

Current Practices in the Diagnosis and Treatment of Varicella Infections in the United States

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Background

- The US Centers for Disease Control and Prevention Advisory Committee on Immunization Practices recommended a one-dose varicella immunization program in 1996, expanding to two doses in 2006
- More than 3.5 million cases of varicella, 9,000 hospitalizations, and 100 deaths associated with varicella are prevented annually in the US through widespread vaccination¹
- Since varicella is now relatively uncommon, health care providers (HCPs) may not immediately recognize varicella symptoms in their patients, resulting in misdiagnosis and/or inappropriate treatment
- This study conducted online vignette-based survey of HCPs (Physicians and Nurse Practitioners) to investigate diagnosis and treatment management for varicella infection in US children (under the age of 18)

Methods

- Eight most common case vignettes representing varicella infection among patients with varying clinical backgrounds were developed from the literature and also feedback from two clinical scientific advisors
- Each vignette had an associated diagnosis of either uncomplicated or complicated varicella infection. Appropriate treatment was based on AAP Red Book guidelines² and confirmed by two experts in the field of infectious disease and childhood illnesses (Table 1)
- An online cross-sectional survey of licensed nurse practitioners and physicians was conducted
- To participate, HCPs had to meet the following criteria: Proficient in English, currently practicing medicine; board certified in pediatrics or family medicine or licensed nurse practitioner; administers varicella vaccines, antibiotics, and antivirals to pediatric patients; and spends ≥50% of time in clinical setting. Physicians were further required to treat at minimum an average of 100 pediatric patients per month
- For each vignette, HCPs selected a probable diagnosis and then recommended one or more interventions from prepopulated lists
- All data were analyzed descriptively using SAS ver 9.4 (SAS Institute Inc, Cary NC, USA)
- Results were stratified by whether HCPs were licensed prior to or following the vaccine era (prior to 1996 or 1996 and later), and were conducted to assess if timing of licensure impacted recognition of varicella infection and selection of appropriate management
- The study was granted an exemption by an Institutional Review Board
- All participants signed an informed consent

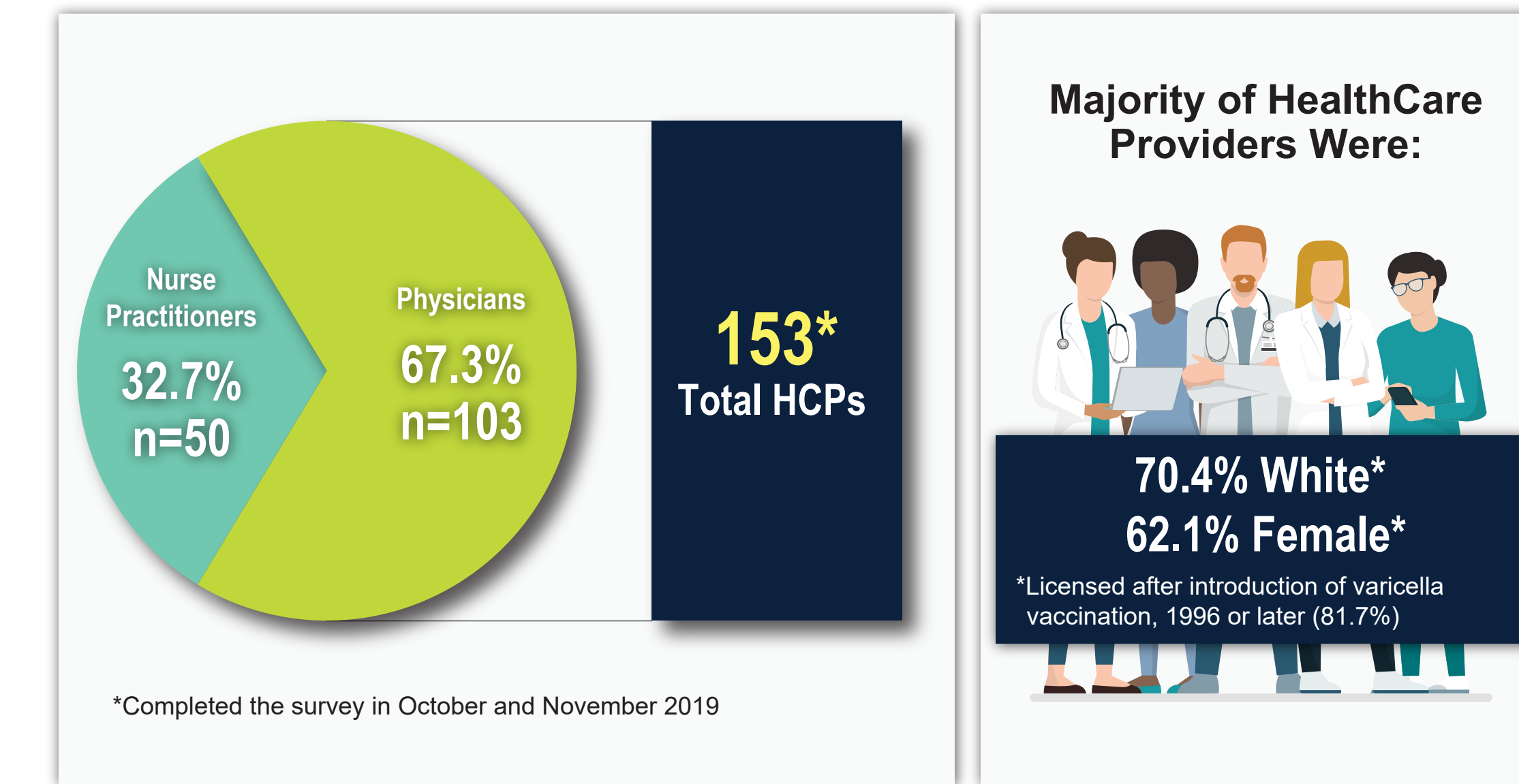
Table 1. Vignette Summary Descriptions

Vignette #	Varicella Vaccination Status	Age and Health Status	Diagnosis	Primary Treatment Recommendation
1	Unvaccinated, no known exposure to varicella	Healthy 3½-year-old	Uncomplicated typical varicella	Supportive care
2	Unvaccinated, exposed 14 days prior	Healthy 5-year-old	Uncomplicated typical varicella-like symptoms	Supportive care
3	Vaccine status unknown, not exposed to varicella	Healthy 7-year-old	Complicated typical varicella with staph infection of lesions	Antibiotics
4	Vaccinated except for varicella and MMR, exposed to shingles 7 days prior	3-year-old with history of asthma and on prednisone	Uncomplicated typical varicella	Antivirals
5	Vaccinated, prior exposure to varicella 12 days prior	Healthy 10-month-old	Uncomplicated typical varicella	Supportive care
6	Not vaccinated (personal belief exemption), exposure to varicella 10 days prior	Healthy 15-year-old	Uncomplicated typical varicella	Antivirals
7	No varicella or MMR vaccination, no known exposure to varicella	6-year-old with history of lung problems	Complicated typical varicella with viral pneumonia	Antibiotics + hospitalization
8	Not vaccinated (religious belief exemption), no known exposure	Healthy 14-year-old	Uncomplicated typical varicella	Supportive care

Supportive care was appropriate for all vignettes except Vignette #7 where hospitalization was recommended.

Results

Figure 1. Study Sample



- Mean age was 44 years (SD 10.9), with those licensed before the varicella vaccination era being on average 20 years older (60 years) than those licensed during the varicella vaccination era (40 years)
- Majority (93.6%) spend 75% to 100% of their time in the clinical setting and work in a wide range of employment settings

Diagnosis of Varicella Infection

- Overall, 79.2% of HCPs accurately recognized varicella infection across the eight vignettes (Figure 2)
- Among respondents who accurately recognized varicella infection, the majority (86.7%) accurately categorized the infection as uncomplicated or complicated
 - The ability to recognize the case as uncomplicated or complicated was similar between those licensed prior to 1996 (87.4%) and those licensed in 1996 or later (86.5%)
- For complicated varicella cases, accurate diagnosis ranged from 70.3% to 100%
 - For vignette #3, 41.8% of respondents recognized varicella infection accurately. Among accurate responses, 70.3% identified the vignette as a complicated case (Table 2)
 - For vignette #7, 79.7% of respondents recognized varicella infection accurately. 100% of the accurate respondents identified the case of varicella as complicated
- For uncomplicated varicella infection vignettes, accurate diagnosis ranged from 80.4% to 94.2%
 - Most of these vignettes were identified as uncomplicated varicella infection (89.6% to 97.7%), with the exception of vignette #4, where close to half incorrectly believed the case was complicated (47.2%). Vignette #4 described an uncomplicated varicella case in a child with a history of asthma and current use of oral prednisone, which do not meet criteria for complicated infection. However, clinicians may be responding as complicated in light of the risk of the case becoming complicated
- HCPs licensed prior to the advent of widespread vaccination were more likely to correctly diagnose complicated cases (71.4%) of varicella infection compared to those licensed later (58.4%)
- Those licensed prior to 1996 were more likely to recognize varicella infection (88.8%) compared to those licensed in 1996 or later (77.1%)
- When varicella was not correctly recognized, it was more frequently confused with bacterial infection, not otherwise specified (24.8%), "other" (20.1%), impetigo (19.3%), and hand, foot and mouth disease (12.2%) were the most common diagnoses selected

Figure 2. Accuracy of Varicella Diagnosis

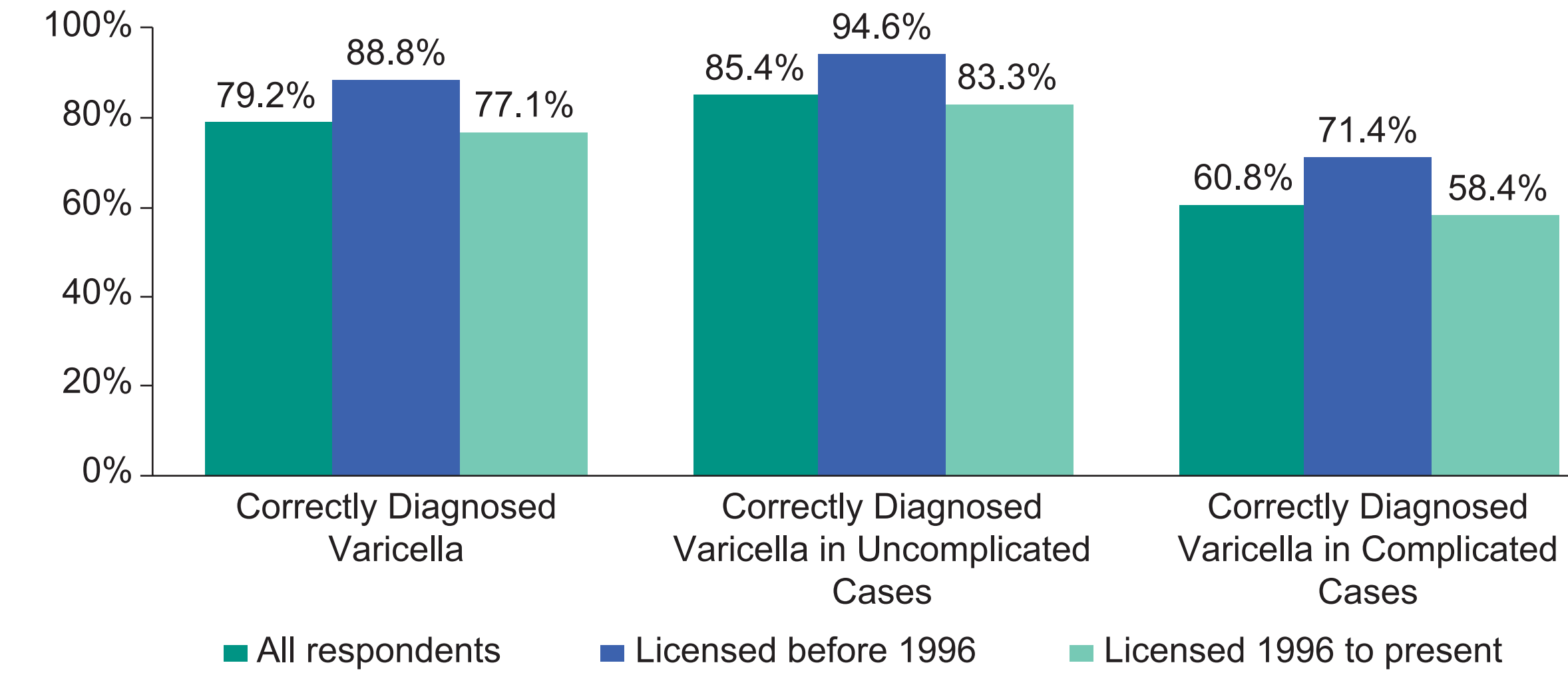


Table 2. Recognition of Varicella Infection

	Correctly Diagnosed as Varicella Infection			Correctly Diagnosed as Complicated vs Uncomplicated (% of correct diagnoses)		
	All Respondents	Licensed Before 1996	Licensed 1996 to Present	All Respondents	Licensed Before 1996	Licensed 1996 to Present
Vignette 1 - Uncomplicated varicella	81.7%	92.9%	79.2%	89.6%	96.2%	87.9%
Vignette 2 - Uncomplicated varicella	83.7%	89.3%	82.4%	93.8%	92.0%	94.2%
Vignette 3 - Complicated varicella with staph infection of lesions	41.8%	53.6%	39.2%	70.3%	86.7%	65.3%
Vignette 4 - Uncomplicated varicella	80.4%	96.4%	76.8%	52.8%	40.7%	56.3%
Vignette 5 - Uncomplicated varicella	86.9%	96.4%	84.8%	97.7%	92.6%	99.1%
Vignette 6 - Uncomplicated varicella	94.1%	100.0%	92.8%	93.1%	100.0%	91.4%
Vignette 7 - Complicated typical varicella with viral pneumonia	79.7%	89.3%	77.6%	100.0%	100.0%	100.0%
Vignette 8 - Uncomplicated varicella	85.6%	92.9%	84.0%	86.3%	92.3%	84.8%

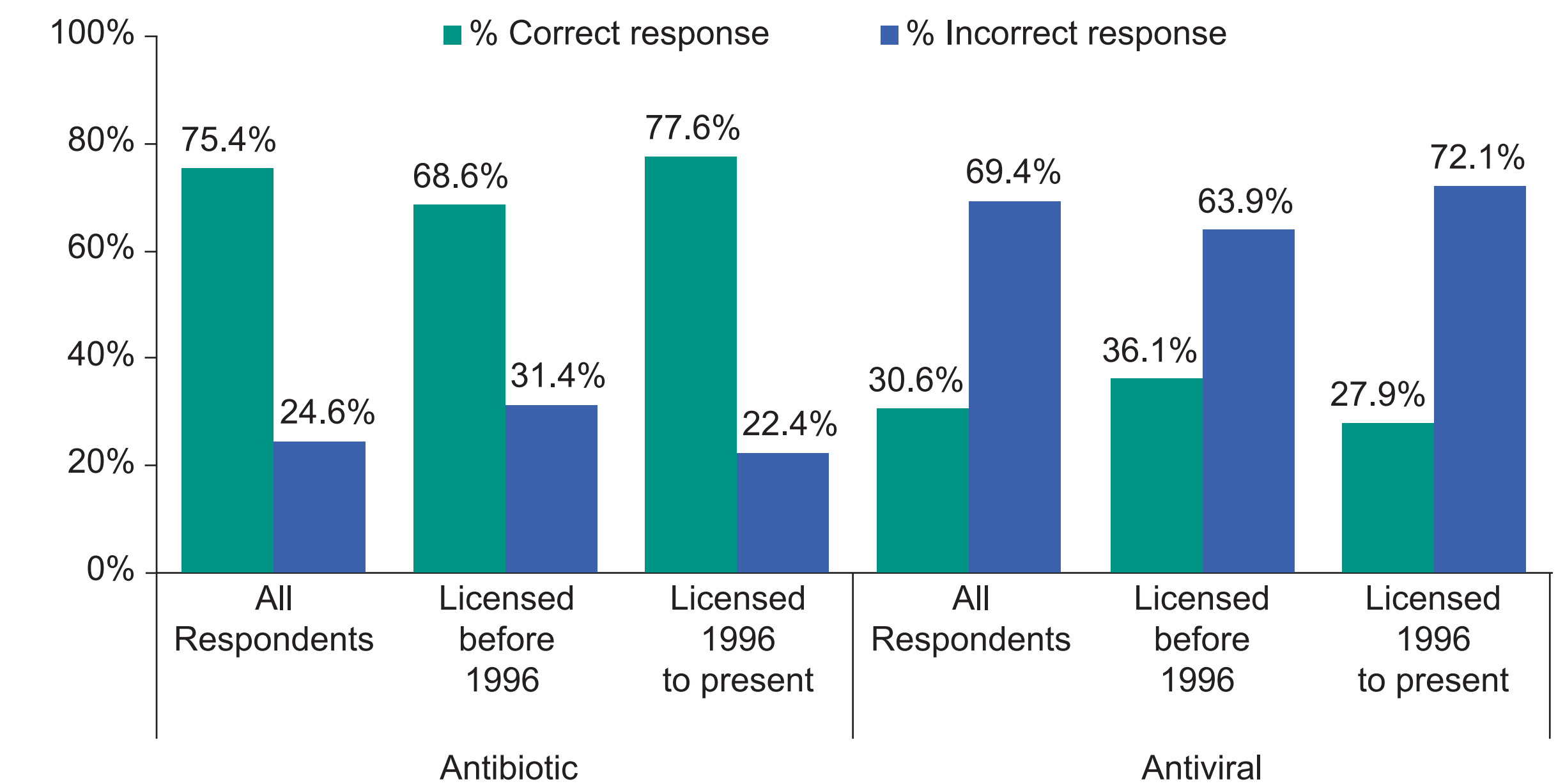
Limitations

- Small number of respondents may not be representative of the general US population of HCPs
- Vignettes were developed based on literature, and not all possible varicella case descriptions were included. 2 cases were removed from analysis as clinical key opinion leaders advised that the cases were not adequately clear and there was no consensus on appropriate treatment for them
- Like any other vignette survey, this study is subject to responder bias and recall bias
- This is a descriptive analysis. As a result, statistical significance or true difference among the groups cannot be inferred

Treatment/Disease Management Recommendations

- Antibiotics were considered appropriate therapy for vignettes #3 and #7, while antivirals were appropriate for vignettes #4 and #6
- 75.4% of antibiotic recommendations were considered appropriate therapy for the described cases (Figure 3)
- The remaining 24.6% of antibiotic recommendations were incorrectly assigned to other vignettes
 - Vignette #4 was most commonly incorrectly prescribed antibiotic therapy, with 14.4% of respondents recommending antibiotics
- 69.4% of antiviral recommendations were assigned to vignettes where antiviral therapy was not indicated
 - Vignette #7 was the most common incorrectly prescribed antiviral therapy, with 35.9% of respondents recommending antivirals
- In the four vignettes where supportive care was the most appropriate management strategy, HCPs correctly recommended supportive care 81.0% to 83.7% of the time, including recommendations for home care such as acetaminophen and calamine lotion
- HCPs licensed prior to 1996 were more likely to recommend supportive care (70.5% vs 56.7%), antibiotics (22.8% vs 12.4%), and antivirals (32.1% vs 12.0%) compared to those licensed in 1996 or later
 - Of antibiotic recommendations, 68.6% were correctly assigned by earlier-trained HCPs compared to 77.6% by later-trained HCPs
 - Conversely, antivirals were more often correctly assigned by earlier-trained HCPs (36.1%) compared to later-trained HCPs (27.9%)

Figure 3. Accuracy of Antibiotic and Antiviral Recommendations



Conclusions

- Though a majority of HCPs recognize varicella and complicated vs uncomplicated, there is still a sizable proportion of HCPs who fail to correctly diagnose it
- Varicella infection generally, and complicated cases in particular, may be inappropriately treated by some HCPs
- Training and continued education may help HCPs better recognize and manage future cases of varicella infection
- Varicella vaccination and maintaining high coverage rates is an important strategy to avoid vaccine-preventable disease re-emergence and to minimize unnecessary use of antimicrobial and antiviral therapies

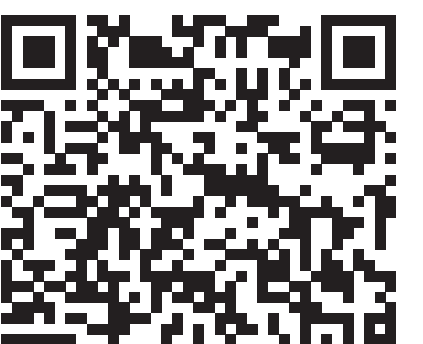
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