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Importation of Measles into America: How a Travel Clinic Can Help Prevent the Next Outbreak

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Abstract

There were an increased number of cases of measles in the United States (US) in the year 2014 including a major outbreak of measles originating at an amusement park in California. A visitor to the park, who probably was infected with measles during travel abroad, was suspected to be the source patient in the outbreak. This placed vaccination of children with the measles, mumps and rubella (MMR) vaccine at the center of medical, social and even political debate. Our travel clinic is accessed by a large number of persons prior to their travel abroad. Those who are not immune to measles have an opportunity to receive the MMR vaccine at their pre-travel visit. 912 persons were evaluated for in-person travel consultation at our travel clinic in the period January to December 2013 and 963 persons were evaluated during the same period in 2014. In addition to the traditional travel vaccines, 70 doses of the MMR vaccine were administered in 2013. 92 doses of MMR vaccine were administered in 2014. 315 tests for measles serology were performed in 2013, and 350 was the corresponding number for 2014.

As seen in our data, among the large number of travelers seen at our clinic, a considerable number was not immune to measles and they were provided the MMR vaccine. The travel clinic thus represents a unique opportunity to increase the uptake of the MMR vaccine in healthy individuals. When these individuals are tested and vaccinated, it helps protect them from infection when they travel abroad and also increases herd immunity against measles in their communities when they return home.

Aim of study

The aim of this study was to evaluate the number of travelers seen at the TC who were offered measles serology testing and/or vaccination with MMR during the years 2013 and 2014.

Introduction

On the 25th of September 2016, the International Expert Committee for Documenting and Verifying Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Americas declared the region free of endemic measles. The Center for Disease Control and Prevention (CDC) however has reported small spikes in measles cases in 2008, 2011 and 2013, with the majority of outbreaks traced to individuals returning home from travel abroad. In 2014, the US experienced multiple outbreaks of this disease with significantly higher case numbers [1,2]. These outbreaks were considered "import-associated" (cases of patients returning from travel abroad and their contacts that developed measles - the majority of whom were not vaccinated) [1]. 97% of the reported cases in the first half of 2014 were considered imported cases [2].

The trend continued into 2015 and measles cases in multiple states were linked to an outbreak at an amusement park in California [1,3]. The source patient probably acquired measles infection during travel abroad, then unvaccinated individuals at the park were infected and these in turn transmitted the infection to other vulnerable individuals across the country following their return to their home states. In addition to these outbreaks, there also was an increase in the number of individual cases across twenty-four of the states of the US [1].

One very important solution to prevent these imported measles outbreaks is to improve the uptake of the measles, mumps and rubella (MMR) vaccine in those planning to travel abroad. However there are many obstacles to vaccination. These include misconceptions regarding safety benefit of natural infection in contrast to immunizations lack of time to get to appointments cost of vaccination, and low awareness regarding risk and need for vaccination among healthy adults [4-7]. Misconceptions remain among some parents regarding a link between MMR and autism, though this has been refuted in multiple studies [8,9]

A unique opportunity to increase uptake of the MMR vaccine exists when healthy individuals visit a Travel Clinic (TC) prior to travel out of the country. These travelers are already primed to receive "travel vaccines" like hepatitis A, typhoid or yellow fever depending on the region of travel. The visit to a TC presents an opportunity to review their immunization status and offer the MMR vaccine to susceptible individuals. Confirmation of immunity to

measles either due to previous vaccination or previous infection and then vaccinating those individuals at risk of acquiring measles while abroad will help maintain the "endemic-free" status of the USA. In this study, the number of patients who received the MMR vaccine at our TC during the years 2013 and 2014 is reported. In addition, the number of patients tested and the results for measles immunity is also reported.

Methods

The Reliant Medical Group (RMG) – a private multi-specialty group in Central Massachusetts – offers travelers an opportunity to be evaluated by Infectious Diseases / Travel Medicine consultants at a specialized Travel Clinic. Traditional "travel vaccines" offered include hepatitis A, typhoid, polio, meningitis, yellow fever, Japanese encephalitis and rabies. In addition, routine vaccines – hepatitis B, varicella, influenza, and pneumococcus, MMR, Tdap and Td are also available. When an individual visits the TC, previous vaccination and other medical records are reviewed and recommendations are individualized for the respective country of travel. In addition to vaccination, counseling regarding mosquito-borne-illnesses, diarrheal diseases and other travel-related questions are also addressed. In response to the multiple outbreaks of measles in the country, there was an added emphasis in our TC on serological testing for and vaccination against measles.

Travelers without documented 2-dose vaccination in prior immunization records or without evidence of immunity by serology, were offered testing (measles virus antibody IgG, Quest Diagnostics Inc., USA, reference range: <or = 0.90 implies negative - no measles IgG antibody detected, 0.91 - 1.09 is equivocal, >or = 1.10 implies positive - measles IgG antibody detected) and MMR vaccine (Merck & Co., Inc.). Patients lacking evidence of immunity were given two doses of the vaccine per CDC recommendations.

For the purpose of this study, the electronic medical records of travelers seen in the TC in 2013 and 2014 were evaluated. Billing codes for MMR vaccine and codes for measles serology testing were utilized to obtain data for the purpose of this report. The study was approved by the clinic's institutional review board.

Results

A total of 912 persons were evaluated for in-person travel consultation at the TC in the period January to December 2013, and 963 persons were evaluated during the same period in 2014. The majority of patients were residents of Massachusetts. The main purpose of travel was holiday to country of origin; others included tourism, international studies, missions and pilgrimages. Traditionally administered "travel vaccines" included typhoid, hepatitis a, polio, meningitis and yellow fever.

Specific to the present report (Table 1) for the year 2013: a total of 349 patients did not have documentation of prior 2-dose vaccination or immunity by serology. They were offered serology testing and vaccination. 15 patients underwent the test for measles serology. 8 patients were seronegative for measles immunity and all accepted the vaccine. 70 doses of the MMR vaccine were administered in 2013. In 2014: a total of 389 patients were diagnosed to be non-immune to measles. Of these, 350 patients underwent the test for measles serology. 10 patients were seronegative for measles immunity and 9 accepted the vaccine. A total of 92 doses of MMR vaccine were administered in 2014.

Year	2013	2014
Total number of travelers	912	963
Number offered MMR testing	349	389
Number tested	315	350
Serology positive	307	340
Serology negative	8	10
Seronegative patients vaccinated	8	9
Vaccines administered without testing	62	83
Total vaccines administered	70	92

Table 1: Present report for the year 2013.

Discussion

In the previous few years there have been an increased number of imported cases of measles in North America [2]. An increased number of measles cases have also been seen in Europe [10]. Evaluating and containing the spread of these infections results in considerable costs varying from $25,000 by one estimate to as high as $799,136 in one report of a travel-associated measles outbreak associated with a hospital in Arizona [11,12]. In response to the increased number of these outbreaks, health officials in the US published recommendations to ensure two-dose MMR vaccine in children, measles immunity in health-care personnel, along with a new recommendation to ensure measles immunity in international travelers. Regarding travelers – acceptable evidence of immunity could be either two doses of the MMR vaccine or a serology report indicating immunity. Unfortunately in-spite of strong medical literature to support recommendations from health officials, universal coverage with vaccines faces many obstacles [4-7,13].

In 2013, more than 61 million international visits were made by US citizens and the corresponding number for 2014 was more than 68 million [14]. Literature informs us that less than 50% of travelers visit a TC prior to travel abroad [15]. Even so, as seen by the data in this report, the TC at the RMG serves a large number of travelers. In a twelve-month period alone, 963 travelers were evaluated by a travel specialist in 2014, and 912 travelers were seen in 2013. This compares very favorably with the number of travelers seen over a two-year period by Global TravEpiNet a large consortium of 18 travel clinics in the US, where the median number of travelers per site was 201 [16].

Review of data from the TC for the years 2013 and 2014 indicate that a considerable number of persons in the community planning to travel abroad were at risk for measles infection and if they did get infected, would import measles back to the US on their return.

When they visited the TC it was an important contact point for protecting them from infection with measles while abroad and thus preempting the spread of measles among the community on their return home.

In addition, our study revealed that the majority of persons who lacked documented immunity were actually immune to measles when tested by serology. Hence it was more cost-effective to test and then vaccinate only if needed.

This report has a few limitations: The TC provided telephone consults in addition to face-to-face evaluations. 963 and 912 only represent the number of travelers who were actually seen by one of the Travel Medicine consultants in the TC in the years 2014 and 2013 respectively. Hence the precise total number of persons counseled prior to travel was not captured. Also, data regarding age, nationality, purpose and region of travel was not extracted because the primary aim of the study was protection of travelers - irrespective of age, country of origin or country of travel - from acquiring measles during travel abroad, rather than describing the demographics of these travelers.

These limitations do not distract from the important findings of this report regarding the gap between MMR vaccine recommendations and the implementation of these guidelines. This is evidenced by the high number of travelers who required measles testing and MMR vaccination reported in this study. Increasing physician and patient awareness regarding the risk of importation of measles from abroad will help to partially bridge this gap. Additionally, there should be an increased emphasis on improving the uptake of the MMR vaccine at every opportunity at any and all physician visits. These should include primary care as well as specialty services such as TCs.

Conclusion

In conclusion – though endemic measles is considered eliminated from the Americas, there remains the possibility of importation of this disease by Americans traveling to countries where measles has not been eliminated. It is in this scenario that a TC offers a unique opportunity to protect individual travelers as well as the community as a whole from outbreaks of this infection.

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