An Economic Model Exploring the Value of a Microneedle Patch Delivery Presentation for the Seasonal Influenza Vaccine

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ABSTRACT

Background: New vaccine delivery technologies may improve the acceptability, ease of delivery (potentially enabling self-vaccination), and vaccine efficacy compared to existing technologies for influenza vaccines. One such technology is the microneedle patch (MNP), an intradermal delivery technology currently in development. While MNPs seem promising, their potential economic and epidemiologic impacts have not yet been evaluated.

Methods: We utilized a Susceptible-Exposed-Infectious-Recovered transmission model linked to an economic influenza outcomes model to explore the economic value of introducing the MNP into the current influenza vaccine market in the US from the third party payer and societal perspectives. Data to populate the model were obtained from published literature. We also explored the impact of different vaccination settings, self-administration, the MNP price, vaccine efficacy, compliance, and MNP market share on the results. We compared the costs and health outcomes without and with the MNP and estimated the incremental cost effectiveness ratios (ICERs). Cost effectiveness was measured by the cost per quality adjusted life year (QALY).

Results: With healthcare provider administration, MNP introduction would be cost-effective (ICERs ≤$6,191/QALY) at all MNP price points ($9.50-$30) and market shares (10%-60%) explored. If the option for vaccine self-administration were available with the MNP, and the MNP compliance increased by ≥10%, the patch could be cost effective, even when factoring in a possible slight reduction in administration success for self-administration compared to provider administration. Increases in the vaccine efficacy due to the presentation of the vaccine in a MNP could also improve its cost effectiveness compared to current technologies.

Conclusions: The economic value of the MNP will depend on its price and impact on compliance and efficacy. The MNP opens up the possibility for self-administration of vaccines, which can potentially increase vaccine compliance. With self-administration, the MNP remained cost effective under certain assumptions.