



VARICELLA AND HERPES ZOSTER SURVEILLANCE AND VACCINATION RECOMMENDATIONS 2010-2011

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Abbreviations

ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Area
EU	European Union
MSs	Member States
VZV	Varicella-Zoster Virus
VENICE	Vaccine European New Integrated Collaboration Effort

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ISO 3166-1 Country Codes

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DK	Denmark
EE	Estonia
FI	Finland
FR	France
DE	Germany
GR	Greece
HU	Hungary
IS	Iceland
IE	Ireland
IT	Italy
LV	Latvia
LT	Lithuania
LU	Luxembourg
MT	Malta
NL	The Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
SK	Slovakia
SI	Slovenia
ES	Spain
SE	Sweden
UK	United Kingdom

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Background

Varicella (chickenpox) and herpes zoster (shingles) are acute communicable diseases caused by varicella-zoster virus (VZV), belonging to the *Herpesvirus* group.

The primary infection with VZV causes varicella. Chickenpox is a highly contagious, relatively mild disease. It mainly affects children- 90% of cases occur under 13 years of age. The illness is characterized by a vesicular rash, fever and malaise. It may result in serious complications such as bacterial super-infections (cellulitis, pneumonia, osteomyelitis), or neurological sequelae (encephalitis, cerebellar ataxia) and deaths.

Persons at increased risk of complications are: immunocompromised individuals and neonates. Infections in pregnancy may be associated with congenital varicella syndrome. Affected children commonly have abnormalities of extremities, damaged central nervous system, skin scarring and eye abnormalities.

Varicella is a seasonal disease with incidence peaks during winter and spring. Outbreaks occur in pre-school and school children. Periodic larger outbreaks may occur with an inter-epidemic cycle of 2 to 5 years [1].

In Europe monovalent vaccines (*VarilrixTM*, GlaxoSmithKline Biological, Rixensart, Belgium and *VarivaxTM* Sanofi Pasteur MSD, Lyon, France) and formulations combining the varicella component with measles, mumps and rubella antigens (*PriorixTetraTM*, GlaxoSmithKline Biological, Rixensart, Belgium and *ProQuadTM*, Sanofi Pasteur MSD, Lyon, France) are licensed for prevention of varicella.

After primary infection with the VZV, the virus remains latent in the dorsal root ganglia of the nervous system. The latent virus can be reactivated and result in herpes zoster (shingles). The mechanism of reactivation is not well established. The risk groups include people above 50 years and immunocompromised.

Herpes zoster manifests as a characteristic vesicular eruption generally limited to a dermatome and unilateral radicular pain. Complications such as chronic neuropathic

pain, bacterial super-infections of skin, segmental motor nerve damage, may occur in between 21 - 48% of patients [2].

Approximately 10-20% of adults have an episode of zoster during their lifetime. The highest incidence of disease varies between 5 and 10 cases per 1000 persons older than 60 years [3].

Live, attenuated vaccine against herpes zoster (*Zostavax*, Sanofi Pasteur MSD, SNC) was licensed in Europe in 2006, but is not available uniformly on the market in European countries. Estimated efficacy depends on patients' age. It ranges from 63.9% in the 60- to 69 years age group to 37.6% in the 70- to 79 years age group [4].

The European case definition for varicella is still not available. Therefore comparison of surveillance data has to be done cautiously.

Aim of the study and specific objectives

The aim of the study was to collect information on the status of introduction of varicella and herpes zoster vaccination for children, adolescent and high risk groups in the EU/EEA countries.

The specific objectives of the study were to:

- characterize surveillance systems for varicella and herpes zoster within MSs,
- summarize recommendations for varicella and herpes zoster vaccination, within MSs,
- summarize future strategy for varicella and herpes zoster vaccination within MSs,
- summarize information about impact of varicella vaccination within MSs.

Methods and materials

Study design

A cross-sectional survey was undertaken. This survey was a collaborative study between the European Centre for Disease Prevention and Control (ECDC), VENICE Project and European Union (EU) and European Economic Area (EEA) Members States (MSs).

Currently 27 EU and two EEA (Norway and Iceland) countries participate in the VENICE project (http://venice.cineca.org/participating_countries.html). A gatekeeper was previously identified for each member state; the gatekeepers are responsible for conducting all VENICE surveys inside their countries.

Some gatekeepers filled the survey themselves. In some instances gatekeepers delegated another expert as contact point for the varicella or herpes zoster survey.

Data collection

Two standardized on-line questionnaires concerning varicella and herpes zoster were developed. Predominantly close-ended questions were used. Information sought included surveillance of varicella and herpes zoster, vaccination recommendations for varicella/herpes zoster, future strategy for varicella and herpes zoster vaccination, impact of vaccination, payment and administration costs for vaccine.

The questionnaire was developed by the Polish partner and later shared with the other members of the VENICE II Consortium for comments: the Italian Istituto Superiore di Sanità (ISS), the French Institut de Veille Sanitaire (InVS) and the Irish Health Protection Surveillance Centre (HPSC).

Data handling

The electronic questionnaire was developed on the VENICE website (<http://venice.cineca.org>) by CINECA (the technical partner of the VENICE II Consortium) during October-November 2010. It was available for all participating MSs in a private area of the web platform. The electronic questionnaire was filled in

by gatekeepers or contact points in each country and saved. After the closure of the survey the database was downloaded for analysis.

Pilot study

The questionnaire was pilot tested by three VENICE project-leading partners (ISS, InVS and HPSC). The pilot study was undertaken in September 2010. After the pilot study, the questionnaire was reviewed and amended.

Data processing

Gatekeepers in each MSs entered data directly on-line. The leading group contacted varicella/herpes zoster contact points by email if clarification was needed in relation to their responses.

Study period

The electronic questionnaires were completed between 4th and 15th October 2010. Reminder was sent and the data collection extended to 20th October 2010.

Data analysis

Collected data were analyzed using Microsoft Excel and EpiInfo software and descriptive statistics were produced. The following variables were analyzed:

- types of surveillance systems on varicella/herpes zoster and type of cases reported,
- varicella/herpes zoster vaccine recommendations for general population and high risk groups (medical, occupational, social, other),
- payment and administration of varicella/herpes zoster vaccination,
- planned policy for varicella/herpes zoster vaccination in Europe,
- impact of varicella/herpes zoster vaccination in Europe.

Response rate and data validation

The participation ratios were 100% (29/29) for varicella survey and 96% (28/29) for herpes zoster survey. One country (Finland) did not respond to the herpes zoster survey.

Due to fact that during 2010 two parallel surveys have been performed collecting information on varicella/herpes zoster surveillance and vaccination recommendations in European countries, the coordinators of VENICE and EUVAC.NET networks

decided to compare the results of surveys. The additional validation circulated among contact persons of both European networks was performed during May-June 2011.

Results Varicella

1.1 Surveillance of varicella

Among the 29 participating countries twenty two (76%) had developed at least one surveillance system for varicella. In fourteen of them surveillance operates for more than ten years. There is comprehensive, mandatory surveillance in eighteen countries (62%) and a sentinel system in eight countries (28%).

In Cyprus, Germany, Greece Ireland and United Kingdom there are two types of surveillance: mandatory reporting and an additional sentinel system (

Table 1). In Germany mandatory surveillance of varicella exists in only five “lander”: Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, and Thuringia. In Ireland mandatory reporting is restricted to viral meningitis/encephalitis cases caused by any virus (including VZV). Varicella is reported only from GP sentinel sites. In Greece only varicella cases with complications are mandatory reported. The parallel sentinel system collects data on all-spectrum varicella cases. In United Kingdom the sentinel system exists in England and Wales, the national surveillance exists in Scotland and Northern Ireland.

Data for surveillance purposes are derived from different sources. However the main source of data is notification by clinicians (73%). Hospital episodes are used in 5 countries (17%) and laboratory reporting, death registration are used in 4 countries (

Table 1).

Table 1. Surveillance systems of varicella in UE/EEA countries, 2010

Country	Surveillance 1	Surveillance 2	Source of data
Austria	-	-	-
Belgium	Sentinel, since 2006	-	Notifications by clinicians
Bulgaria	National, mandatory, since 1940	-	Notifications by clinicians, laboratory reporting, hospital episodes
Cyprus	National, mandatory, since 2004	Sentinel	Notifications by clinicians
Czech Republic	National, mandatory, since 1953	-	Notifications by clinicians
Denmark	-	-	-
Estonia	National, mandatory, since 1953	-	Notifications by clinicians
Finland	National, mandatory, since 2008	-	Laboratory reporting
France	Sentinel, since 1990	-	Notifications by clinicians
Germany	Sentinel, since 2005	Mandatory reporting of varicella since 2001 in five Land of the former GDR (Brandenburg (2009) Mecklenburg-Western Pomerania (2006), Saxony (2001), Saxony-Anhalt (2001), Thuringia (2001))	Notifications by clinicians, hospital episodes, death registration
Greece*	National, mandatory *, since 2004	Sentinel	Notifications by clinicians
Hungary	National, mandatory, since 1998	-	Notifications by clinicians, death registration
Iceland	-	-	-
Ireland	Sentinel, since 2000	Mandatory notification of varicella zoster meningitis/encephalitis	Notifications by clinicians, laboratory reporting
Italy	National, mandatory, since 1960	-	Notifications by clinicians, death registration, hospital episodes
Latvia	National, mandatory	-	Notifications by clinicians, hospital episodes
Lithuania	National, mandatory, since 1973	-	Notifications by clinicians
Luxemburg	-	-	-
Malta	National, mandatory, since 2004	-	Notifications by clinicians
Netherlands	Sentinel, since 2000	-	Notifications by clinicians
Norway	-	-	-
Poland	National, mandatory, since 1970	-	Notifications by clinicians
Portugal	Sentinel, since 2002	-	Notifications by clinicians
Romania	-	-	-
Slovakia	National, mandatory, since 1953	-	Notifications by clinicians
Slovenia	National, mandatory, since 1990	-	Notifications by clinicians
Spain	National, mandatory, since 1904	-	Notifications by clinicians
Sweden	-	-	-
England and Wales	Sentinel, since 1968	-	Notifications by clinicians
Scotland	National, mandatory, since 1988	-	Notifications by clinicians, laboratory reporting, hospital episodes, death registration
Northern Ireland	National, mandatory, since 1990	-	Notifications by clinicians, laboratory reporting, hospital episodes, death registration

*Only varicella cases with complications

Sixteen countries (55%) reported that they collect data on all varicella cases. In four countries (DE, IE, LT, PL) fatal cases are routinely notifiable, in 3 countries (DE, LT, PL) hospitalized cases, in 2 countries (DE, IE) meningitis/encephalitis cases, in 2 countries (DE, GR) cases with complications, congenital (PL) and vaccinated cases (DE) in one country. In Greece only varicella cases with complications are mandatory reported. Detailed data are in Table 2.

Epidemiological investigation of cases is routinely conducted in 4 countries (BG, GR, HU, LV).

Table 2. Characteristic of routinely reported cases in UE/EEA countries, 2010

Country	Cases routinely reported	Epidemiological investigation of cases routinely conducted
Belgium	All cases	No
Bulgaria	All cases	Yes
Cyprus	All cases	No
Czech Republic	All cases	No
Estonia	All cases	No
Finland	Only laboratory confirmed	No
France	All cases	No
Germany	Hospitalized cases, meningitis/encephalitis, fatal cases, cases with complications, vaccinated cases	No
Greece	Cases with complications	Yes
Hungary	All cases	Yes
Ireland	Fatal cases, meningitis/encephalitis	No
Italy	All cases	No
Latvia	All cases	Yes
Lithuania	All cases, hospitalized cases, fatal cases	No
Malta		No
Netherlands	All cases	No
Poland	All cases, hospitalized cases, fatal cases, congenital cases	No
Portugal	N/A	N/A
Slovakia	All cases	No
Slovenia	All cases	No
Spain	All cases	No
United Kingdom	All cases	No

Varicella case classification compatible with the 2010 CDC case definition were used for surveillance purposes in 7 countries (24%). CDC case classification includes probable and confirmed cases.

Probable cases were characterized as acute illness with:

- Diffuse (generalized) maculopapulovesicular rash, AND
- Lack of laboratory confirmation, AND
- Lack of epidemiologic linkage to another probable or confirmed case.

Confirmed cases were characterized as acute illness with diffuse (generalized) maculopapulovesicular rash, AND:

- Epidemiologic linkage to another probable or confirmed case, OR
- Laboratory confirmation by any of the following:
 - Isolation of varicella virus from a clinical specimen, OR
 - Varicella antigen detected by direct fluorescent antibody test, OR

- Varicella-specific nucleic acid detected by polymerase chain reaction (PCR), OR
- Significant rise in serum anti-varicella immunoglobulin G (IgG) antibody level by any standard serologic assay.

Five countries (BE, CZ, FR, IT, NL) (17%) implemented national case definition for surveillance purposes. Clinical case definition is used in 4 countries (BE, FR, IT, NL). In Finland only laboratory confirmed cases are reported to surveillance system.

In eight countries (BG, CZ, ES, FI, DE, GR, IE, PL) laboratories are using ELISA (enzyme-linked immunosorbent assay) test to confirm varicella and seven countries (BG, CZ, DE, FI, GR, IE, ES) are using VI (virus isolation) and PCR (polymerase chain reaction) was used in 5 countries, DFA (direct fluorescent antibody test) in 3 countries (CZ, DE, IE), indirect fluorescence in one country (ES). Detailed data concerning laboratory test used in each country are presented in

Table 3.

Table 3. Case definition and laboratory tests for surveillance purposes in UE/EEA countries, 2010

Country	Official case definition for surveillance purposes	Case definition	Recommended laboratory confirmation	Laboratory tests
Belgium	National	A vesicular exanthema which appears in successive crops, with lesions evolving rapidly from superficial papules to vesicles and eventually to scabs	No	-
Bulgaria	Compatible with CDC case definition	-	Yes, for all cases	ELISA, VI
Cyprus	Compatible with CDC case definition	-	No	-
Czech Republic	National	A. Possible case: Any person meeting the clinical criteria B. Probable case: Any person meeting the clinical criteria and with an epidemiological link C. Confirmed case: Any person meeting the clinical and the laboratory criteria	Yes, for specific cases	ELISA, VI, DFA, PCR
Estonia	No	-	No	-
Finland	No	-	Yes	ELISA, PCR, VI, antigen detection
France	National	Sudden onset of a typical rash (maculo-papulovesicular rash for 3-4 days with itching and dissipation phase) associated with a moderate fever (37,5°C - 38°C).	No	-
Germany	Compatible with CDC case definition	-	Yes, for specific cases	ELISA, VI, DFA, PCR
Greece	Compatible with CDC case definition	-	Yes, for specific cases	VI, ELISA
Hungary	No	-	No	-
Ireland	No	-	Yes, for specific cases	ELISA, VI, DFA, PCR
Italy	National	Case definition is only clinical: An illness diagnosed by a medical doctor with acute onset with a rash compatible with varicella	No	-
Latvia	No	-	No	-
Lithuania	No	-	No	-
Malta	Compatible with CDC case definition	-	No	-
Netherlands	National	A vesicular exanthema which appears in successive crops, with lesions evolving rapidly from superficial papules to vesicles and eventually to scabs	No	-
Poland	No	-	No	ELISA
Portugal	-	-	-	-
Slovakia	No	-	No	-
Slovenia	No	-	No	-
Spain	Compatible with CDC case definition	-	Yes, only for fatal cases	ELISA, VI, PCR, Antigen identification by Indirect Fluorescence
Scotland	Compatible with CDC case definition	-	-	-

In 14 countries (48%) case based surveillance data are collected (Table 4).

Case-based surveillance data are varies in particular countries and contains information on:

- demographic variables (age, gender, address) (14 countries),
- hospitalization (12 countries),

- notification source (GP, hospital, lab) (12 countries),
- vaccination status of patients (11 countries),
- outcome (8 countries),
- laboratory test details (8 countries),
- case classification (7 countries),
- epidemiological link (6 countries),
- clinical complications (6 countries),
- clinical picture (3 countries)
- other (1 country).

In Belgium also the type of diagnosis (clinical or laboratory) for each patient is collected (in the sentinel surveillance system).

In Germany case based data are collected only in five “lander” (Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, Thuringia).

Table 4. Case-based surveillance data collected in EU/EEA countries, 2010

Country	Case based data
Belgium	Demographic variables (age, gender, address), vaccination status of patients, laboratory test details, other
Cyprus	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, epidemiological link, hospitalization, outcome, case classification
Czech Republic	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, epidemiological link, hospitalization
Finland	Notification source (GP, hospital, lab), demographic variables (age, gender, address), laboratory test details
France	Demographic variables (age, gender, address), hospitalization, clinical complications
Germany	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, epidemiological link, hospitalization, clinical picture, clinical complications, outcome, case classification
Greece	Notification source, demographic variables (age, gender, address), vaccination status of patients, epidemiological link, hospitalization, clinical picture, clinical complications, outcome, laboratory test details, case classification
Hungary	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, epidemiological link, hospitalization, laboratory test details, clinical complications, outcome
Ireland	Notification source (GP, hospital, lab), demographic variables (age, gender, address), hospitalization, laboratory test details, outcome, case classification
Italy	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, hospitalization, laboratory test details
Latvia	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, hospitalization, laboratory test details, outcome
Malta	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, hospitalization, laboratory test details, clinical picture, clinical complications, case classification
Slovakia	Notification source (GP, hospital, lab), demographic variables (age, gender, address), vaccination status of patients, epidemiological link, hospitalization, clinical complications, outcome, case classification
Slovenia	Notification source (GP, hospital, lab), demographic variables (age, gender, address), hospitalization, outcome, vaccination status of patients

Aggregated surveillance data are collected in 9 countries (BG, EE, ES, DE, GR, IE, LT, PL, UK) (31%). All of them aggregate data according to age group, 8 countries according to gender, 3 countries according to hospitalization and to the vaccination status (Table 5).

Table 5. Aggregated surveillance data in EU/EEA countries, 2010

Country	Aggregated data
Bulgaria	Age group, gender, hospitalization status
Estonia	Age group, gender
Germany	Age group
Greece	Age group, gender, vaccination status, hospitalization status
Ireland	Age group, gender
Lithuania	Age group, gender, hospitalization status
Poland	Age group, gender, vaccination status
Spain	Age group, gender, vaccination status
United Kingdom	Age group, gender

1.2. Vaccine recommendations

Vaccine against varicella is registered in all studied countries except Bulgaria (97%). Monovalent vaccine is available in 28 countries and combined vaccine (MMRV) in 15 countries (AT, BE, CY, CZ, EE, DE, HU, IT, LV, LU, MT, NL, PL, SK, SI) (52%).

In seven countries there is no specific recommendation for varicella vaccination (BG, CZ, HU, PT, RO, SK, SE).

1.2.1. Recommendations for universal vaccination

Varicella vaccination for children is included in the childhood immunization schedule as recommended at national level in five countries (AT, CY, DE, LU, PL).

In Spain only two autonomous regions- Madrid and Navarra, and two autonomous towns -Melilla and Ceuta- have included two doses of vaccine against varicella for all children at 15 months and 3-6 years.

Vaccination is included in the childhood immunization schedule as mandatory in Latvia and Greece. In Latvia the combined vaccine (measles-mumps-rubella-varicella (MMRV) is used, and in Greece- the monovalent vaccine.

In France vaccination is recommended for adolescent at the age 11-18 years. More detailed data are in Table 6.

In Poland a general recommendation is stated for unvaccinated persons, without defining the age recommended, nor the vaccination schedule.

Varicella catch-up vaccination campaigns are implemented only in Luxembourg. The target groups are all children up to 12 years of age.

1. Especially recommended for unvaccinated children aged 9-17 years, who didn't contracted varicella. Second dose at least 6 weeks after 1 dose.
2. Vaccination recommended for children at the age of 13-18 months but administered only by the private sector.
3. Recommended for unvaccinated children aged 11-18 years, who didn't contracted varicella.
4. First dose at 11-14 months, second at 15-23 months. Vaccination recommended also for unvaccinated adolescents under 18 years.
5. Mandatory vaccination for children. First dose at 12-18 months, second dose at 4-6 years. Vaccination recommended for adolescent over 12 years.
6. Vaccination recommended for susceptible adolescents with a 2-dose schedule.
7. Mandatory vaccination for children at 12-15 months.
8. Schedule include 2 doses for all age groups. First dose of MMRV at 12 months of age, second dose at 15-23 months of age. Vaccination recommended also for susceptible adolescents. Schedule include 2 doses for all age groups.
9. The Spanish Health Authority –Interterritorial Health Council not recommend varicella vaccine to be include in childhood vaccination schedule. Only two autonomous regions- Madrid and Navarra, and two autonomous towns -Melilla and Ceuta- have included two doses of vaccine against varicella for all children at 15 months and 3-6 years.

1.2.2. Varicella vaccination for high risk groups

Varicella vaccination is recommended for specific risk groups in 17 (58%) countries (AT, BE, DE, DK, EE, ES, FR, IE, IS, IT, LU, LT, NL, NO, PL, SI, UK).

Vaccination is recommended for medical risk groups in thirteen countries (45%) (AT, BE, DE, DK, EE, ES, FR, IE, IT, LU, NO, PL, SI).

Vaccination is recommended for susceptible persons in six countries (BE, EE, FR, IT, LU, PL). In France vaccination is recommended for susceptible teenagers between 11-18 years old. In Luxembourg, it is recommended for susceptible adolescents above 12 years of age. In Italy the new national vaccination plan 2010-2012 (waiting for final approval) recommends to offer the vaccination (free of charge) to all susceptible individuals aged more than 12 years. In Estonia vaccination is recommended for adults over 50 years. In Poland vaccination is recommended to all susceptible persons, independently of age.

Vaccination is also recommended for the following medical risk groups:

- Seronegative women of childbearing age (AT, BE, DE, EE, FR, IE, LU, PL),
- Immunocompromised persons (AT, ES, IE, NO, LU, PL),
- Persons with acute lymphocytic leukemia in remission (BE, EE, ES, IE, IT, NO, LU, PL, SI),
- Persons with leukemia (AT, BE, EE, ES, IT, NO, LU),
- Persons infected with HIV (BE, IE, PL),
- Candidates for organ transplantation (AT, DE, DK, EE, ES, FR, IE, IT, NO, LU, SI),
- Persons before chemotherapy (DE, EE, NO, PL),
- Other (BE, DE, EE, ES, SI).

Vaccination for occupational risk groups is recommended in 14 countries (AT, FR, DE, EE, FI, IE, LT, LU, NO, MT, NL, ES, SI, UK) (48%), for social risk groups in 2 countries (AT, IE), for other risk groups in 12 countries (AT, DE, ES, FI, FR, IE, IS, SI, PL, LU, NO, UK). More detailed data are included in Table 7.

Table 7. Vaccine recommendations for risk groups, in UE/EEA countries, 2010

Risk groups	Countries	Total
Medical risk groups		n=14
Seronegative women of childbearing age	AT, BE, DE, EE, FR, IE, LU, PL	n=8
Immunocompromised persons	AT, ES, IE(1), LU, PL(2), NO	n=6
Persons with acute lymphocytic leukemia in remission	BE, EE, ES, IE(1), IT, LU, SI, PL(2), NO	n=9
Persons with leukemia	AT, BE, ES, IT, LU, EE(3), NO	n=7
Persons infected with HIV	BE, IE, PL(2)	n=3
Candidates for organ transplantation	AT, DE, DK, ES, EE(3), FR, IE, IT, LU, SI, NO	n=11
Persons before chemotherapy	DE, PL(2), EE(3), NO	n=4
Rother	BE(4), DE(5), ES(6), IE(7), SI(8)	n=5
Occupational risk groups		n=14
Susceptible health care workers	AT, DE, ES, FR, IE, NL, LU, UK, SI, LT, MT, NO, FI	n=13
Susceptible pedagogical Staff	AT, FR	n=2
Susceptible day-care personnel	AT, DE, FR, FI	n=4
Other	IE(9), DE(10), EE(11), FR(12),	n=4
Social risk groups		n=2
Children in residential units for severe physical disability	IE	n=1
Person in military barracks or other similar communal type accommodation	AT	n=1
Other		n=13
Seronegative family members of high-risk children	AT, ES, SI, PL(2), NO	n=5
Close contacts of immunocompromised individuals	IS, UK, FI, SI	n=4
Seronegative close contacts of immunosuppressed individuals	AT, DE, ES, IE, FR, LU, PL(2)	n=7

(1) Some immunocompromised, under supervision.

(2) Mandatory for children aged under 12 years.

(3) Recommended for seronegative children under 12 years.

(4) Recommended for children with nephrotic syndrome, malignant tumor.

(5) Recommended for susceptible persons with severe neurodermatitis, close contacts of medical risk groups.

(6) Recommended for persons with respiratory, cardiovascular, metabolic and neurologic chronic diseases.

(7) Recommended for children in residential units for severe physical disability.

(8) Recommended for children who did not have varicella and are treated with high doses of steroids.

(9) Recommended for laboratory workers who may be exposed during work.

(10) Recommendation only for new appointed personnel in kindergartens.

(11) Recommended for children`s hospitals (departments) or hematological/oncological departments staff.

(12) Immunocompetent adults over 18 years old with no (or doubtful) history of varicella within 3 days after a contact with a varicella case. Women after a first pregnancy with no (or doubtful) history of varicella. Children who did not have varicella and are treated with high doses of steroids because of kidney diseases, severe asthma or other diseases.

1.3 Payment and administration of varicella vaccine

For specific medical risk groups vaccine is provided free of charge in 4 countries (IT, DE, PL, ES). For occupational risk groups the vaccine is provided free of charge in 5 countries (DE, ES, FI, MT, NO). In France and Luxembourg the vaccine for risk groups is partially subsidized. In Luxembourg vaccine is free of charge and 90% of the administration costs (medical visit) are reimbursed. More detailed data are in Table 8.

Table 8. Payment and administration of vaccines according to national recommendations, EU/EEA countries, 2010.

Risk groups	Cost category			
	Vaccine and administration free of charge	Partial subsidy for vaccine and administration	Full vaccine and administration cost paid by recipients	Vaccine free of charge, administration cost paid by recipient
Medical risk groups				
Susceptible persons in specific age group	IT	FR	PL, EE	
Seronegative women of childbearing age	DE	LU, FR	AT, PL, EE, IE	
Immunocompromised persons	PL, ES	LU	AT, IE	NO
Persons with acute lymphocytic leukemia in remission	IT, ES, PL	LU	IE	NO
Persons with leukemia	IT, ES	LU	AT, EE	NO
Persons infected with HIV	PL		IE	
Candidates for organ transplantation	DE, IT, ES	FR, LU	AT, EE, IE	NO
Persons before chemotherapy	DE, PL		EE	NO
Other	DE, ES	FR		
Occupational risk groups				
Susceptible health care workers	DE, ES, FI, MT, NO	FR, LU	AT, IE	
Susceptible pedagogical staff		FR	AT	
Susceptible day-care personnel	DE, FI	FR	AT	
Other			IE	
Social risk groups				
Person in military barracks or other similar communal type accommodation			AT	
Other				
Seronegative family members of high-risk children	ES, PL		AT	
Seronegative close contacts of immunosuppressed individuals	DE, ES, PL	FR, LU	AT	
Close contacts of immunocompromised individuals				
Other		FR		

1.4 Future strategy for varicella vaccination

Five countries are considering the inclusion of varicella vaccination into the national immunization schedule (Table 9). In Poland, Cyprus and Hungary the monovalent vaccine is considered for this purpose, in Finland, Hungary and Slovakia the introduction of combined vaccine (MMRV) is considered.

In 3 countries expert advisory boards on immunization recommend to include vaccination against varicella into the national immunization schedule. The main basis for the decision to include varicella into national immunization schedule is the anticipated epidemiological impact on varicella and herpes zoster (Table 9). Cost effectiveness ratio is taken into consideration only in Finland.

Table 9. Future strategy for varicella vaccination in UE/EEA countries, 2010

	Countries	Total
Planned introduction of varicella vaccination into the national immunization schedule	CY*, FI, HU, PL**, SK	n=5
Monovalent vaccine	CY, HU, PL	n=3
Combined vaccine (MMRV)	FI, HU, SK	n=3
Basis for the decision		
Anticipated epidemiological impact on varicella	CY, HU, PL, SK	n=4
Anticipated long-term epidemiological impact on herpes zoster	PL, SK	n=2
Cost effectiveness ratios (CER)	FI	n=1
Social demand	-	n=0

* within 2 years

** more than 2 years

Eight countries do not consider inclusion of varicella vaccination into national immunization schedule (

Table 10). The main reasons for this decision are cost of vaccination and lack of resources (3 countries).

Table 10. Future strategy for varicella vaccination in EU/EEA, 2010 cont.

	Country	Total
Not planned to introduce varicella vaccination into national schedule	CZ, IE, FR, LT, NL, PT, RO, SE	n=8
Rationale for the decision		
Lack of recognition of varicella as a serious disease	CZ	n=1
Perception of age shift with varicella vaccines	PT, FR	n=2
Theoretical concerns that immunization may lead to an increased incidence of herpes zoster	PT, FR	n=2
Cost of vaccination	CZ, LT, RO	n=3
Inability to achieve sufficient vaccination coverage	FR	n=1
Insufficient cost-effectiveness of vaccination	PT	n=1
Lack of resources that are addressed to other health priorities	CZ, LT, RO	n=3
Other	SE (1), NL(2)	n=2

1. No, evaluation done

2. In the Netherlands, no definitive decision on varicella vaccination has yet been made. The Dutch Health Council will advise on future strategy for varicella vaccination when more information on the disease burden of VZV in the Netherlands will become available.

1.5 Impact of varicella vaccination

Five countries have established mechanisms for monitoring the varicella vaccination coverage (Table 11). Three countries (DE, LU, PL) at national level, and two (IT, LV) at sub-national level. To obtain the numerator necessary for assessing varicella vaccine coverage three countries used health record data, two countries used immunization survey and two countries used pharmaceutical data (Table 11).

Table 11. Vaccine coverage assessment in EU/EEA, 2010

	Country	Total
Mechanism for monitoring the varicella vaccination coverage	DE, LV, LU, PL, IT*	n=5
Health record data (immunization records)		
Medical records	DE, LV, PL	n=3
Immunization surveys		
Telephone survey	DE, LU	n=2
Mail survey	LU	n=1
Pharmaceutical data		
Pharmaceutical distribution data (from national purchaser)	LU	n=1
Pharmaceutical sales data (from private pharmacies)	DE	n=1

In Germany vaccine coverage among 2-year old children was 34- 51%, depending on data sources. In Italy, according to a national vaccination coverage survey conducted in 2008, varicella vaccination coverage ranges between 0% and 72.9% according to the regional strategies. In Latvia varicella vaccine coverage in 2008 (year of introduction) was 48,1%, in 2009 -63,9% in 2010 - 78,9% in the second year of life. In Luxembourg vaccine coverage for all recommended vaccines is assessed by surveys conducted by mail or by telephone (in case of the absence of reply) administered to a representative sample of parents of children 25-30 months of age, every 5 years. The last survey was undertaken in 2007 and surveyed the immunization status of the 2005-birth cohort. The coverage data were not provided.

In Poland in 2008 15,987 doses of varicella vaccine were distributed. Distinction between fully and partially immunized children is not possible.

Results Herpes Zoster

2.1 Surveillance of herpes zoster

Eleven countries (39%) developed surveillance system for herpes zoster. National comprehensive surveillance system exist in 6 countries (CZ, ES, IE, MT, SK, SI) and sentinel in 5 countries (BE, FR, IE, NL, UK) (Table 12).

In Ireland mandatory notification of viral meningitis or encephalitis including that caused by varicella-zoster virus. Shingles is reported only from sentinel sites to the sentinel surveillance system.

Table 12. Surveillance system on herpes zoster in UE/EFTA countries, 2010

Type of surveillance	Countries	
National comprehensive	CZ, ES*, IE, MT, SK, SI	n=6
Sentinel	BE, DE, NL, UK	n=4

* The herpes zoster surveillance in Spain has been recently implemented (2007). Currently, not all the Spanish regions report to the national level.

Four countries (BE, DE, ES, FR) implemented herpes zoster case definition for surveillance purposes (Table 13). All those countries used only clinical case definition.

Table 13. Herpes zoster case definition in UE/EFTA countries, 2010

Country	Case definition
Belgium	Grouped vesicular eruptions, unilateral distribution, over area of a single dermatome.
France	First visit to GP for localized zoster (vesicles with an erythematous base, painful, restricted to skin areas supplied by a sensory nerves of a single or associated group of dorsal root ganglia), without or with vesicular rash in another area (disseminated zoster).
Germany	Occurrence of a vesicular rash restricted to a dermatome of a spinal nerve pathway, accompanied by at least one of the following symptoms: painful neuralgia of the affected region, fever, loss of appetite, myalgia, burning sensation and/or itching of the affected region.
Spain	Clinical case definition: an illness with acute, painful papulovesicular rash affecting areas supplied by sensory nerves of a single or associated group of dorsal root ganglia. A disseminated herpes zoster clinical form is possible.

Aggregated data on herpes zoster cases are collected in 3 countries (ES, IE, UK). In 9 countries (BE, CZ, FR, IE, DE, MT, NL, SK, SI) case-based data are collected (Table 14). In Ireland both type of surveillance data are collected as being relevant (aggregate for sentinel surveillance and case based for viral meningitis or encephalitis caused by VZV).

Table 14. Herpes zoster surveillance data

Country	Type of collected data
Belgium	Case-based
Czech Republic	Case-based
France	Case-based
Germany	Case-based
Ireland	Both as being relevant
Malta	Case-based
Netherlands	Case-based
Slovakia	Case-based
Slovenia	Case-based
Spain	Aggregated
England and Wales	Aggregated

2.2 Herpes zoster vaccine recommendation

Vaccine against herpes zoster is registered in 14 countries (AT, CZ, EE, DE, GR, HU, LT, NL, NO, PT, PL, SK, SE, UK). At the time of the survey, the vaccine was not available on the market in any European country.

Specific recommendations for herpes zoster vaccination were developed in two countries (AT, UK). In Austria vaccination with live vaccine is recommended for persons aged over 50. In United Kingdom a single dose of vaccine has been recommended for all adults aged 70 years.

One country – Germany - plans to include herpes zoster vaccination into national immunization schedule in 2012. This decision was based on anticipated long-term epidemiological impact on herpes zoster and cost effectiveness ratios.

Eighteen countries do not consider inclusion of herpes zoster vaccination into national immunization schedule.

The reasons for these decisions are following:

- cost of vaccination (8 countries),
- inability to achieve sufficient vaccination coverage (3 countries),
- insufficient cost-effectiveness of vaccination (3 countries),
- insufficient cost-utility of vaccination (3 countries),
- lack of resources that are addressed to other health priorities (10 countries),
- other (2 countries).

In France, it was considered that data on effectiveness herpes zoster vaccination among elderly were insufficient. In Sweden no evaluation carried out.

Table 15. Future strategy for herpes zoster vaccination cont.

	Country	Total
Introduction of vaccination into the national immunization schedule Not planned	BG, CY, CZ, EE, FR, GR, HU, IE, IS, LV, LT, MT, NL, NO, PT, PL, SK, SE	n=18
Basis for the decision		
Cost of vaccination	CZ, GR, HU, IS, LV, LT, MT, SK	n=8
Inability to achieve sufficient vaccination coverage	CY, IS, SK	n=3
Insufficient cost-effectiveness of vaccination	MT, PT, SK	n=3
Insufficient cost-utility of vaccination	MT, PT, SK	n=3
Lack of resources that are addressed to other health priorities	BG, CY, CZ, EE, GR, LV, LT, MT, PL, SK	n=10
Other	FR, SE, NO	n=3

Discussion

There is high diversification in surveillance systems on varicella in Europe. Among twenty nine countries participating in the study twenty two developed at least one surveillance system for varicella. Those systems however compile epidemiological data in different manner, and only in fourteen countries the surveillance exists for more than ten years.

Although most countries have surveillance on varicella, comparability of surveillance data is limited. The limitations results from:

- different types of surveillance (mandatory vs sentinel),
- various scope of collected data (all cases vs meningitis/encephalitis, cases with complications),
- different degrees of data available at national level (case-based vs aggregated)

Furthermore there is no EU standardized case definition and classification of varicella. Nine of the twenty two countries with existing surveillance did not use any case definition for surveillance purposes. Laboratory confirmation of varicella is

required only in six countries, but generally restricted to selected cases. Cases are therefore ascertained mostly based on physicians' decision. In populations with high circulation of varicella the positive predictive value of the clinical diagnosis of varicella is very high. The lack of uniform case definition criteria used across Europe, and especially the lack of uniform laboratory criteria, may become a problem in societies with effective vaccination programmes.

The second important consideration is the heterogeneity in vaccination recommendations among European countries. Out of twenty nine participating countries, twenty two have vaccine recommendations for varicella. Varicella vaccination for children is included into the childhood immunization schedule as recommended at national level in five countries and as mandatory in two countries. Vaccine recommendations for specific risk groups are developed in seventeen countries.

There is no uniform vaccination policy in Europe and vaccination is mostly recommended for specific high risk groups. We cannot therefore expect that the effect of "herd immunity" in predictable time. Moreover only five countries have established mechanism for monitoring the varicella vaccination coverage but without information about risk groups. At least 2 countries (FR, PT) have decided not to introduce childhood varicella vaccination because of fears about detrimental indirect effects (age shift towards older age groups, potential increase in adult cases).

Systems of payment for vaccination differ as well. In four countries vaccine and administration are free of charge for risk groups, in two countries vaccine is partial subsidy and in two recipients must paid full vaccine and administration cost.

According to the results of our study no major changes in the varicella national childhood immunizations programs are planned in European countries in the near future. Introduction of varicella vaccination is considered in five countries.

The remaining countries which are not currently considering implementing varicella vaccination indicate lack of resources and cost of vaccination as the main barrier of implementing a programme.

Surveillance system on herpes zoster is established in eleven countries, of which four implemented a standard case definition.

Because most countries don't have surveillance system on herpes zoster estimation of occurrence and assessment of severity of symptoms of this disease is not possible. Another significant point is that lack of surveillance systems of herpes zoster makes impossible the estimation of the potential impact of varicella vaccination on the incidence of shingles.

Specific recommendations for herpes zoster vaccination were developed only in two countries. Eighteen countries reported that they do not plan to introduce this vaccine into national immunization schedule in the near future.

Conclusions and Recommendations

- A high variability of surveillance systems implemented in European countries was observed. Implementation of surveillance in all EU/EEA countries would help in development of evidence-based vaccination recommendations, targeting appropriately defined target populations.
- Vaccination coverage data are missing in several countries which have adopted varicella vaccination recommendations. Valid vaccine coverage estimates, especially in relation to risk groups, are key prerequisites of documenting the performance of the national vaccination systems.
- Only few countries decided to adopt zoster vaccination into their immunization schedules. There is a need for better evidence, and surveillance systems for zoster in European countries.

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Appendix 1. Questionnaire

SURVEY ON VARICELLA VACCINATION

I. SURVEILLANCE OF VARICELLA

1. Is varicella a disease subject to the surveillance system?

- Yes, at national level
- Yes, at subnational level
- No

If yes, go to Q2. If no go to Q14
Single choice

2. Since when has varicella been under surveillance?

(open text)

Comment under the field: "If surveillance was introduced at subnational level before national, please enter both dates with explanation"

3. Reporting of varicella in your country is:

- Mandatory
- Voluntary

Single choice

4. What type of surveillance for varicella exists in your country?

- National (comprehensive) surveillance system
- Sentinel
- Other, please specify.....

Multiple choice

5. The sources of data are :

- Statutory notifications by clinicians
- Laboratory reporting
- Hospital episodes
- Death registration
- Other, please specify....

Multiple choice

6. What type of cases are routinely reported?

- All cases
- Hospitalized cases
- Fatal cases
- Meningitis, encephalitis
- Congenital cases
- Cases with complications
- Other, please specify

Multiple choice

7. Is epidemiological investigation of cases and their contacts routinely conducted?

- Yes
- No

Single choice

Comments

8. Is there an official case definition for varicella used in your country for surveillance purposes?

- Yes, compatible with CDC case definition (insert link to http://www.cdc.gov/ncphi/diss/nndss/casedef/varicella_current.htm)
- Yes, national
- Not known

Single choice

9. If national, please provide the complete case definition:

.....

10. Is laboratory confirmation recommended for surveillance purposes?

- Yes, for all cases
- Yes, only for fatal cases
- Other, please specify
- No

If yes, go to Q11. If no, go to Q12

Single choice

Comments

11. Which laboratory methods are accepted to confirm varicella?

- VI (*Virus isolation*)
- ELISA (*Enzyme-linked immunosorbent assay*)
- DFA (*Direct fluorescent antibody test*)
- PCR (*Polymerase chain reaction*)
- Other, please specify.....

Multiple choice

12. Are case-based surveillance data collected?

- Yes
- No

If yes, go to Q13 and then to Q14. If no, go to Q14

Comments

13. If case-based, what data are collected?

- Notification source (GP, hospital, lab)
- Demographic variables (age, gender, address)
- Vaccination status of patients
- Epidemiological link
- Hospitalization
- Laboratory test details
- Clinical picture
- Clinical complications
- Outcome
- Case classification

Comments

Multiple choice

14. Are aggregated surveillance data collected?

- Yes
- No

15. If yes, please provide the aggregated level/s:

- Age group
- Gender
- Vaccination status
- Hospitalization status

If yes go to Q15, If no go to Q16

Comments to surveillance of varicella

II. VACCINE RECOMMENDATIONS

16. Is the vaccine against varicella licensed in your country?

- Yes
- No
- Not known

If yes go to Q16. If no, go to Q15.

Single choice

17. Are you planning to license vaccine against varicella in your country?

- Yes
- No
- Not known

If yes, go to Q25. If no-end of questionnaire.

Single choice

18. Which kind of vaccines are registered in your country

- Monovalent
- Combined vaccine (measles-mumps-rubella-varicella (MMRV))

Multiple choice

Comments

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19. Are there specific recommendations for varicella vaccination?

- Yes
- No

If yes, go to Q18. If no, go to Q25.

20. Is varicella vaccination for children mandatory or recommended?

- Mandatory at national level
- Recommended at national level
- Mandatory only in some subregional units *(open a large field for description)*
- Recommended only in some subregional units *(open a large field for description)*
- Vaccination is not recommended

If mandatory or recommended , go to Q21. If is not recommended , go to Q26.

21. Please specify vaccination schedule for children

- 1 dose..... age/ age range
- 2 dose.....age/ age range

22. Is varicella vaccination for adolescent mandatory or recommended?

- Mandatory at national level
- Recommended at national level
- Mandatory only in some subregional units *(open a large field for description)*
- Recommended only in some subregional units *(open a large field for description)*
- Vaccination is not recommended

23. Please specify vaccination schedule for adolescent

- 1 dose.....age/age range
- 2 dose.....age/age range

24. Which kind of vaccine is used in routine vaccination programme?

- Monovalent
- Combined vaccine (MMRV)

Multiple choice

25. Were varicella catch-up* vaccination campaigns implemented?

- Yes
- No

** Catch up campaigns: Programmes giving the opportunity to people who have not been vaccinated in due course (when they represented a target of the campaign) or for older age groups than those targeted, to benefit from the vaccination*

If yes, go to Q22. If no, go to Q23. Single choice

26. What were the target groups of catch-up campaigns?

- Age or age range, please, specify.....

27. Is the varicella vaccination recommended in your country to specific risk groups?

- Yes, at national level
 Yes, at subnational level
 No

If yes, go to Q24. If no go to Q31.

28. Please specify for which risk groups:

Risk groups	Is vaccine recommended/mandatory	Payment	Comments
Medical risk groups	r/m	Vaccine and administration free of charge/partial subsidy for vaccine and administration/full vaccine and administration cost paid by recipients/vaccine free of charge, administration cost paid by recipient	
Susceptible persons in specific age group, please specify.....			
Seronegative women of childbearing age			
Immunocompromised persons			
Persons with acute lymphocytic leukemia in remission			
Persons with leukemia			
Persons infected with HIV			
Candidates for organ transplantation			
Persons before chemotherapy			
Other, specify....			
Occupational risk groups			
Susceptible health care workers			
Susceptible pedagogical staff			
Susceptible day-care personnel			
Other, specify...			
Social risk groups			
Children in nursery			
Person in military barracks or other similar communal type accommodation			
Other			
Seronegative family members of high-risk children			
Seronegative close contacts of immunosuppressed			
Other, specify....			

***Susceptible person: person without history of varicella/no-immune person/seronegative person**

Comments to vaccine recommendations

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III. FUTURE STRATEGY FOR VARICELLA VACCINATION

29. Are you planning to include varicella vaccination into the national immunization schedule?

- Yes
- No

If yes, go to Q26. If no, go to Q30.

Single choice

30. If yes, when do you consider inclusion of varicella vaccination into national immunization schedule?

- 1 year
- 2 years
- >2 years
- Not known**

31. Which institution recommend to include vaccination against varicella into national immunization schedule?

- National agency for Health Technology Assessment
- National Health Authority
- Expert advisory board on immunisation
- Other, please specify.....

Multiple choice

32. Which vaccine is considered?

- Monovalent
- Combined vaccine (MMRV)

Multiple choice

33. What could be the basis for the decision to include vaccine against varicella into the national immunization schedule?

- Anticipated epidemiological impact on varicella
- Anticipated long-term epidemiological impact on herpes zoster
- Cost effectiveness ratios (CER)
- Social demand
- Other, please specify.....

Go to section II

Multiple choice

34. What are the reasons of not considering to include varicella vaccination into national immunization schedule?

- Lack of recognition of varicella as a serious disease
- Perception of age shift with varicella vaccines

- Theoretical concerns that immunization may lead to an increased incidence of herpes zoster
- Cost of vaccination
- Inability to achieve sufficient vaccination coverage
- Insufficient cost-effectiveness of vaccination
- Insufficient cost-utility of vaccination
- Lack of resources that are addressed to other health priorities
- Other, please specify....

Go to section II

Multiple choice

Comments to future strategy for varicella vaccination

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IV. IMPACT OF VARICELLA VACCINATION

35. Do you have a mechanism for monitoring the varicella vaccination coverage?

- Yes, at national level
- Yes, only in some subnational areas
- No

If yes at national level, go to Q32. If no, go to section II

36. What methods were used to measure the vaccination coverage numerator?

Health record data (immunization records) :

- medical records
- computerized medical records

Immunization surveys

- household survey, in person
- individual interview, in person
- telephone survey
- mail survey

Pharmaceutical data

- pharmaceutical distribution data (from industry)
- pharmaceutical distribution data (from national purchaser)
- pharmaceutical sales data (from private pharmacies)

Multiple choice

37. What was the denominator of vaccine coverage in your country in 2008?

- general population
- specific age groups, please specify
- risk group, please specify
- other

Single choice

38. What was the vaccination coverage in 2008 in your country?

Coverage % at age/risk group.....

Coverage % at age /risk group

Coverage % at age /risk group

39. Has the impact of varicella vaccination been assessed in your country?

- Yes, please describe
- No

Go to section II

Comments to impact of varicella vaccination

SECTION II.
HERPES ZOSTER (SHINGLES)

1. Is herpes zoster a disease subject to surveillance ?

- Yes, at national level
- Yes, at subnational level. Please describe (*if chosen -open large box for comments*)
- No

If yes , go to Q2. If no, go to Q7.
Single choice

2. Reporting of herpes zoster in your country is:

- Mandatory
- Voluntary

Single choice

3. What type of herpes zoster surveillance exists in your country?

- National surveillance system
- Subnational surveillance system
- Sentinel surveillance

Multiple choice

4. Is there an official case definition for herpes zoster used in your country?

- Yes
- No

5. If yes, please provide the complete case definition:

.....

6. The collected data are:

- Case-based
- Aggregated
- Both as being relevant

Comments

II. VACCINE RECOMMENDATIONS

7. Is the vaccine against herpes zoster licensed in your country?

- Yes
- No

If yes, go to Q9. If no go to Q8.

Single choice

8. Are you planning to license a vaccine against herpes zoster in your country?

- Yes
- No
- Unknown**

If yes, go to Q14. If no- end of questionnaire.

9. Are there specific recommendations for herpes zoster vaccination?

- Yes
- No

If yes, go to Q10. If no, go to Q14.

10. Is herpes zoster vaccination for general population mandatory or recommended?

- Mandatory
- Recommended at national level
- Herpes zoster vaccination is recommended only in some subregional units (*open a large field for description and go to Q11*)
- Vaccination is not recommended

If yes, go to Q11. If no, go to Q12.

11. Please specify vaccination schedule for general population

1 dose..... age/age group

2 dose.....age/age group

12. Is the herpes zoster vaccination recommended in your country to specific risk groups?

- Yes, at national level
- Yes, at subnational level
- No

If no, go to Q12.

13. If yes, please specify for which risk groups:

End of questionnaire

III. FUTURE STRATEGY FOR HERPES ZOSTER VACCINATION

11. Are you planning to include herpes zoster vaccination into the national immunization schedule?

- Yes
- No

If yes, go to Q15. If no, go to Q17..

15. If yes, when do you consider inclusion of herpes zoster vaccination into national immunization schedule?

- 1 year
- 2 years
- >2 years

16. What could be the basis for the decision to include herpes zoster vaccine into the national immunization schedule?

- Anticipated long-term epidemiological impact on herpes zoster
- Cost effectiveness ratios (CER)
- Social demand
- Other, please specify...

End of questionnaire

Multiple choice

17. What are the reasons of not considering to include herpes zoster vaccination into national immunization schedule?

- Cost of vaccination
- Inability to achieve sufficient vaccination coverage
- Insufficient cost-effectiveness of vaccination
- Insufficient cost-utility of vaccination
- Lack of resources that are addressed to other health priorities
- Other...specify

End of questionnaire

Multiple choice