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Adherence with and completion of recommended hepatitis vaccination schedules among adults in the United States

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ABSTRACT

Introduction: Adult vaccination coverage rates in the US are well below national targets, leaving many adults at increased risk. Additionally, typical vaccination coverage calculations do not adequately approximate population immunity as they do not consider whether multidose vaccines were administered within the recommended schedules. As timely administration of each dose optimizes overall vaccine effectiveness, we sought to document adherence to and completion of the hepatitis A (HepA), hepatitis B (HepB), and combined hepatitis A and hepatitis B (HepA-HepB) multidose vaccine schedule in an insured adult population in the US.

Methods: We conducted a retrospective database study of administrative claims from 2008 to 2015 (analyzed in 2017). Completion of 2 (HepA) and 3 doses (HepB and HepA-HepB), and adherence to the 2- and 3-dose recommended schedules were measured among individuals aged 19 years and older at first dose. The proportion of patients who completed 2 and 3 doses and were adherent to the recommended schedule were estimated using Kaplan-Meier methods.

Results: For HepA, 27.14% of initiating adults were adherent to the recommended schedule, and 32.05% had received a second dose by 42 months. Approximately one-third of adults who initiated the HepB or HepA-HepB series completed all 3 doses within 2 years of the minimum spacing (31.17% and 32.27%, respectively). Generally, completion and adherence were highest in individuals aged 60–64 years at the time of initiation.

Conclusions: Hepatitis vaccine adherence and completion in adults is suboptimal. As a result, the majority of adults initiating each series may not be receiving the full protective benefit of these multidose vaccines.

1. Introduction

The adult vaccination schedule in the United States (US) recommends administration of up to 13 vaccines, ranging from 1 to 3 doses each, for various groups of adults aged ≥19 years [1]. However, adult vaccine uptake is suboptimal, and national estimates indicate coverage in adult populations falls far short of Healthy People 2020 goals, leaving a substantial proportion of adults at risk [2,3].

Vaccination coverage estimates may not provide a full picture of vaccine protection, as it does not consider whether doses of multidose vaccines were administered at recommended intervals. Timely administration of each dose optimizes the overall vaccine effectiveness and, therefore, estimates based on counting doses administered without considering dose timing may overestimate population immunity for multidose vaccines.

Most literature on multidose vaccination focuses on adolescent populations [4]. The few studies that examine multidose coverage in adult populations are dated and may not represent current vaccination recommendations or practice patterns. In one of these studies, Nelson et al. [5] found that 56.4–75.0% of patients who initiated the 2-dose hepatitis A vaccine (HepA) series and 38.9–58.6% of patients who initiated the 3-dose hepatitis B vaccine (HepB) series had not completed the series within a year of initiation. However, this study only counted doses within the first year as being fully compliant, disregarding the recommended timing of each dose. Additionally, the study was conducted among medical care organization enrollees, who may not be representative of high-risk adult populations across the US who are recommended to receive HepA or HepB vaccines [1].

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Recent assessments of adult vaccine adherence are needed to understand the extent to which this population is receiving the full protective benefit of these vaccines. To this end, we conducted a retrospective study of completion and adherence with recommended HepA, HepB, and combined hepatitis A and hepatitis B vaccine (HepA-HepB) schedules from 2008 to 2015 among adults in the US (Table 1).

2. Material and methods

2.1. Data source and study population

The study population included adults aged ≥19 years from the MarketScan Research Databases, maintained by Truven Health Analytics, LLC, an IBM Company. Three databases containing administrative health insurance claims were used: the Commercial Claims and Encounters Database, which is nationally representative of individuals with employer-sponsored insurance; the Medicare Supplemental Database (Medicare), which is representative of the 30% of Medicare enrollees with supplemental plans; and the Multi-State Medicaid Database (Medicaid), comprising over 28 million enrollees in eleven geographically dispersed states. The analysis, conducted in 2017, included all data from January 1, 2008, through December 31, 2015.

Eligible individuals were aged ≥19 years at the first observed claim for HepA, HepB, or HepA-HepB. To ensure capture of the first dose of the vaccine series, 18 months of continuous enrollment before vaccination (i.e., preindex) for the HepA analysis and 6 months of preindex continuous enrollment for the HepB and HepA-HepB analyses were required.

Individuals with an altered HepB dose/schedule due to hemodialysis (CPT code 90747) were excluded from all analyses. Individuals with an accelerated HepA-HepB dosing schedule were excluded from the HepA-HepB analysis. Doses received more than 4 days prior to the minimum dose spacing window were considered invalid and removed from the analysis [6].

2.2. Study measures

This study assessed adherence (i.e., adherence with dose timing) with the recommended two- and three-dose HepA and HepA-HepB schedules, as well as completion (i.e., count of doses) of two and three doses of HepA, HepB, and HepA-HepB within defined time windows following the initial dose in accordance with recommended dose timing (Table 1). As there is no upper limit on timing of the second and third dose of HepB, an individual who has not received a subsequent dose is technically still adherent with the schedule. Therefore, it is more accurate to estimate completion of HepB than adherence.

Vaccine completion was assessed at the minimum recommended dose spacing and at 12 and 24 months after the minimum recommended spacing for each vaccine (Table 1). For the three-dose HepB and HepA-HepB vaccines, we estimated completion of two doses and completion of three doses.

2.3. Statistical analysis

Kaplan-Meier (KM) survival methods were employed to estimate time to completion of the second and third dose and the proportion of individuals who completed the second and third dose after initiation (as appropriate). The use of the KM method allows for right-censoring of records for individuals with no evidence of subsequent doses, thus allowing for inclusion of the full sample of individuals. These patients were censored at the end of continuous enrollment or the end of the data, whichever occurred first.

Each vaccine was analyzed separately. All results were estimated for the sample overall and stratified by age at initiation. Sensitivity analyses were conducted to assess the effect of changes in continuous enrollment requirements before and after the first observed vaccine.

The RTI International institutional review board determined this study to be research not with human subjects. All analyses were conducted in SAS, version 9.4 (Cary, NC).

3. Results

3.1. Hepatitis A vaccine

HepA was initiated by 367,814 individuals (Table 2). Of these individuals, 55.0% were female, and the mean (standard deviation [SD]) age at initiation was 39.4 (15.9) years. Most HepA initiators (91.7%) were commercially insured, while 4.4% had Medicaid and 4.0% had Medicare supplemental insurance. Among these individuals, the mean (SD) periods of continuous enrollment pre- and post-HepA initiation were 39.8 (18.8) and 21.5 (18.0) months, respectively.

Only 27.1% of individuals were adherent to the recommended HepA schedule (i.e., received the second dose within 18 months of the first dose) (Fig. 1A). Individuals aged ≥70 years had the lowest rate of adherence (23.2%), while individuals aged 60–64 years had the highest adherence rate (35.0%) (Fig. 2A). Completion of the second dose showed little improvement over time. At 30 months, two-dose completion among all individuals was 30.3%. The incremental improvement in two-dose completion rates between 18 and 30 months ranged from a 1.6 percentage-point difference (individuals aged ≥70 years) to a 3.4 percentage-point difference (individuals aged 19–49 years). Two-dose completion at 30 months was lowest among individuals aged ≥70 years (24.8%) and highest among individuals aged 60–64 years (37.6%).

Table 1
Table of Vaccine Schedules. *Source*: CDC [6].

Product (manufacturer, approval year)	Vaccine type	Dose 1	Dose 2 recommended spacing	Dose 3 recommended spacing	Dose 2 spacing evaluation points	Dose 3 spacing evaluation points
Havrix (GSK, 1995)	A	0	6–12 months	–	18, 30, and 42 months	–
Vaqta (Merck, 1996)	A	0	6–18 months	–	18, 30, and 42 months	–
Twinrix (GSK, 2001)	A/B	0	1 month	6 months	1, 13, and 25 months	6, 18, and 30 months
Recombivax HB (Merck, 1986)	B	0	At least 1 month after first dose	At least 2 months after the second dose and 4 months after the first dose	1, 13, and 25 months	4, 16, and 28 months
Engerix B (GSK, 1989)	B	0	At least 1 month after first dose	At least 2 months after the second dose and 4 months after the first dose	1, 13, and 25 months	4, 16, and 28 months

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