

Analysis of pediatric outpatient visits uncovers disparities in molluscum contagiosum treatment across medical specialties in the United States

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Abstract

Molluscum contagiosum (MC) is a common viral infection that affects the skin of children. In this study, treatment regimens and demographic information for MC patients across US medical specialties were compared. We discovered an average of 471,383 pediatric MC visits annually using the National Ambulatory Medical Care Survey database from 2000 to 2016. Non-Hispanics (82.9%) and Caucasians (91.0%) made up the majority of the visitors. The majority of cases were handled by pediatricians (46.5%), family medicine doctors (10.6%), and dermatologists (36.7%). Compared to pediatricians, dermatologists saw a higher percentage of Caucasian patients (95% vs. 84%) and patients with private insurance (83% vs. 73%). Patients were more likely to see family medicine doctors (55.0%) in non-metropolitan areas than pediatricians (26.4%) or dermatologists (16.3%). Dermatologists were less likely than pediatricians (38%) to favor spontaneous resolution (70%). Dermatologists favored terpenoids (20%), imiquimod (12%), and curettage (10%), while pediatricians primarily used terpenoids (12%), steroids (4%), and imiquimod (4%). The majority of MC cases are managed by pediatricians; however, treatment approaches deviate markedly from recommended best practices.

Introduction

Molluscum contagiosum (MC) is a common infectious dermatological disease caused by a DNA poxvirus.¹ It commonly affects children and presents as a cluster of small umbilicated papules along the distribution of the hands, torso, and genitals. Affected adults are more likely to be younger or immunocompromised. MC is one of the world's five most prevalent skin diseases and the third most common viral skin infection in children, with a reported prevalence of 5.1-11.5%.² While there is a consensus to treat adult MC or disseminated MC cases associated with immunosuppression, the decision to treat benign cases in immunocompetent children is not straightforward.^{3,4} In immunocompetent patients, MC infection and associated lesions may take years to resolve; however, most are cleared within 6-9 months, rendering treatment redundant.⁵ However, children, parents, or physicians may elect to treat lesions to resolve the associated pruritus or pain, prevent autoinoculation or transmission, or limit scarring. In practice, the frequency with which lesions resolve spontaneously is unknown. Many options have not been rigorously proven effective through randomized trials for cases where treatment is indicated, and none are approved by the Food and Drug Administration.⁶ Additionally, specialties outside dermatology are often consulted for patients with MC. It is unclear which specialty patients are most likely to seek and whether patient demographics or treatment practices vary. This study aims to investigate the treatment decisions made across various specialties for MC to understand the prevailing trends in management.

Materials and Methods

The National Ambulatory Medical Care Survey (NAMCS), a Center for Disease Control and Prevention and National Center for Health Statistics sponsored study, collects information on outpatient care at non-federally employed physicians' offices in the United States. The sampling methods of the survey are stratified by geographic location and specialty and weighted to convey a nationally representative sample. As the analysis was performed on data extracted from a publicly accessible forum, this study was exempt from obtaining informed consent and institutional review board approval.⁷

The database was filtered for visits describing patients ≤ 21 years occurring from 2000-2016. The data was then obtained from records that were populated with the diagnosis code for MC in the International Classification of Diseases (ICD)-9 ("0780-") or ICD-10 ("B081") formats within any of the diagnosis fields. Demographics, including age, sex, race, ethnicity, geography, and payment status, were extracted from 256 records representing 8,013,517 visits. The data were further restricted to records that mentioned MC as the sole diagnosis to limit confounding factors in subsequent analysis. All treatments and procedures associated with 156 records representing 4,432,549 visits were tabulated across all specialties.

Results

A total of 8,013,517 visits for MC occurred in patients aged 21 years and under within the study period (2000-2016), corresponding to 471,383 visits per year. Of the visits by physician specialties recorded, pediatricians saw the most cases (46.5%), followed by dermatologists (36.8%), family medicine physicians (FM) (10.6%), and other specialties (6.1%) (Figure 1). Using the 2021 census data to estimate the total United States population in this age group, the average annual incidence rate was estimated to be 55/10,000.

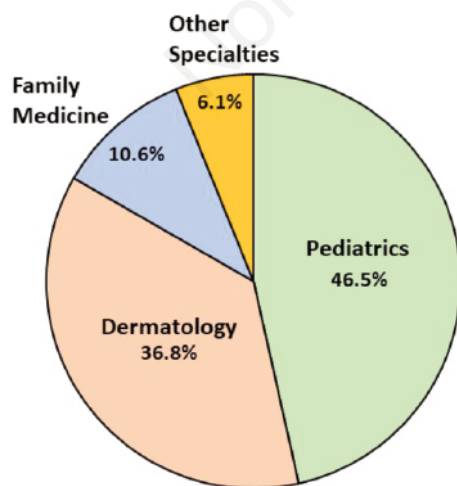


Figure 1. Pie chart showing physician specialties who cared for outpatient pediatric patients with molluscum contagiosum from 2000 to 2016 in the United States.

Demographics

Each specialty saw a similar age distribution in their patients, with a median age of 6 years (Figure 2). However, pediatricians observed the highest percentage of patients under 12 years. Adolescent patients >12 years were most likely to be examined by dermatologists. Most visits were made by Caucasian (91.0%) and non-Hispanic patients (82.9%) (Table 1). Pediatrics had the highest percentage of patients of non-Caucasian descent (16.2%), followed by dermatology (5.3%) and family medicine (FM) (2.3%). Patients visiting dermatologists vs. pediatricians were more likely to be Caucasian (95% vs. 84%) and hold private insurance (83% vs. 73%, respectively). African American and Hispanic patients were more likely to visit pediatricians (61.6% and 45.2%, respectively) than dermatologists (25.8% and 20.1%, respectively). Caucasian patients were more likely to visit dermatologists (42.5%) than pediatricians (34.8%). Pediatricians conducted most visits with new patients (99.7%), whereas dermatologists conducted the most visits with previously established patients (41.6%). Patients living in non-metropolitan areas were more likely to visit FM physicians (55.0%) than pediatricians (26.4%) or dermatologists (16.3%). Those with private insurance were more likely to see dermatologists (47.0%) than pediatricians (30.8%) or FM (16.8%).

Treatment

No treatment was prescribed in nearly half of the visits (47.2%), and pediatricians were more likely than dermatologists to forgo therapy (70.3% vs. 37.5%) (Table 2). The most common treatments used were terpenoids (20.8%), imiquimod (7.4%), curettage (6.5%), salicylate (6.1%), and liquid nitrogen (5.5%). The least prescribed treatments were antimetabolites (0.3%), H2 blockers (0.7%), iodine (0.8%), antihistamines (0.9%), and lotions (1.0%). Dermatologists prescribed classes of medications that other specialties did not, including catechins (4.1%), calamine and sarna lotion (1.8%), antihistamines (1.8%), H2 blockers (1.4%), and antimetabolites (0.6%). Pediatricians were the only specialty to prescribe iodine (2.6%). FM physicians preferentially prescribed salicylates (26.3%).

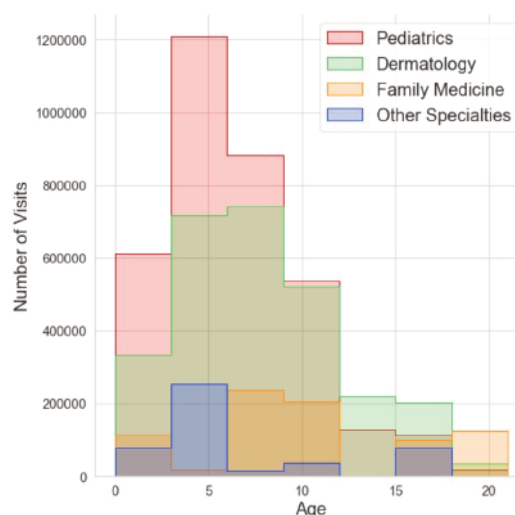


Figure 2. Per physician specialty, pediatric outpatients of different age groups who received care for molluscum contagiosum from 2000 to 2016 in the United States.

Discussion

A previous study summarizing the epidemiological trends of MC in all ages from 1990 to 1999 estimated 280,000 visits per year and showed that dermatologists, FM physicians, and pediatricians oversaw 70.8%, 13.4%, and 7.2% of visits, respectively.⁸ Our study, which focuses solely on patients 21 and younger in recent decades, reveals a dramatic increase in yearly visits and that pediatricians are the most likely providers to see patients with

MC. Primary care specialties (PCP), including pediatrics and FM, were more likely to see non-Caucasian patients, those living in non-metropolitan areas, and those without private insurance. With the growing number of cases and the evolution of specialties involved in patient care, it is essential to analyze differences in treatment strategies to ensure that patients receive optimal and equitable care.

This study found that the decision to treat varied considerably between specialties, with PCPs being less likely to pursue inter-

Table 1. Demographics of pediatric patients with molluscum contagiosum visiting for outpatient physician care between 2000 and 2016.

	Pediatrics		Dermatology		Family medicine		Other specialties		All specialties	
	Visits	%	Visits	%	Visits	%	Visits	%	Visits	%
Average age in years (SD)	6.4 (3.7)		7.4 (4.3)		8.2 (4.6)		8 (6)		7 (4.3)	
Sex										
Female	1,280,791	57.7	1,127,781	47	60,189	7.8	165,523	63	2,730,542	46.4
Male	938,814	42.3	1,272,812	53	715,852	92.2	97,341	37	3,152,033	53.6
Race										
Caucasian	1,861,585	83.9	2,274,913	94.8	758,118	97.7	262,864	100	5,352,240	91
African American	192,345	8.7	80,622	3.4	17,874	2.3	0	0	312,010	5.3
Other	165,675	7.5	45,058	1.9	50	0	0	0	218,324	3.7
Ethnicity										
Hispanic	243,301	19.5	108,100	8.7	133,575	40.9	45,927	43.1	537,757	17.1
Non-Hispanic	1,006,965	80.5	1,136,081	91.3	193,205	59.1	60,692	56.9	2,613,560	82.9
Patient status										
New patient	2,212,812	99.7	1,401,656	58.4	585,550	75.5	242,972	92.4	4,614,826	78.4
Established patient	6,794	0.3	998,937	41.6	190,491	24.5	19,892	7.6	1,267,748	21.6
Geography										
Metro area	2,071,060	93.3	2,309,105	96.2	466,462	60.1	262,864	100	5,319,940	90.4
Non-metro area	148,546	6.7	91,488	3.8	309,579	39.9	0	0	562,635	9.6
Insurance										
Private insurance	882,743	73.2	1,345,795	83.7	480,591	80.3	156,245	100	2,865,374	80.3
Medicaid/CHIP	275,392	22.8	147,436	9.2	44,203	7.4	0	0	467,031	13.1
Self-pay	12,694	1.1	12,865	0.8			0	0	25,559	0.7
Other	30,789	2.6	46,811	2.9	73,823	12.3	0	0	151,423	4.2
Unknown	4646	0.4	55,231	3.4			0	0	59,877	1.7

SD, standard deviation; CHIP, clonal hematopoiesis of indeterminate potential.

Table 2. Medications utilized in the treatment of molluscum contagiosum in the pediatric population between 2000 and 2016.

Treatment	Family medicine (%)	Pediatrics (%)	Dermatology (%)	Other specialties (%)	All specialties (%)	All specialties
No tx	51.60	70.30	37.50	21.00	1,884,032	47.20
Terpenoid	12.20	11.70	20.00	68.10	831,831	20.80
Imiquimod	0.00	4.00	11.90	0.00	294,382	7.40
Curettage	0.00	1.20	10.10	10.90	259,841	6.50
Salicylate	26.30	2.80	5.20	0.00	244,380	6.10
Nitrogen	6.80	0.00	9.20	0.00	217,768	5.50
Antibiotic	6.80	2.50	7.70	0.00	216,816	5.40
Steroid	3.00	4.40	1.70	0.00	100,382	2.50
Retinoid	0.00	2.00	3.50	0.00	95,611	2.40
Sinicatechin	0.00	0.00	4.10	0.00	85,472	2.10
Podophyllotoxin	0.00	0.90	2.10	0.00	54,690	1.40
Lotion	0.00	0.00	1.80	0.00	38,323	1.00
Antihistamine	0.00	0.00	1.80	0.00	37,849	0.90
Iodine	0.00	2.60	0.00	0.00	31,287	0.80
H2 blocker	0.00	0.00	1.40	0.00	28,269	0.70
Antimetabolite	0.00	0.00	0.60	0.00	11,616	0.30

ventions than dermatologists. This difference can be attributed to multiple reasons. Dermatologists are likely to encounter more cases where treatment is definitively indicated. These include sexually transmitted MC, lesions associated with immunosuppression, pain or pruritus, or prolonged course.⁶ Additionally, while cryotherapy is a first-line treatment, primary care facilities are unlikely to have the equipment to enable this procedure, dissuading them from it.⁹ PCPs may be more comfortable forgoing active treatment since most lesions spontaneously resolve. Instead, they may opt to refer the patients to dermatologists. Finally, patients or guardians who seek dermatologists may be more likely to insist on treatment for reasons such as favorable cosmetic outcomes.

Terpenoids, including cantharidin, are the most frequently used treatment options across all specialties. A prospective randomized trial comparing curettage, cantharidin, and imiquimod found that curettage was the most efficacious treatment with the lowest risk of recurrence and side effects.¹⁰ Despite this, rates of curettage were low among FM physicians (0%) and pediatricians (1.2%). This is likely explained by patient preference, as children might face anxiety over cryotherapy and curettage, which can cause pain and bleeding.¹¹ While cantharidin is associated with side effects secondary to its blistering mechanism, it has been proven to be an efficacious treatment with high patient and parent satisfaction.¹²

Dermatologists had the highest rate of first-line therapy utilization. Treatments considered first-line, including cryotherapy, cantharidin, and curettage, are based on medium-quality evidence from smaller randomized trials.^{13,14} Of all the treatments available for MC, only podophyllotoxin has been evaluated in a randomized controlled trial.¹⁵ However, podophyllotoxin has not been evaluated for safety in patients below 10 years and was prescribed in only a minority of cases. Additionally, dermatologists were the only group with recorded data on the use of second-line agents, including catechins, lotions, antihistamines, H₂ blockers, and antimetabolites. Salicylic acid, another second-line agent, was the most commonly prescribed treatment among FM physicians. While studies have shown that this treatment is effective, they have also demonstrated that it is associated with higher levels of lesion reoccurrence and local irritation.¹⁰

Imiquimod, the second most popular treatment overall, has not been proven through large prospective trials to be more effective in treating MC than spontaneous resolution.¹⁶ Data from unpublished randomized trials suggest that 5% imiquimod cream is associated with application site reactions.¹⁶ Interestingly, this agent was most prescribed by dermatologists. These findings suggest the need for extensive prospective RCTs to definitively assess their effectiveness compared to existing first-line agents.

PCPs were found to prescribe topical corticosteroids more frequently than dermatologists (FM physicians, 3.0%; pediatricians, 4.4%; dermatologists, 1.7%). These agents are not indicated for the treatment of MC, and there are concerns that treatment may exacerbate infection by lowering the host immune response.¹⁷ In a subset of MC cases complicated by a concurrent eruption of erythematous plaques known as molluscum dermatitis, corticosteroids may be considered to limit pruritus. However, emollients can be used in milder cases to avoid adverse effects.¹⁸

This study had a few limitations. First, survey data were not collected on referrals; therefore, it is unknown whether the providers advised follow-up with a dermatologist. Second, direct-to-consumer treatments were not assessed, and providers may have recommended that patients use these products. Third, laser therapy was not assessed in this study. Finally, sampling errors within the NAMCS may have led to an underestimation of the frequency of treatments prescribed.

Conclusions

MC is a prevalent dermatosis that is self-limiting in most cases. However, it may be advisable to actively treat others. Most patients, regardless of race, tend to visit pediatricians rather than dermatologists for this diagnosis, likely because of limited access. Insurance typically allows easier access to primary care without the need for referrals. Pediatricians are more likely to forgo active treatment, whereas dermatologists tend to proceed with it. Notable differences in treatment among medical specialties include an increased tendency to avoid curettage, cryotherapy, and the use of topical corticosteroids among PCPs. Differences among treatment preferences in specialties may reflect differences in training emphasis. Imiquimod has limited proven effectiveness in randomized trials but has widespread use. The results of this study support the need for extensive prospective trials to evaluate the efficacy of imiquimod. In cases of prolonged or complicated MC, for which treatment is indicated, first-line therapies and referrals to dermatologists should be considered.

References

1. Chen X, Anstey AV, Bugert JJ. Molluscum contagiosum virus infection. *Lancet Infect Dis* 2013;13:877-88.
2. Olsen JR, Gallacher J, Piguet V, Francis NA. Epidemiology of molluscum contagiosum in children: a systematic review. *Fam Pract* 2014;31:130-6.
3. Tying SK. Molluscum contagiosum: the importance of early diagnosis and treatment. *Am J Obstet Gynecol* 2003;189:S12-6.
4. Basdag H, Rainer BM, Cohen BA. Molluscum contagiosum: to treat or not to treat? Experience with 170 children in an outpatient clinic setting in the northeastern United States. *Pediatr Dermatol* 2015;32:353-7.
5. Lee R, Schwartz RA. Pediatric molluscum contagiosum: reflections on the last challenging poxvirus infection, Part 1. *Cutis* 2010;86:230-6.
6. Eichenfield L, Hebert A, Mancini A, et al. Therapeutic approaches and special considerations for treating molluscum contagiosum. *J Drugs Dermatol* 2021;20:1185-90.
7. Moreno MA, Goni N, Moreno PS, Diekema D. Ethics of social media research: common concerns and practical considerations. *Cyberpsychol Behav Soc Netw* 2013;16:708-13.
8. Molino AC, Fleischer AB, Feldman SR. Patient demographics and utilization of health care services for molluscum contagiosum. *Pediatr Dermatol* 2004;21:628-32.
9. Chapa PJ, Mavura DR, Philemon R, et al. Contributing factors and outcome after cryotherapy of molluscum contagiosum among patients attending tertiary hospital, northern tanzania: a descriptive prospective cohort study. *Dermatol Res Pract* 2021;2021:9653651.
10. Hanna D, Hatami A, Powell J, et al. A prospective randomized trial comparing the efficacy and adverse effects of four recognized treatments of molluscum contagiosum in children. *Pediatr Dermatol* 2006;23:574-9.
11. Badri T, Gandhi GR. Molluscum Contagiosum. In: StatPearls. eds. Treasure Island (FL): StatPearls Publishing; 2022.
12. Cathcart S, Coloe J, Morrell DS. Parental satisfaction, efficacy, and adverse events in 54 patients treated with cantharidin for molluscum contagiosum infection. *Clin Pediatr (Phila)* 2009;48:161-5.
13. Harel A, Kutz AM, Hadj-Rabia S, Mashiah J. To treat mollus-

- cum contagiosum or not-curettage: an effective, well-accepted treatment modality. *Pediatr Dermatol* 2016;33:640-5.
14. Guzman AK, Schairer DO, Garelik JL, Cohen SR. Safety and efficacy of topical cantharidin for the treatment of pediatric molluscum contagiosum: a prospective, randomized, double-blind, placebo-controlled pilot trial. *Int J Dermatol* 2018;57:1001-6.
 15. Syed TA, Lundin S, Ahmad M. Topical 0.3% and 0.5% podophyllotoxin cream for self-treatment of molluscum contagiosum in males. A placebo-controlled, double-blind study. *Dermatol* 1994;189:65-8.
 16. Theos AU, Cummins R, Silverberg NB, Paller AS. Effectiveness of imiquimod cream 5% for treating childhood molluscum contagiosum in a double-blind, randomized pilot trial. *Cutis* 2004;74:134-8, 141-2.
 17. Osio A, Deslandes E, Saada V, et al. Clinical characteristics of molluscum contagiosum in children in a private dermatology practice in the greater Paris area, France: a prospective study in 661 patients. *Dermatology* 2011;222:314-20.
 18. Netchiporouk E, Cohen BA. Recognizing and managing eczematous id reactions to molluscum contagiosum virus in children. *Pediatrics* 2012;129:e1072-5.

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