First Feasibility of a Surveillance Platform to Monitor Upper Respiratory Infections with Community-Submitted Symptoms and Specimens for Molecular Diagnostic Testing

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Objective
Modern informatics-based participatory surveillance systems are one approach to obtaining disease information in real-time and at scale. However, none of these Internet-based systems employ molecular techniques to rapidly verify the intelligence data they garner. This work describes the GoViral platform; designed to acquire community generated diagnostic samples and couple them with other contemporaneous information such as participatory syndromic reports.

Background
Why We Need Influenza Surveillance
• Influenza causes substantial burden of illness and severe outcomes in the US every year
• Despite this burden, there is limited information on attack rates in different population groups and limited means for assessing the magnitude of an evolving influenza season
• Mobile and Internet-connected tools can enable a more real-time picture of disease incidence
• Contributing data directly from the home can potentially capture information on seemingly mild illness that would not be disclosed to health care professional

Current Internet-Based Influenza Surveillance
• Internet-based influenza surveillance systems have been developed and deployed nationally for years in 10 countries in Europe as well as Australia and here in the United States through Flu Near You [1, 2] (below)
• Isolated pilot efforts to employ oral detection have occurred, but to-date a scalable method for participatory diagnostic sample collection has not been developed
• Community participation in analysis and specimen for flu collection is largely unexplored

Feasibility of Oral and Nasal Samples for Flu Detection
• Nasopharyngeal wash and aspirate is generally considered the gold standard method of specimen collection, however lay volunteers cannot be asked to perform these techniques at home [3]
• Oral specimen collection systems have been widely used to obtain genetic material for direct-to-consumer medical tests, however the literature on oral specimens is sparse
• Nasal swabs have been demonstrated to be used by volunteers to collect samples at home [4]

Methods
Specimen Collection
• A cohort of 281 lay volunteers in the Boston area were recruited through a variety of modern channels
• Participants were instructed to perform the specimen collection and rapid test within 48 hours of experiencing symptoms
• Customized videos and instruction sheets showed participants how to collect their samples (right)
• Participants were also registered for the Flu Near You site and reported symptoms through weekly surveys
• Samples tested by GemMark eSensor Respiratory Panel and BioFire FilmArray Respiratory Panel

At Home Flu Test Kit
• These kits along with prepaid mailing labels were mailed to participants at the beginning of the influenza season
• Each of the kits sent to participants included: (left)
  A) Rapid test
  B) Rapid test liquid reagent
  C) Nasal swab with transport medium
  D) Oral Specimen collector
  E) Flocked nasal swabs

Results
Number of participants with positive results from oral or nasal specimen (above)
• Among the cohort of enrolled study participants, 76 participants completed the diagnostic samples and specimens were sent for nucleic acid analysis.

Next Steps and References
• Future studies will increase the amount of reported data which will enable evaluation of the relationship between reported symptom profiles and viral etiology as well as spatio-temporal distribution of upper respiratory infection, and impact of these efforts on individual’s public health and healthcare seeking behavior.
• Patient-centered, rapid information retrieval and distribution will enable individuals to take more interest and responsibility for their health, drive healthcare costs down, and above all provide better care for everyone.
• More real-time methods for detection can be incorporated and related decision making examined