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Medical Intelligence Report

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Topic: Update on COVID-19 Research

Vaccine Clinical Trial Results

Moderna Vaccine

Moderna released the results of the first interim analysis of their Phase 3 clinical trial investigating the efficacy of a potential COVID-19 vaccine (Moderna, 2020 and NIH, 2020). The analysis was based on 95 cases of COVID-19 confirmed at least two weeks after participants received their second dose as stipulated in the original trial protocol. The study has enrolled more than 30,000 participants in the United States and is being conducted in collaboration with the National Institutes of Health (NIH) and the Department of Health and Human Services (HHS). The trial was designed to test the efficacy in those who may be more vulnerable to infection, and thus, 37% of the participants are from racial and ethnic minorities, 23% were over the age of 65, and 17% were under 65 with high-risk medical conditions.

> **The analysis revealed that 90 of the cases of COVID-19 occurred in participants in the placebo group and 5 cases occurred in the group who received the vaccine, leading to an estimate of vaccine efficacy of 94.5%.**

There were eleven severe cases of COVID-19 reported, and all eleven occurred in participants who were in the placebo group. There is also evidence of efficacy for older individuals and those with ethnic or racial minority backgrounds. The results suggest that the efficacy was consistent across all groups (Herper and Branswell, 2020).

No significant safety concerns were reported, and a review of the adverse effects showed that the vaccine was well-tolerated with mainly mild or moderate effects. Severe events after the first dose included 2% of participants reporting injection site pain, and severe events after the second dose included fatigue in 9.7% of participants, muscle aches (8.9%), joint pain (5.2%), headache (4.5%), pain (4.1%), and erythema/redness at the injection site (2.0%).

The company also reported that they are working with the CDC and McKesson, a COVID-19 vaccine distributor contracted by the United States government, as well as global stakeholders to be prepared for distribution of the vaccine after approval by the FDA. By the end of 2020, Moderna estimated they will have approximately 20 million doses of the vaccine ready to ship for use in the United States with 500 million to 1 billion doses globally available during 2021.

One significant difference between the Moderna vaccine and the previously described Pfizer vaccine is that the Moderna version remains stable at standard refrigerator temperatures for 30 days and can be shipped and stored at standard freezer temperatures for up to six months.

The main component of the Moderna and Pfizer vaccines is a molecule called mRNA that is unstable. To combat this problem, Pfizer recommends storage at ultra-low temperatures. Moderna has been able to modify the mRNA molecules and the vaccine components to improve the stability for more convenient storage and shipping (Moderna, 2020). Due to the large number of doses required for inoculation of the world population, both vaccines will be necessary to meet the demand. However, Moderna's vaccine may be able to be used in areas where ultra-low freezers are not available while Pfizer's vaccine can be used in large medical facilities that have access to the proper equipment.

Both vaccines have exceeded the early estimates of vaccine efficacy from disease experts and provide a good safety profile.

The small differences in efficacy between the two vaccines (90% for Pfizer and 94.5% for Moderna) are not comparable due to differences in the trial protocols, and they should not be used to rank the efficacy of the vaccines. In a statistical analysis it is possible that the values would be equivalent.

Pfizer Vaccine

Pfizer and its partner BioNTech announced that they are planning to file for Emergency Use Authorization from the FDA on November 20 (Johnson, 2020). The process will include more up-to-date and complete information from the Phase 3 trial than released earlier. Additional information that has been released includes

- The two-dose vaccine regimen was 95% effective at preventing disease in clinical trials and had no major safety problems.
- The vaccine was 94% effective in people over 65.
- Information on safety for 38,000 people of the 44,000 in the trial for two months after the second dose.
- Safety data on 100 children between 12 and 15 years old who were recently added to the participants in the trial.

COVID-19 Outbreaks in Nursing Homes

COVID-19 cases are again rising in nursing homes across the country even with $5 billion from the federal government applied to putting new precautions in place to prevent transmission, such as 14,000 fast-test machines and personal protective supplies (Alonso-Zaldivar, 2020 and Roubein, 2020).

There was a four-fold increase in the number of new cases in residents each week between May and October, and the number of deaths of residents in nursing homes more than doubled during that time from 318 a week to 699.

The number of cases among staff at nursing homes also increased by more than four-fold between May 31 (855 cases) and October 25 (4,050 cases). The rise in infections in staff is thought to be the transmission route from community-based cases due to the high possibility of asymptomatic or pre-symptomatic transmission. Additionally, infections in the staff and exposure of others in the facilities leads to a shortage of available workers.

Several studies have shown that the quality rating of a facility does not have a correlation with the number of cases or deaths at a facility. Instead, there seems to be an association between the levels of community-based transmission outside of the long-term care facilities and the compliance of a facility with basic infection control rules. The Associated Press reported that for the week ending October 25, about one in six nursing homes in states with surging numbers of cases did not report having tested staff at the facility in the prior week, which is against government requirements to test staff at least weekly in areas where the virus is spreading. One in five nursing homes also reported shortages of basic protective supplies during that time period, and nearly one in four facilities reported a nurse staffing shortage (Alonso-Zaldivar, 2020). Politico reports that to combat the shortages, Indiana has deployed the National Guard to help with testing, reporting results and screening employees (Roubein, 2020). They also found that 15% of nursing homes report they have less than one week supply of at least one type of key personal protective equipment, such as gloves or masks, and 22% have a shortage of staff.

CDC announces new information on Masks

The CDC released a new scientific brief describing the use of cloth masks in the community to prevent the spread of SAR-CoV-2 (CDC, 2020).

The report states that using a "non-valved multi-layer cloth mask" both reduces the emission of virus-laden droplets and reduces the inhalation of infectious droplets by the person wearing the mask.

Previously, the CDC has reported that masks are useful for source control (reducing the source of infectious virus) by stopping exhaled droplets, but this update also includes a description of a protective effect for other nearby people wearing a non-medical grade mask. People wearing a mask are protected by filtration of fine droplets and particles less than 10 microns in size. The report states that

Multiple layers of cloth with higher thread counts have demonstrated superior performance compared to single layers of cloth with lower thread counts, in some cases filtering nearly 50% of fine particles less than 1 micron.

New research also suggests that some types of fabric (e.g. polypropylene) may enhance the filtering effect by producing a static that enhances the capture of particles. Masks that utilize

silk have been found to help repel moist droplets and reduce fabric wetting, which helps to maintain breathability and comfort.

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