weeks are calculated with and without later data and with varying the total number of case assumptions. The estimates within each season are robust towards these different options.