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Varicella Immunization Requirements for US Colleges: 2014–2015 academic year

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Abstract

Objective—To obtain information on varicella pre-matriculation requirements in US colleges for undergraduate students during the 2014–2015 academic year.**Participants**—Healthcare professionals and member-schools of the American College Health Association (ACHA).**Methods**—An electronic survey was sent to ACHA members regarding school characteristics and whether schools had policies in place requiring that students show proof of 2-doses of varicella vaccination for school attendance.**Results**—Only 27% (101/370) of schools had a varicella pre-matriculation requirement for undergraduate students. Only 68% of schools always enforced this requirement. Private schools, 4-year schools, Northeastern schools, those with <5,000 students, and schools located in a state with a 2-dose varicella vaccine mandate were significantly more likely to have a varicella pre-matriculation requirement.**Conclusions**—A small proportion of US colleges have a varicella pre-matriculation requirement for varicella immunity. College vaccination requirements are an important tool for controlling varicella in these settings.

Keywords

varicella; chickenpox; immunization; vaccination; college

Introduction

College and university students have an increased risk of disease transmission of vaccine-preventable diseases because of the close contact in living quarters, classes, and activities.

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Over 20 million students were enrolled in the 4,706 US degree-granting colleges during the 2011–2012 academic school year, representing 41% of the US 18–24 year-old population in 2011¹. When outbreaks of vaccine-preventable diseases occur on college campuses, they can be disruptive since students may miss classes and activities and these outbreaks are costly to control^{2–6}; some have resulted in severe disease. There are also challenges with controlling outbreaks in residential settings⁷ that include identifying and managing exposed contacts, as well as isolating and providing food and medical care to ill students.

State immunization laws that require students to be vaccinated against vaccine-preventable diseases for school-entry have been critical to the success of the US vaccination program since the 1970s⁸. Immunization requirements for college students have been recommended by the Advisory Committee on Immunization Practices (ACIP) and the American College Health Association (ACHA) since the 1980s, and were developed in response to measles and rubella cases on college campuses^{3, 6, 9}. Although all 50 states and the District of Columbia (D.C.) have implemented an immunization requirement for at least one vaccine-preventable disease for elementary school-entry, a considerably smaller number of states have implemented a requirement for college-entry¹⁰.

One vaccine-preventable disease of potential concern on college campuses is varicella. Varicella is highly contagious. It is typically a self-limiting disease in children, but it can cause severe disease in adolescents and adults. There have been documented outbreaks of varicella occurring among young adults^{11, 12} and in residential settings⁷. These outbreaks can lead to disruption in school attendance and activities⁶; students with varicella may miss classes and activities for 7 days or more¹³. Although a large proportion of US college-aged students are likely to have immunity against varicella, international students may have higher susceptibility to varicella, and students with underlying conditions who have contraindications for vaccination may be at greater risk for severe varicella^{14–16}. ACIP recommends 2-doses of varicella vaccine or other evidence of immunity to varicella be required for college-entry since 2007¹³. However, little is known about implementation of this recommendation at the college level. We conducted a survey of US colleges to obtain information on their varicella pre-matriculation requirements for undergraduate students for the 2014–2015 academic year.

Methods

In fall 2014, ACHA's membership included 916 member-schools (i.e., colleges and universities) and more than 2,800 college healthcare professionals. Some college healthcare professionals are ACHA members even though their school may not be members. Fifty-three percent of ACHA members were public schools and 90% were 4-year schools. The breakdown by school size was: 45% <5,000 students, 39% 5,000–19,000 students, and 16% 20,000 students and by region: 23% Midwest, 29% Northeast, 30% South, 17% West, and 1% other region.

An electronic survey was distributed by ACHA to their members in October 2014. Two reminders were sent one week apart to increase reporting. The survey collected data on the school characteristics, including location, number of students, whether the school (a) was a 2

or 4-year institution, (b) was public or private, (c) had a health clinic, (d) offered varicella vaccination, and whether or not the school had a policy in place requiring that students show proof of 2-doses of varicella vaccination for school attendance. We defined a school with a varicella pre-matriculation requirement as a school requiring proof of varicella immunity for school attendance (2-doses of varicella immunization or other evidence of immunity¹³). If schools had a varicella pre-matriculation requirement for school attendance, we collected data regarding the year that the requirement became effective, students covered under the requirement (e.g., only full-time students, residents, students taking classes), whether other evidence of immunity to varicella besides 2-doses varicella vaccination was accepted, how students were managed if they failed to comply with the policy, and how frequently the policy was enforced. We also collected data on state mandates on varicella immunization for elementary, middle, or high-school entry from each state's immunization website. Data on state mandates on varicella immunization requirements for college-entry were collected using our survey.

Analyses were performed using SAS 9.3 (SAS Institute, Inc., Cary, NC). Pearson χ^2 or Fisher's exact test were used to analyze factors associated with a school having a varicella pre-matriculation requirement. A significant association was defined as 2-sided P value of $<.05$. We used exact logistic regression to model whether varicella pre-matriculation requirements were related to school type (public/private and 2 or 4 year-school), size, region, and whether the school was in a state with a varicella immunization mandate for college-entry.

This project was determined by CDC to be an evaluation of an existing public health program. This was considered to be a non-research activity and therefore not subject to review by the CDC institutional review board.

Results

Health professionals representing 370 schools, of which 322 were ACHA member-schools, responded to the survey. Of these, 184 (50%) were public and 321 (87%) were 4-year schools. The breakdown by school size was as follows: 50% had $<5,000$ students, 41% had 5,000–24,999 students, and 9% had $\geq 25,000$ students. The geographic distribution of schools was similar to that of the overall membership of the ACHA member-schools. Most schools (363 schools, 99%) had a health center and 47% offered varicella vaccination.

A little more than a quarter of the schools (101, 27%) had a 2-dose varicella pre-matriculation immunization requirement for undergraduate students for the 2014–2015 academic year. The requirement was implemented during 2007–2014 by 50% of schools and during 1995–2006 by 12%. The requirement applied to all undergraduate students for 78% of schools, only health profession students for 6%, and certain subgroups (e.g., only full-time students, residents, students taking classes) for 15%. The policy was reported as always enforced by 68% of schools, sometimes enforced by 18% of schools and infrequently by 8%. The most common approaches to managing non-compliant students included withholding registration (68%), not allowing students to attend classes (19%), withholding

grades (11%), placing housing restrictions (7%), not allowing students to matriculate (7%), and fining students (6%).

Private schools, 4-year schools, those with <5,000 students and schools located in the Northeast were significantly more likely to have a varicella pre-matriculation requirement ($p < 0.0001$) (Table 1). Schools were also more likely to have a varicella pre-matriculation requirement if they were located in a state with a 2-dose varicella vaccination mandate for middle/high school or college-entry. In the exact logistic model all variables remained significant except for 2 versus 4-year schools. Among the schools with a varicella pre-matriculation requirement for 2 doses of varicella vaccine, 96% accepted at least one other type of evidence of immunity to varicella: laboratory confirmation of disease (95%), provider history of varicella and/or herpes zoster (80%), self-reported history of varicella and/or herpes zoster (11%), and birth before 1980 (30%). Data on varicella vaccination or other evidence of immunity to varicella is stored electronically by 69% of schools and in paper record only by 28% of schools.

Among the 269 schools without a 2-dose varicella pre-matriculation immunization requirement, 168 (62%) had a recommendation that students should receive 2-doses of varicella vaccination (although this was not enforced or checked), while 101 (38%) of schools had neither a 2-dose varicella immunization requirement or recommendation. Of the schools without a varicella pre-matriculation requirement, 10 (4%) had definite plans to implement a varicella requirement in the future and 41 (15%) had possible plans.

Comment

In this survey of varicella pre-matriculation requirements among US colleges and universities, we found that only about a quarter of the schools that responded to the survey had a varicella pre-matriculation requirement for undergraduate students, despite it having been seven years since ACIP recommended varicella immunity as a college-entry requirement. Moreover, only two-thirds of the schools with a requirement reported that it was always enforced. Schools located in a state with a 2-dose varicella vaccine mandate for college students were more likely to have a varicella pre-matriculation requirement in place. Most schools without a varicella pre-matriculation requirement do not plan to implement one in the future.

The proportion of schools with a varicella pre-matriculation requirement is low although it improved from 5% in 1999 (ACHA unpublished data) to 27% in 2014. Nationally, there is no organization that can enforce immunization requirements for school or college-entry and that might contribute to the low rates of colleges with a varicella immunization requirement. ACIP and CDC only issue national recommendations¹³ and ACHA only issues guidelines¹⁷. Only state laws can mandate an immunization requirement for colleges within that particular state; even with a mandate, a plan for enforcement is needed. Potential barriers for implementing a college pre-matriculation requirement for any disease include the time and cost for school health staff to obtain and verify student vaccination information in an environment with already limited funds and budget cuts¹⁸. Even for states with a college-entry immunization requirement, without allocated funding, staff, and resources, colleges

may have limited enforcement capacity. An additional barrier may be the perception that varicella is a mild disease and decreased familiarity and experience with the disease among health care providers because of declining incidence. Some factors that may help overcome these barriers include a tracking system of student immunization records and the ability to incorporate immunization information in a central student database¹⁹.

In general, school pre-matriculation requirements follow the ACIP recommendations regarding what is considered evidence of immunity to varicella¹³, which include 2 doses of vaccine, provider-documented history of varicella, positive serology for VZV, or birth before 1980¹³. However, 11% of schools still accepted self-reported history of disease as evidence of immunity. ACIP updated their recommendations in 2007 and self-reported history of disease was no longer considered evidence of immunity to varicella¹³.

Schools located in states with a 2-dose varicella immunization mandate for school attendance were significantly more likely to have a varicella pre-matriculation requirement. State mandates have been found in previous surveys to be a determinant for establishing school policies for pre-matriculation requirements of other vaccine-preventable diseases^{19–21}. The number of states with varicella school-entry immunization requirements has increased from 4 in 1999 to 49 states and D.C. in 2014 (CDC unpublished data). However, school-entry varicella immunization requirements in the U.S. vary by year of implementation as well as ages and grades covered under the requirement. Not all students on campus may have evidence of immunity against varicella even if the college is located in a state with a 2-dose varicella immunization school-entry requirement since there may be out-of-state or international students. A college-entry immunization requirement for varicella would help ensure that all students on campus, including in-state, out-of-state, and international students, have evidence of immunity against varicella. The number of states with a varicella immunization requirement for college-entry appears to be lagging behind the school-entry requirements as self-reported in our survey.

Our finding that private schools were more likely to have a varicella pre-matriculation requirement than public schools may be related to more flexibility in implementing school pre-matriculation requirements in private schools. We also found that smaller schools were more likely to have a varicella pre-matriculation requirement, which has been found previously for vaccines other than varicella^{19, 20}. Additionally, schools located in the Northeast were more likely to have a varicella pre-matriculation requirement, which may be related to a higher proportion of schools in this area being private, smaller, and located in states with a 2-dose middle/ high school, or college-entry state mandate.

Despite the low proportion of schools with a varicella pre-matriculation requirement, the majority of college-aged population are likely protected from varicella. Data from the 2009–2010 NHANES serological survey found that VZV seroprevalence was 97% for 12–19 and 98%–99% for 20–49 year-olds¹⁶. Nevertheless, there may be pockets of students susceptible to varicella on college campuses if they were never vaccinated and never had varicella disease, which is becoming increasingly likely given declining varicella incidence in the U.S.²² In addition, the number of school-aged children with non-medical varicella vaccination exemptions is increasing²³, potentially raising the number of un- or under-

vaccinated young adults. Foreign-born students, especially those from tropical countries, may be at higher risk of varicella during young adulthood due to higher susceptibility^{24, 25}. In tropical climates, varicella tends to be acquired at older ages and varicella vaccination is not routinely administered in many countries outside the U.S.²⁶. International students may have limited access to varicella vaccination because of challenges related to vaccine storage, cost, and lack of vaccine availability in certain countries²⁷. The proportion of international students increased from 7.0% in fall 2008 to 8.9% in spring 2014 (7% of the undergraduate population)^{14, 15, 28}. All these factors create a growing number of susceptible students that could be large enough to sustain an outbreak.

It is also important to have high vaccine coverage levels to protect persons who have contraindications to vaccination, including certain groups of students with immunocompromising conditions or taking immunosuppressive medications. The proportion of students with HIV is approximately 0.2–0.3% but the proportion with chronic conditions (e.g., cancer, diabetes, auto-immune disease) has increased from 3.7% in 2008 to 5.2% in 2014^{14, 15}. Considering these factors, it is concerning that most of the schools currently without a pre-matriculation requirement do not have plans to implement one. While it is encouraging that there have not been published reports of varicella outbreaks in US colleges to date, outbreaks among young adults living in close contact have been reported^{11, 12}.

Requirements for pre-matriculation varicella vaccination are an important strategy for preventing varicella cases and outbreaks on college campuses. College-entry requirements will also ensure that students have evidence of immunity against varicella according to ACIP's published recommendations. ACHA has guidelines on Standards of Practice for Health Promotion in Higher Education²⁹ and pre-matriculation immunization requirements for college-entry for 14 vaccine-preventable diseases, including varicella¹⁷, which can be used to assist colleges in developing their pre-matriculation requirements. Although college health organizations cannot enforce immunization requirements, their recommendations can help to guide college health. Students should be asked to provide their immunization records and be required to be vaccinated against varicella and other vaccine-preventable diseases if susceptible or under-vaccinated, preferably before coming on campus. There are also materials available to educate parents and students on the importance of vaccinations^{30, 31}.

There were several limitations to this survey. This was a cross-sectional survey capturing information at one time point and the results are self-reported. Only 35% of ACHA member-schools responded, but the respondents were similar to those of all ACHA member-schools. ACHA member-schools only represent ~20% of all US colleges so the survey findings may not represent the immunization policy for non-ACHA member-schools.

Only a small proportion of US colleges (<30%) have a varicella pre-matriculation requirement for varicella immunity. State mandates can be influential in prompting colleges to implement a varicella pre-matriculation requirement^{19, 21}. Immunization requirements for college-entry are not only important for preventing cases of vaccine-preventable diseases and outbreaks on campuses, but are also valuable for identifying susceptible persons since college is one of the last opportunities to screen a large population before they reach an age at which the risk of severe varicella increases.

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Table 1

Characteristics of US Colleges and Universities by Varicella Pre-matriculation Requirements, 2014–2015 Academic Year

Variable	Total Participating Schools (N=370)	Schools WITH varicella pre-matriculation requirements (N=101)		p-value ^c
		#	%	
School Type, Public vs Private				
Private	176	69	39	<.0001
Public	184	25	14	
Unknown	10	7	70	
School Type, 2-Year vs 4-Year				
2-Year	39	5	13	0.0454
4-Year	321	89	28	
Unknown	10	7	70	
Campus Location				
Urban	189	51	27	0.8413 ^d
Nonurban ^a	174	46	26	
Multiple Locations	2	0	0	
Unknown	5	4	80	
Region^b				
Midwest	86	13	15	<0.0001
Northeast	110	53	48	
South	113	26	23	
West	59	8	14	
Pacific	1	0	0	
Unknown	1	1	100	
Student population size				
<5000 Students	186	73	39	<.0001
5000–24,999 Students	150	27	18	
25,000 Students	32	0	0	
Does the college have a health center				
Yes	363	97	27	0.1263 ^e
No	5	3	60	
Unknown	2	1	50	

Variable	Total Participating Schools (N=370)	Schools WITH varicella pre-matriculation requirements (N=101)		p-value ^c
		#	%	
Offers varicella vaccination				
Yes	171	48	28	ND
No	193	51	26	
Unknown	6	2	33	
State has a 2-dose varicella vaccine college requirement (self-reported)				
Yes	52	48	92	<.0001
No	291	41	14	
Unknown	27	12	44	
State has a 2-dose varicella vaccine elementary school requirement				
Yes	304	89	29	0.0667
No	66	12	18	
State has a 2-dose varicella vaccine middle/high school requirement				
Yes	230	77	33	0.0006
No	140	24	17	

Note: ND, Not Determined

^a Nonurban locations include suburban, rural, and small towns.

^b States are divided into regions according to the Census definition. Source: http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

^c Chi square test used. Excluded those with unknown or missing information.

^d Excluded schools in multiple locations or with missing/unknown information on school location for Chi Square test.

^e Fisher's exact test used.