



Medical Record Documentation of Varicella History as Evidence of Immunity Among Unvaccinated Children and Adolescents in the Post-Vaccine Era



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BACKGROUND

Before 1995

•Parental recall of positive varicella history was considered a valid indicator of immunity for children.

1995

•With the licensure of varicella vaccine (VV), the Advisory Committee on Immunization Practices (ACIP) initially recommended that individuals with a history of disease be exempt from VV.

1995-2006

•During several post-vaccine licensure outbreaks, second varicella infections among unvaccinated children with a varicella history were reported suggesting that the initial report of infection was inaccurate.

2006

•ACIP revised their criteria for evidence of varicella-zoster virus (VZV) immunity. In order to be considered immune and exempt from VV, individuals born after 1980 who report a history of disease as evidence of immunity now must provide proof of healthcare provider diagnosis or verification.

•It is uncertain if a healthcare provider diagnosis of varicella that is documented in a medical record (MR) can be used to accurately verify a reported history of disease.

OBJECTIVES

- To examine the accuracy of MR documented varicella history as a measure of VZV immunity among unvaccinated individuals born after 1980.
- To examine the accuracy of MR documented varicella history compared with parent/patient recall of history.

METHODS

- Study Design:** Cross-sectional study completed between 2004-2006
- Setting and Participants:**
 - Study participants from 3 Philadelphia clinics included 536 unvaccinated 5-19 year olds with MR reviews completed.
 - Participants were stratified based on age groups: 5-9 years old, 10-14 years old and 15-19 years old.
- Measures of VZV Immunity Assessed:**
 - Varicella history was obtained from 3 potential sources:
 - Parent interview (5-14 year olds) and Patient interview (15-19 year olds)
 - Any MR documentation including screening during well visits
 - Acute visit MR documentation of varicella
- Gold Standard Measure of VZV Immunity:**
 - CDC National VZV Laboratory tested serologic specimens from all participants for VZV IgG antibodies.
- Analysis:**
 - For each age group and source, positive predictive value (PPV), negative predictive value (NPV), sensitivity, and specificity were calculated by comparing varicella history to serologic results.
 - Sensitivity and specificity were compared between different sources using McNemar's chi square.
 - Based on findings from pre-vaccine licensure studies, we considered a PPV>95% to be highly predictive of immunity.

RESULTS

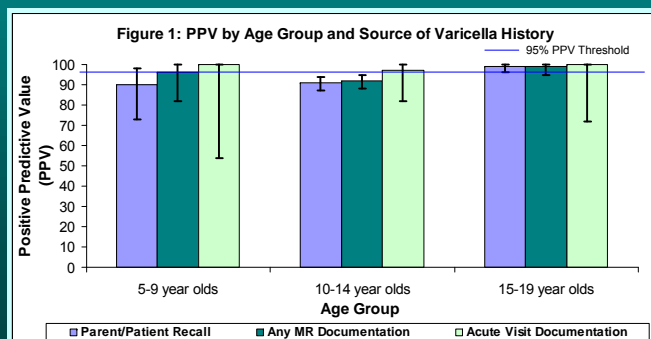
Table 1: Participant Characteristics by Age Group

	5-9 year olds	10-14 year olds	15-19 year olds
Age, median	8	13	16
Birth year, median (range)	1996 (1994-2001)	1992 (1989-1996)	1988 (1985-1990)
Born in US, n (%)			
Yes	47 (98)	304 (99)	180 (98)
No	1(2)	1 (1)	3 (2)
Gender, n (%)			
Male	21 (44)	165 (54)	84 (46)
Female	27 (56)	140 (46)	99 (54)
Race/Ethnicity, n (%)			
Black, non hispanic	40 (84)	269 (88)	156 (85)
White, non hispanic	4 (8)	20 (7)	19 (10)
Other	4 (8)	16 (5)	8 (5)
Years Attending Clinic, median (range)	2 (0-8)	2 (0-14)	2 (0-18)

Table 2: Source of Varicella History by Age Group

Source of Varicella History	5-9 year olds (N=48)	10-14 year olds (N=305)	15-19 year olds (N=183)
Parent/Patient Recall			
Yes, n (%)	29 (60)	263 (86)	167 (91)
Any MR Documentation			
Yes, n (%)	28 (58)	243 (80)	155 (85)
Acute Visit Documentation			
Yes, n (%)	6 (13)	29 (10)	11 (6)
Laboratory Confirmation			
Positive, n (%)	35 (73)	267 (88)	180 (98)

- Parent/Patient recall and MR documentation of varicella history increased with age from 60% to 91% and from 58% to 85%, respectively.
- Of those participants with any MR documentation, 79%(22/28) of 5-9 year olds, 88% (214/243) of 10-14 year olds and 93% (144/155) of 15-19 year olds had their disease recorded as part of routine screening during a well visit.
- For all age groups, the proportion of participants with documentation of an acute visit with a varicella diagnosis was much lower (6%-13%) compared with documentation of history based on other sources.



RESULTS

Table 3: Validity of Reported Varicella History Compared With VZV IgG Results by Source

Source of Varicella History	5-9 YEAR OLDS							
	TP	FP	FN	TN	PPV	NPV	Sensitivity	Specificity
Acute Visit Documentation	6	0	29	13	100	31	17*	100
Any MR documentation	27	1	8	12	96	60	77	92
Parent/Patient Recall	26	3	9	10	90	53	74	77
Source of Varicella History	10-14 YEAR OLDS							
	TP	FP	FN	TN	PPV	NPV	Sensitivity	Specificity
Acute Visit Documentation	28	1	239	37	97	13	10*	97*
Any MR documentation	224	19	43	19	92	31	84+	50
Parent/Patient Recall	240	23	27	15	91	36	90	39
Source of Varicella History	15-19 YEAR OLDS							
	TP	FP	FN	TN	PPV	NPV	Sensitivity	Specificity
Acute Visit Documentation	11	0	169	3	100	2	6*	100
Any MR documentation	153	2	27	1	99	4	85+	33
Parent/Patient Recall	165	2	15	1	99	6	92	33

* P<0.0001, + P<0.05
 True Positive (TP): positive history and seropositive, False Positive (FP): positive history and seronegative
 False Negative (FN): no/uncertain history and seropositive, True Negative (TN): no/uncertain history and seronegative
 Positive Predictive Value (PPV): percentage with positive varicella histories and who were immune
 Negative Predictive Value (NPV): percentage with no or uncertain varicella histories who were susceptible
 Sensitivity: percentage of immune individuals who had positive varicella histories
 Specificity: percentage of susceptible participants who had no or uncertain varicella histories

- For 5-9 year olds, PPV was lowest for parent/patient recall of history and highest for acute visit documentation.
- For 10-14 year olds, PPV was similar for parent/patient recall and any MR documentation.
- PPV was high (99-100%) regardless of source of history for 15-19 year olds.
- Among all age groups, PPV for acute visit documentation was a highly accurate indicator of VZV immunity: 100% (95% CI: 54-100%) for 5-9 year olds, 97% (95% CI: 82-100%) for 10-14 year olds and 100% (95% CI: 72-100%).
- These findings are driven by the low number (≤1) of participants with false positive histories.
- Specificity, which impacts the number of false positives, was also higher for acute visit documentation compared with parental recall, but differences were only statistically significant for the 10-14 year old age group.

CONCLUSION

- Our findings suggest that documentation of an acute visit for varicella in the MR is highly predictive of VZV immunity and is a practical way to confirm varicella history for unvaccinated children born between 1985-2001 (participants 5-19 years).
- Based on results, this type of verification may entail contacting health care provider offices other than the patient's current primary care physician.
- For most participants with any MR documentation, varicella history was based on medical history information provided to the clinician from the parent or guardian during a well visit.
- Seropositivity was extremely high among older participants (15-19 year olds, birth years 1985-1990), which suggests that these individuals may not need additional verification when reporting history of disease as evidence of immunity.
- With the changing epidemiology of varicella and noticeable reductions in disease due to VV impact, these results may not apply to individuals born after 2001.