

Comparison of two strategies to prevent varicella outbreaks in housing facilities for asylum seekers

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SUMMARY

Background: The proportion of adults with positive varicella serology is lower in populations from tropical countries. Therefore immigrants to countries with a temperate climate are at risk of acquiring varicella infection during adulthood.

Methods: We tested two different strategies to prevent varicella outbreaks in housing facilities for asylum seekers arriving in the Canton of Vaud, Switzerland. The first strategy consisted of a rapid response with isolation of the affected individuals and vaccination of the susceptible contacts. The second strategy consisted of a general vaccination upon arrival of all asylum seekers aged 15–39 years with no history of chickenpox.

Results: From May 2008 to January 2009 we applied the rapid response strategy. Eight hundred and fifty-eight asylum seekers arrived in the Canton and an attack rate of 2.8% (seven cases among 248 exposed asylum seekers) was observed. The mean cost was US\$ 31.35 per asylum seeker. The general vaccination strategy was applied from February 2009 to May 2010, a period during which 966 asylum seekers were registered. This second strategy completely prevented any outbreak at a mean cost of US\$ 83.85 per asylum seeker.

Conclusions: Of the two analyzed interventions to prevent varicella outbreaks in housing facilities for asylum seekers, the general vaccination strategy was more effective, more sustainable, and ethically preferable, although more costly.

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1. Introduction

The varicella zoster virus (VZV) is highly contagious, but for reasons that remain unclear, the seroprevalence is quite different in temperate and tropical regions. In temperate regions the seroprevalence is >90% among persons older than 12 years, but the seroprevalence in tropical regions can be as low as 30% in adults.¹ Persons migrating from low to high seroprevalence countries are therefore at risk of acquiring VZV infection.

Varicella acquired during childhood is usually a benign disease, but varicella acquired during adulthood is associated with much greater morbidity and mortality. In adults, the risk of hospital admission with varicella is 13–16-times higher and the risk of death from varicella is 25–40-times higher than in children.^{2–4} Immuno-compromised patients are at even higher risk of complications, such

as disseminated varicella infection. A special problem also arises for pregnant women, because of the risk of transmission to the fetus.

In 2007 an epidemic of varicella erupted in a housing facility for asylum seekers in the Canton of Vaud, Switzerland. A 33-year-old HIV-positive man from Eritrea living in a center for 125 asylum seekers, was diagnosed with disseminated varicella complicated by VZV pneumonia. Following this case, a further 15 cases of chickenpox were diagnosed within the next couple of days.

After this epidemic we designed a rapid response strategy to try to contain such outbreaks. During a second period we applied a general vaccination strategy for all susceptible adults between the ages of 15 and 39 years. Here we describe the advantages and downsides of the two different strategies.

2. Patients and methods

2.1. Setting

Currently over 40 000 asylum seekers live in Switzerland, a country with a total population of 7.75 million. The Canton of Vaud,

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Table 1

Origins of asylum seekers who arrived in Switzerland during the two intervention periods

	May 2008–January 2009	February 2009–May 2010
Sub-Saharan Africa	7388 (51%)	7281 (39%)
Eritrea	2887	1787
Somalia	2041	608
Nigeria	901	2289
Others	1559	2597
Central Asia	2513 (17%)	3431 (18%)
Iraq	1171	1037
Georgia	447	862
Afghanistan	426	898
Europe	1610 (11%)	3335 (18%)
Serbia	904	865
Kosovo	199	842
Russia	195	575
Indian subcontinent	1229 (8%)	1767 (9%)
Sri Lanka	1153	1643
Middle East	792 (5%)	1392 (7%)
Turkey	381	719
Syria	304	518
Far East	401 (3%)	818 (4%)
South and Central America	36 (0.2%)	51 (0.3%)
Unknown	625 (4%)	567 (3%)
Total	14 594	18 642

Source: modified from the Asylum Statistics of the Federal Office for Migration; available at: http://www.bfm.admin.ch/content/bfm/en/home/dokumentation/zahlen_und_fakten/asylstatistik.html.

with a total population of 700 000, receives between 800 and 1000 newly arriving asylum seekers per year and currently has a population of asylum seekers of around 5000.⁵ Their countries of origin vary from year to year according to the political and social situations in different parts of the world. Table 1 shows the origins, and Figure 1 the sex and age distributions, of the asylum seekers who arrived in Switzerland during the study period. As asylum seekers are randomly sent to the different regions, these national figures are also representative of the Canton of Vaud. Asylum seekers receive a temporary resident permit until their application has been evaluated. Some are then granted permanent resident status, but the majority (about 90–95%) are sent back to their home country within a couple of months.

All arriving asylum seekers spend the first couple of months in collective housing facilities. In the Canton of Vaud there are a total of seven such facilities, which are of variable size; the larger centers can accept up to 150 persons, the smaller ones up to 30 persons. Living conditions are crowded: they sleep in bedrooms with 2–10 beds, share washing and toilet facilities, and eat in large

canteens. Most asylum seekers attend classes and some are professionally active outside the housing facilities.

Medical services are provided by nurse practitioners supervised by physicians. Upon arrival, all asylum seekers have a medical evaluation, which includes administration of basic vaccinations. These immunizations did not include vaccination against varicella before this study. For the Swiss population varicella vaccination with two doses is recommended for all children aged 11–15 years with no history of chickenpox, and catch-up vaccination is recommended for persons up to 39 years of age with no history of chickenpox.

Varicella immune status is verified upon employment for all medical staff of the Canton of Vaud, and vaccination is recommended if the healthcare worker is non-immune. Varicella immune status is not verified for the general staff of the facilities housing asylum seekers.

2.2. Interventions

Whenever a case of varicella was diagnosed in any housing facility for asylum seekers, it was considered that it had the potential to cause a varicella epidemic. Two different strategies to control such outbreaks were adopted: from May 2008 to January 2009 a rapid response strategy was applied, from February 2009 to May 2010 a general vaccination strategy of all susceptible persons aged 15–39 years was adopted.

2.2.1. Rapid response strategy

Figure 2 summarizes the rapid response strategy. If a new case of varicella was diagnosed among the population of asylum seekers, the index case was moved for isolation to a single room, and instructed not to use common facilities such as eating rooms or living rooms. Isolation was imposed until all skin lesions were crusted. Strict isolation was, however, often difficult to achieve, as there were for example insufficient bathrooms in these housing facilities to allow separation of sick and healthy persons. There were also no strict procedures to verify the observance of the isolation measures. Detection of secondary cases was done by passive surveillance.

About three nurse practitioners and a physician supervisor were then dispatched to the affected housing facility to conduct an evaluation of the situation within 48 h. The evaluation comprised short individual interviews of all asylum seekers at the center, using pictures of varicella skin eruptions to determine which asylum seekers had not had chickenpox. Persons who reported a negative history of chickenpox and absence of vaccination were considered at high risk and were offered varicella serology.

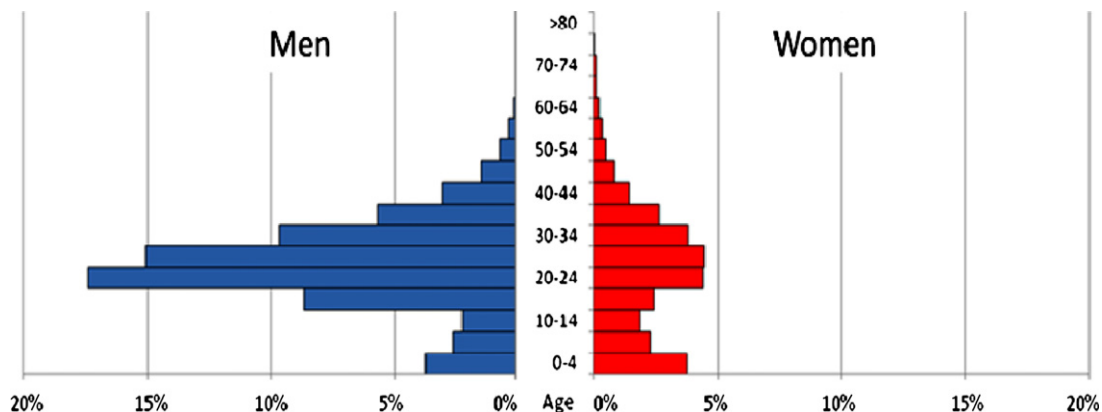


Figure 1. Sex and age distribution of asylum seekers who arrived in Switzerland between May 2008 and May 2010 ($N = 33\ 236$) (Source: modified from the Asylum Statistics of the Federal Office for Migration; available at: http://www.bfm.admin.ch/content/bfm/en/home/dokumentation/zahlen_und_fakten/asylstatistik.html).

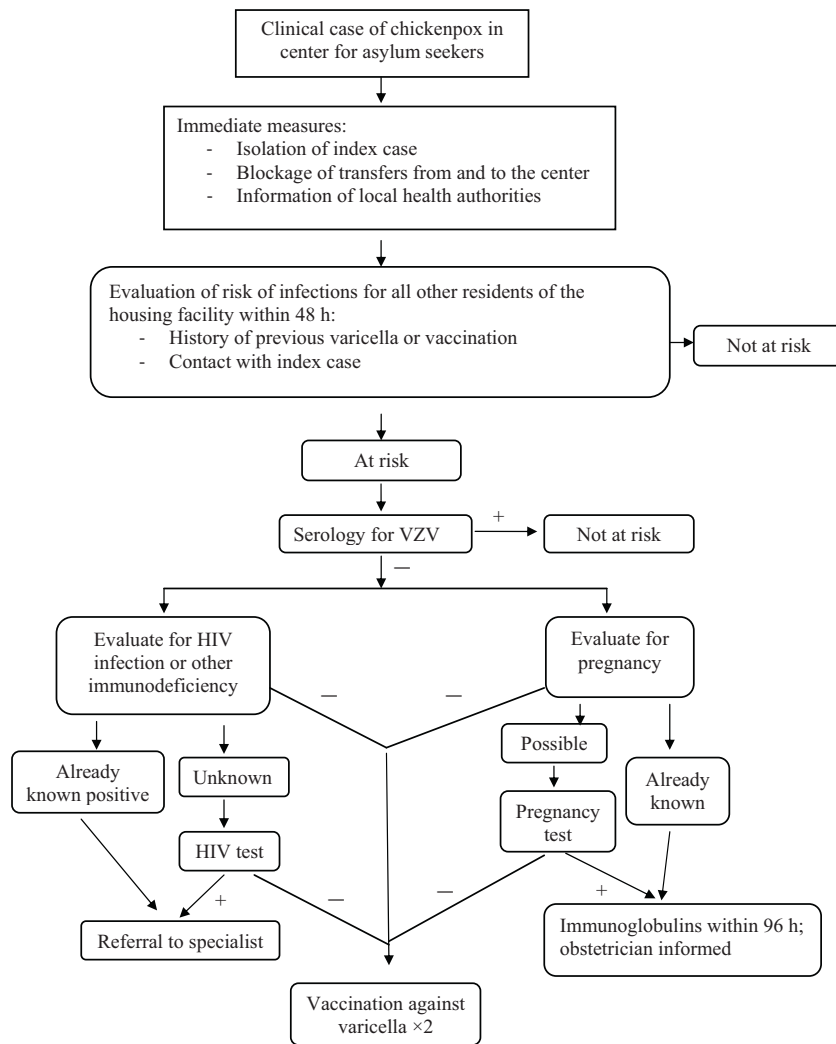


Figure 2. Rapid response strategy.

Furthermore individuals who were unsure about pregnancy or who had not had an HIV test within the last 2 years were offered the appropriate tests.

Persons with a negative VZV serology and no contraindication to immunization (no immunosuppression and no pregnancy) were vaccinated within 72 h after exposure and received a second dose a month later. In the case of pregnancy, varicella-zoster-specific immunoglobulins were administered. For immunocompromised patients the indication for immunoglobulins was to be decided by an experienced clinician.

2.2.2. General vaccination strategy

From February 2009 to May 2010 we applied a general vaccination strategy. Upon arrival in the Canton of Vaud, Switzerland, all asylum seekers aged 15–39 years who reported a negative history of chickenpox were considered for vaccination. This strategy differed slightly from the Swiss guidelines, which recommend vaccination of all children aged 11–15 years and catch-up vaccination for persons up to 39 years with a negative chickenpox history. This decision was taken under the pressure of budget restrictions and with the aim to protect mainly those patients at high risk of complications. Contraindications for vaccination were a known immunodeficiency or pregnancy. No varicella serology, HIV, or pregnancy tests were done. This was decided in order to reduce, as much as possible, any delay before

vaccination. All eligible candidates received two doses of vaccine at an interval of 1 month.

2.3. Cost data collection

The cost data were extracted retrospectively from the records of the medical services for asylum seekers. Table 2 lists the variables that were collected to perform the cost calculations. The prices of items were extracted from the Swiss medical tariff system ‘Tarmed’. This tariff system forms the basis on which medical bills for medical insurance are established. The treatment costs for outpatients included the fees for medical consultations and the laboratory and radiological investigations. The treatment costs for the inpatient were obtained from the hospital administration and included all usual items (medical costs plus accommodation and food). Costs for human resources were obtained from the financial department of the University Hospital of Lausanne.

3. Results

During the first period, in which the rapid response strategy was applied (May 2008 to January 2009), 858 new asylum seekers arrived in the Canton of Vaud and were lodged in the seven different housing facilities. Five varicella outbreaks were observed in four different housing facilities, named A, B, C, and D in Table 3.

Table 2
Comparison of costs between the two proposed strategies

	Rapid response strategy		General vaccination strategy	
Time period	May 2008–January 2009		February 2009–May 2010	
Number of new asylum seekers who arrived in the housing facilities during the study period	858		966	
Number of asylum seekers evaluated, respectively vaccinated	180 evaluated of 248 exposed		966 evaluated, 570 vaccinated	
Costs: ^a		in US\$ ^a		in US\$ ^a
Human resources (US\$ 51 per h)	1 h per asylum seeker	13 623	10 min per asylum seeker	8184
VZV serology (US\$ 37 per test)	74	2281		
HIV tests (US\$ 20 per test)	12	240		
Vaccinations (US\$ 64 per vaccine)	10 × 2 doses	1280	570 × 2 doses	72 817
Immunoglobulins (US\$ 697 for 625 U)	2	1394		
Treatment costs				
Outpatients	6	1203		
Inpatient	1	6875		
Total		26 896		81 001
Total per asylum seeker	US\$ 26 896/858 asylum seekers	31.35	US\$ 81 001/966 asylum seekers	83.85

VZV, varicella zoster virus; HIV, human immunodeficiency virus.

^a Based on an exchange rate of 1 US\$ = 1.2 CHF.

Table 3
Varicella outbreaks in the different housing facilities during the period of the rapid response strategy

Center	Date	No. of varicella cases	Cases: origin and age	No. of asylum seekers (evaluated/total)	Asylum seekers with negative chickenpox history	Asylum seekers with negative VZV serology	Asylum seekers vaccinated	Ig administered
A	May 2008	2	Iraq, 27 y; Sri Lanka, 30 y	56/58	29 (52%)	3 (10%)	3	0
B	July 2008	1	Sri Lanka, 27 y	15/48	13 (87%)	4 (31%)	4	0
A	Oct 2008	2	Somalia, 19 y; Somalia, 24 y	32/63	11 (34%)	1 (9%)	1	0
C	Dec 2008	1	Eritrea, 25 y	52/53	15 (29%)	4 (27%)	2	2
D	Jan 2009	1	Bosnia, 4 y	25/26	6 (24%)	0 (0%)	0	0
Total		7		180/248	74 (41%)	12 (16%)	10	2

VZV, varicella zoster virus; Ig, immunoglobulin.

At the time these five outbreaks were recognized, a total of 248 asylum seekers were living in these centers and were therefore considered at risk of exposure (Table 2). One hundred and eighty were evaluated for pre-existing immunity to varicella. Sixty-eight persons were not evaluated because they were not in the centers during the period of medical evaluation. Seventy-four individuals (41%) reported a negative history for chickenpox and 12 of these individuals (16%) had a negative serology for varicella. The median age of the asylum seekers with a negative serology was 23.5 years, with a range of 20–48 years. None of these asylum seekers were HIV-positive, but two women were pregnant. Ten asylum seekers received two doses of varicella vaccine and the two pregnant women received immunoglobulins.

With the rapid response strategy there were two secondary cases besides the five index cases. In residential facility A there were two outbreaks, each with two cases; there were no secondary cases in the other three centers. With a total of seven cases, the attack rate was 2.8% (seven cases among 248 exposed asylum seekers). Among these seven cases, there was one 4-year-old child; the other patients were aged 19–30 years. Six cases could be treated on an outpatient basis, but one 27-year-old patient from Sri Lanka was hospitalized for a period of 11 days.

During the period in which the general vaccination strategy was applied (February 2009 to May 2010), 966 asylum seekers arrived in the Canton of Vaud. Five hundred and seventy of these subjects (59%) had a negative history for chickenpox and received two doses of the varicella vaccine. No case of varicella was observed among the asylum seekers during this period.

Table 2 lists the costs that were generated by the two different strategies. The rapid response strategy led to a mean cost of US\$ 31.35 per arriving asylum seeker. The general vaccination strategy generated a mean cost of US\$ 83.85 per arriving asylum seeker.

4. Discussion

VZV can cause significant morbidity and mortality when it infects susceptible adult populations. Asylum seekers often come from tropical regions where the seroprevalence among adults is relatively low. As they live in crowded conditions, they are at particular risk of contracting this disease when they arrive in countries with a temperate climate.

With the above-described rapid response strategy the number of secondary varicella cases could be reduced substantially during outbreaks in the facilities housing asylum seekers. The first outbreak in 2007, when there was no defined action plan, led to a total of 16 cases among 125 asylum seekers, corresponding to an attack rate of 11%. This attack rate dropped to 2.8% (seven cases among 248 exposed asylum seekers) during the period when the rapid response strategy was applied.

For this strategy to work, rapid implementation was imperative and therefore it had to be well-organized. A plan to mobilize sufficient human resources to conduct the investigations was essential. Furthermore varicella serology was not available in all laboratories and therefore contact with the local laboratories was necessary to clarify where blood specimens had to be sent to conduct varicella serology testing. Several problems were encountered with this strategy. First, it was never possible to evaluate the whole population of the affected center. The asylum seekers were indeed not limited in their movements; some were taking language lessons and courses for social integration and others were working. Among the 248 potentially exposed asylum seekers, only 180 (73%) were evaluated. Second, this strategy was quite labor-intensive to implement and we had to count about 1 h per evaluated asylum seeker. This included organizational time and the consultations, which comprised history taking, drawing blood,

and vaccination. Assessment of varicella disease and vaccination history was particularly labor-intensive, as many asylum seekers did not speak any language other than their mother tongue. Third, varicella serology, HIV, and pregnancy tests certainly delayed to some extent the rapid vaccination of susceptible individuals without contraindications. This might have penalized the rapid response strategy in comparison to the general vaccination strategy. Fourth, this strategy was quite disruptive for the team of nurse practitioners and it potentially had a negative impact on the quality of the rest of their activities.

With the general vaccination strategy there was no case of varicella observed in the housing facilities for asylum seekers for a period of 16 months, and this despite the fact that there was a significantly larger proportion of asylum seekers with a negative chickenpox history during this second period (41% vs. 59%, $p = 0.02$). This strategy can therefore be considered as more effective than the rapid response strategy. It was relatively easy to implement, as asylum seekers had a medical consultation upon arrival anyway and varicella vaccine was simply added to the usual vaccination plan for asylum seekers. This approach was similar to the guidelines for the general Swiss population, which recommend catch-up vaccination against varicella of all individuals between 15 and 39 years of age with a negative history of chickenpox, with the exception of pregnant women and persons with immunosuppression. In addition the Swiss guidelines recommend vaccination of all children aged 11–15 years with a negative chickenpox history. The decision not to vaccinate children aged between 11 and 15 years in the housing facilities could be questioned, but was taken because of budget pressures. To keep the strategy as simple as possible and to avoid delays in starting the vaccination of potentially susceptible individuals, the assessment of contraindication was only based on a short anamnesis, including enquiries about any delay in menstruation and any known immunosuppressive disease. Testing for HIV or pregnancy was not done during this period for persons who gave a negative response to the above questions. Based upon the literature, the risk of causing harm by administering the live attenuated varicella vaccine to asymptomatic HIV-positive patients or during unrecognized early pregnancy was considered to be low.^{6–8}

The general vaccination strategy was clearly more expensive than the rapid response strategy. The general vaccination strategy cost 2.7-times more than the rapid response strategy (US\$ 83.85 vs. US\$ 31.35). However, the true cost of the rapid response strategy was probably underestimated, as we may not have captured all the costs associated with the outbreak investigations. It was indeed difficult to estimate the cost of the decision-making process (discussions, meetings, communication with the public health department, etc.), the traveling costs between the health department and the housing facilities, and the work to manage and analyze the data. In addition the rapid response strategy could have been more costly if any complicated varicella cases had occurred. There was luckily no case of varicella encephalitis, pneumonia, or disseminated disease during this period. Furthermore transmission to the local population, such as the general staff of these housing facilities, could have occurred, which could have been very disruptive. The general vaccination strategy generated high expenditure because of the utilization of a large number of costly vaccines. A relatively large proportion of individuals were probably vaccinated unnecessarily. It has indeed been reported that a negative history of chickenpox is a poor predictor of negative varicella serology.⁹ Our data confirm this, as only 12 of 74 individuals (16%) with a negative history had a negative serology during the period of the rapid response strategy. Furthermore the majority of these arriving asylum seekers are usually sent back within a relatively short time. Therefore those individuals were vaccinated unnecessarily, as the risk of catching chickenpox after

returning to their home country is again lower. However, with increasing international travel, this protection might not be completely useless in the future.

A third strategy to prevent outbreaks of chickenpox among such populations would have been to do serological testing of all arriving asylum seekers with a negative chickenpox history, followed by vaccination of susceptible individuals. This approach was advocated by the authors of a study that looked at the cost-effectiveness of different strategies to prevent varicella in refugees arriving in Canada.¹⁰ The calculations were based on a population different to asylum seekers, because these investigators looked at immigrants who were going to stay permanently in their country of adoption. A strategy based on the results of serology would have required an additional medical visit, and follow-up might therefore have been poorer. Based on an estimation using the figures from our population, such a strategy would have probably generated costs intermediate between the rapid response and the general vaccination strategies. The effectiveness would probably also have been intermediate, because outbreaks would not have been avoided completely. Indeed the delay in vaccination caused by the addition of a blood test would favor the occurrence of new outbreaks.

The outcome of this analysis could have been different if the proportion of asylum seekers coming from tropical countries had been higher and if the mean age had been lower. These factors greatly influence the proportion of susceptible individuals, and the larger this proportion, the greater the benefit of simply vaccinating all those with a negative history of chickenpox.

A limitation to this study was the fact that the number of arriving asylum seekers decreased significantly during the second part of the study. During the period of the rapid response strategy an average of 95 asylum seekers were registered per month (858 asylum seekers over a period of 9 months), and during the general vaccination period only 60 asylum seekers were registered every month (966 asylum seekers over a period of 16 months). The housing conditions were therefore less crowded during the second study period, which could have influenced the risk of transmission of varicella.

In conclusion, varicella infection in adult migrating populations living in crowded conditions is a frequent problem. The above-described rapid response strategy was less effective in preventing cases, but was clearly cheaper. As medical services for asylum seekers are often allocated minimal financial resources, the rapid response strategy to prevent varicella outbreaks among these populations could be a valid option. However, this approach always required urgent intervention, which was a source of tension in the medical team. Therefore maintaining this strategy over a prolonged period could have been problematic. The general vaccination of all individuals reporting a negative history of chickenpox was clearly more effective to prevent outbreaks, although at a higher cost. From an organizational point of view this second approach seemed to be a more sustainable intervention in the long term, because it caused less stress and no disruption of the other activities of the medical team. Furthermore this approach was similar to the Swiss guidelines for the prevention of varicella in the general population. Considering that all individuals in a country should have access to a similar level of care, this approach was ethically preferable. In this world where cost-effectiveness often appears to be the predominant factor influencing decisions, we believe that the ethical aspects should remain a key element in the medical decision-making process.

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