Author's response to reviews

Title: Effectiveness of cough etiquette maneuvers in disrupting the chain of transmission of infectious respiratory diseases.

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Author's response to reviews: see over
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The BioMed Central Editorial Team
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We are submitting the attached further amended manuscript, “Assessment of the effectiveness of non-pharmaceutical interventions in epidemic/pandemic-prone infectious respiratory diseases outbreak”, for publication in BMC Pulmonary Medicine. We have addressed the third round of comments, and hope you find the amended article acceptable.

Sincerely,

Jose Gustavo Zayas, MD, MSc
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Biomed Central Editorial Team:

Our team of researchers agreed to respond directly to BioMed Central Editorial Team regarding this article:

Individuals, families, communities, countries and the entire world faces IRD of different severity levels: mild, moderate, severe and those of extraordinary severity. Mortality is directly related with the severity level. When facing a deadly and severe droplet-spread outbreak we must strive to recommend procedures with optimal effectiveness.

Having in mind this extreme scenario our first step was to assess how good or bad current procedures are at blocking the spread of infectious cough-droplets. Subsequent steps/studies will be decided depending of the results.

Therefore this study was designed to primarily assess how well recommended CE maneuvers block cough-droplets coming from inside the chest toward the external environment. Hence, the methodology we used was established solely for that purpose: cough-droplets moving from inside the chest toward the external environment.

The BMC Central Editorial team presented us with some comments to address:

Regarding your first paragraph: to our knowledge do not exist a method to determine neither the total number of droplets expelled when coughing nor the proportion of droplets blocked. We stated before: Our experiment was designed to capture a representative section of the cough plume crossing the path length and the measurement zone, including droplets from the lateral periphery that cross the measurement section. We estimate that we captured close to 15% of cough droplets that are representative of the cough plume but we have no definitive way or method to accurately determine this yet.

1) We will include a plain and brief interpretation of each table.

2) We describe several factors to support our explanation of the counter-intuitive results:

The control data was obtained from a conic expanding unobstructed cough aerosol from 51 non-smoking subjects.

When practicing any of the NPI the short distance from the opening of the mouth before reaching the inner surface of the barrier and the barrier in front of the cough both prevents the conic expansion of the cough aerosol when exiting the mouth.

Another factor would be the shape of the barrier in front of the cough airflow: a vertically elongated concave pear-shape space redirecting a more concentrated flow travelling a shorter distance before crossing the measurement zone.

In short: the shape of the barrier encountered by the cough plume after exiting the mouth and after travelling a shorter distance prevents the expansion of the plume which is then redirected toward an area of lower or no resistance. The shape of the barrier forces the majority of the droplets to compress and move toward the area of low resistance resulting in a more concentrated plume crossing the measurement zone. The number of droplets from the control group was acquired from a less concentrated conically expanding unobstructed flow travelling more distance before crossing the measuring zone. The high speed and high pressure of the expulsion phase of the cough might dislodge particles deposited within the fiber network during the manufacturing process, resulting an increased number of items detected by the system.

3) It is very difficult to critically appraise our results with respect to the references provided by the
reviewer: they all used studies that used a variety of closed systems of various designs to assess the "respiratory droplets" generated by machines, not humans. The majority of them used measurement equipment with much lower resolution, limited range of sizes and biased droplet collection to characterize the size and number of droplets, and almost all of them used equipment with much lower data acquisition speeds than the one used in our study. Those who used human volunteers, like Milton, took non-real time measurements of respiratory samples from unobstructed cough airflow.

However, we found that a cluster randomized trial conducted in France by Canini et al (PLoS ONE, 2010) assessing the effectiveness of facemasks for limiting influenza transmission in households was prematurely interrupted after the control arm and the case arm failed to show the effectiveness of facemasks.

Another study in Germany conducted by Suess et al (BMC Infectious Diseases, 2012) showed that household transmission of influenza can be reduced when using facemasks plus intensified hand hygiene, not when wearing facemask alone.

These two latest studies are aligned with our conclusion that facemasks allow infectious droplets to spread in the external environment.

4) The European Respiratory Society published a booklet: Nino Künzli, Laura Perez, Regula Rapp. Air Quality and Health. European Respiratory Society, 2010; Lausanne, Switzerland.

In Page 25 we found the following statements:

The association between daily changes in ambient PM2.5 levels and daily mortality is often reported for a 10 $\mu g \cdot m^{-3}$ change in PM2.5, but other scales are frequently used.

A large body of studies, for instance, indicates that a 10 $\mu g \cdot m^{-3}$ increase in daily ambient PM2.5 is associated with a 0.5–1.0 % increase in daily mortality, corresponding to an extremely small, but highly significant and relevant, RR of 1.005–1.01.

Despite the existence of so many articles presenting solid evidence of the damaging health consequences such as mortality due to exposure to small particles, including the American Cancer Society Study that involved 500,000 subjects followed over 16 years (ERS, page 25), our approach is different and merits clarification.

We are trying to differentiate the term particles (air pollution studies) from droplets (cough studies). Particles in air pollution studies are made of solid material resulting from combustion.

Droplets are formed when the airway mucus (approximately 95 % water and the remaining percentage solid material) interact with high-speed airflow when coughing. This is the reason why our team of researchers proposes to reach a consensus of referring to droplets when doing cough studies and not particles to avoid confusion. However small droplets leaving the chest can lose their water content due to dehydration becoming airborne solid material.

Therefore after these considerations very respectfully we ask the BMC Central Editorial Team to make a decision on our manuscript at the earliest possible.