



Work package 5 – Task 5.3

Report on reminder systems

(Deliverable D5.4)

Report prepared by

Hanne-Dorthe Emborg

Department of Infectious Disease Epidemiology and Prevention

Statens Serum Institut

Artillerivej 5, 2300 Copenhagen

Denmark

***Disclaimer:** The content of this document represents the views of the author only and is his/her sole responsibility; it cannot be considered to reflect the views of the European Commission and/or the European Health and Digital Executive Agency (HaDEA) or any other body of the European Union. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains.*

| | |
|-------------------------|---|
| Grant Agreement No.: | 801495 |
| Start Date: | 01-08-2018 |
| End Date: | 31-07-2021 |
| Project title | European Joint Action on Vaccination — EU-JAV |
| WP number | WP5 |
| Deliverable number | D5.4 |
| Responsible partner No. | 6 |
| Organisation | Statens Serum Institut |
| Name | Hanne-Dorthe Emborg |
| E-mail address | hde@ssi.dk |
| Nature Report | Report on reminder systems |

Content

| | |
|---|----|
| Abbreviations | 4 |
| Summary | 5 |
| Introduction | 6 |
| Materials and Methods..... | 7 |
| Results..... | 8 |
| Overview of questionnaire response | 8 |
| Additional descriptive information provided by the countries..... | 11 |
| Countries with an IIS in place..... | 11 |
| Austria | 11 |
| Belgium/Flanders | 11 |
| Denmark..... | 12 |
| Finland..... | 12 |
| France..... | 12 |
| Italy..... | 13 |
| The Netherlands..... | 14 |
| Malta | 15 |
| Norway | 15 |
| Romania | 15 |
| Slovenia | 15 |
| Spain..... | 15 |
| Countries with no IIS in place | 16 |
| Croatia | 16 |
| Greece | 16 |
| Latvia | 16 |
| Slovakia | 16 |
| Sweden..... | 16 |
| Discussion..... | 17 |
| Recommendations for future reminder systems..... | 18 |
| Target population..... | 18 |
| How to remind about vaccinations | 18 |
| Adapt reminders to local settings | 18 |
| References..... | 20 |
| Appendix 1 | 21 |
| Appendix 2 | 22 |
| Survey on European vaccination reminder systems..... | 22 |

Abbreviations

| | |
|----------|--|
| DTaP-IPV | Diphtheria, Tetanus, Pertussis-Polio |
| DPTP | Diphtheria, Pertussis, Tetanus and Polio |
| DVR | Danish Vaccination Register |
| ECDC | European Centre for Disease Prevention and Control |
| EU/EEA | European Union/European Economic Area |
| GP | General Practitioner |
| HepB | Hepatitis B |
| Hib | Haemophilus influenzae type b |
| HPV | Human Papillomavirus |
| IIS | Immunisation Information System |
| MenACWY | Meningococcal type A, C, W, and Y |
| MMR | Measles, Mumps and Rubella |
| WP | Work package |

Summary

Reminder/recall systems have been identified in several studies to improve immunisations rates.

In the present WP5 study, we wanted to:

- Obtain information regarding the possibility to send out automatic vaccination reminders/recall by the regional or national Immunisation Information System (IIS) in place. In case the IIS was not used for this task, we asked what methods the countries used to remind about vaccinations;
- Identify if the countries had identified any barriers (languages, social, cultural) towards the implementations of vaccine reminder systems;
- If possible, identify the most optimal reminder systems.

A questionnaire was developed and distributed to 20 European countries to explore if and how parents/recipients were reminded about upcoming or missed vaccinations. A total of 17 countries/regions filled out the questionnaire, Austria, Croatia, Denmark, Finland, Flanders (Belgium), France, Greece, Italy, Latvia, Malta, The Netherland, Norway, Romania, Slovakia, Slovenia, Spain and Sweden. All 17 countries report that patients/recipients are reminded about vaccinations; however, the systems in place vary between countries. Phone and SMS are the most widely used reminders in this survey probably because this is a very efficient way to reach people also in remote/isolated areas. Reminders by phone, SMS and email are used in countries with and without an IIS in place. In addition, some countries use letters, webpage, regional newspaper etc.

In some European countries, vaccination policy is a national issue however this is not the case in all countries. In large European countries, e.g. Italy and Spain, each region has their own IIS that often differ between regions. In other countries, immunisation programmes including reminders are even more decentralized and managed by e.g. the municipalities, baby clinics, school health care etc. Fourteen out of 17 countries answered that reminder systems are well-accepted by the population and in three out of 17 countries, reminders are translated to foreign languages in order to reach individuals with foreign background,

In conclusion, all 17 countries replied that patients/recipients are reminded about some or all vaccinations and 14 countries answer that reminders are well accepted. However, based on the answers in this questionnaire, it is not possible to identify if one method is more efficient compared to another. Translation of reminders to other languages could be considered to further improve coverage.

Introduction

Reminder/recall systems have in several studies been identified to improve immunisations rates (1–4). In a Danish study, personalised written reminders improved coverage, in particular for the reminders given for vaccines later in the schedule. Similarly, an Australian study reported an increased vaccine coverage after implementing friendly, personalised reminder letters and home visits to those who were most in need (5). There are nevertheless wide variations in the organisation of reminder/recall systems and the methodology used to remind parents/recipients about upcoming or missed vaccinations. A Cochrane review concluded that all types of reminders are effective including postcards, letters, telephone or autodialed calls (1).

Work package (WP) 5 focus on immunisation information systems (IIS) which are defined by CDC as “*confidential, population-based, computerized databases that record all immunization doses administered by participating providers to persons residing within a given geopolitical area*” (<https://www.cdc.gov/vaccines/programs/iis/about.htm>). In 2016, ECDC did a survey on IIS in 30 EU/EEA member states. They found that 11 countries had IIS systems operating; three had a subnational IIS operating, while one country had an IIS that was being piloted (6). In the survey, ECDC also asked if the IIS in place was able to send out automatic reminders to people due to vaccination, which was possible in a few countries.

In the present WP5 study, we wanted to:

- Obtain updated information regarding the possibility to send out automatic vaccination reminders/recall by the regional or national IIS in place. In case the IIS was not used for this task, we asked what methods the countries used to remind about vaccinations.
- Identify if the countries had identified any barriers (languages, social, cultural) towards the implementations of vaccine reminder systems
- If possible, identify the most optimal reminder systems

Materials and Methods

A questionnaire was developed and distributed to 20 European countries to explore

- If vaccination reminder systems were in place and to understand what channels and approaches were used to remind the population about vaccinations.
 - Where an immunization information system (IIS) was in place, was the IIS used to automatically send out reminders. If the IIS could not send out automatic reminders were manual approaches used instead to send reminders.
- If the IIS can be used to identify unvaccinated individuals in an outbreak and individuals not fully vaccinated
- If there are any barriers regarding implementation of reminders e.g. religious, social or other barriers
- If any studies or surveillance data are available to visualize change in coverage observed in relation to introduction of reminders.

The questionnaire is available in Appendix 2.

Results

Overview of questionnaire response

In total 17 countries/regions filled out the questionnaire: Austria, Croatia Denmark, Finland, Flanders (Belgium), France, Greece, Italy, Latvia, Malta, The Netherland, Norway, Romania, Slovakia, Slovenia, Spain and Sweden. Ten out of 17 countries report that they have an IIS in place while France report having an IIS covering 2% of the population. Seven of these IIS are used to remind about vaccinations while five countries do not have an IIS in place. In addition, Austria report that the IIS is partly in place and that COVID-19 vaccination letters were sent to anyone being completely unvaccinated (Table 1).

Five out of the 11 countries use the IIS to automatically remind recipients/parents that they are due to vaccination and six countries to remind recipients/parents if the vaccination was not received at the recommended age, while six countries use the IIS to remind clinicians that it is time to call recipients for vaccination (Table 2). Eight out of 11 countries with an IIS are able to use the IIS to identify unvaccinated children in an outbreak with a vaccine-preventable disease and eight can identify children who are not fully vaccinated according to age (Table 2). In four countries, it is allowed to use the IIS to communicate updated information on new vaccines, updated policies, safety concerns, out of stock situations etc. to clinicians (Table 2).

Among countries with an IIS in place different methods are used to remind parents/recipients about vaccination but not all of the countries use the IIS to send out reminders. In Denmark, an algorithm generates digital reminders that parents/recipients receive in their digital mailbox. In The Netherlands, an algorithm generates a letter that is sent out. In Flanders, it is well baby clinics and school health service that remind parents about vaccinations. In Norway, biyearly reports are send to municipalities with information on unvaccinated children. In Italy, Slovenia and Spain, parents are reminded about vaccinations in one or more of the following ways email, SMS, phone and/or letters. In France, approximately 2% of the population is covered by an IIS and receives reminders by email. In Malta, the IIS generates notifications if appointments are missed. In Romania, it is clinicians that are reminded to contact their patients about missing vaccines. In Finland, reminders can be sent out in various ways some municipalities uses phone and SMS others use webpages, newspapers and major shop notice boards and in Austria, letters are sent to anyone being completely unvaccinated against COVID-19 (Table 1).

In countries where no IIS is in place, Greece reminds about vaccination using phone, email and SMS, Croatia use post and phone, Slovakia uses primarily SMS and in Latvia health care professionals send reminders to their patients usually via SMS or by phone. In Sweden, it is Child Health Care Centres and School Health Care that contact parents about vaccinations (Table 1).

Table 1. Countries responding to the reminder questionnaire regarding IIS in place and how parents/recipients are contacted

| Countries | IIS in place | National/Regional | Is the IIS used to remind parents/recipients about vaccinations | How are parents/recipients reminded about vaccination |
|------------------|------------------------------|-------------------|---|---|
| Austria | Partly | National | not yet | COVID-19 vaccination letters have been sent to anyone being completely unvaccinated |
| Belgium/Flanders | Yes | Regional | Yes | Well baby clinics can call parents if they stay away from follow-up consultations School health service check vaccination status and can offer catch-up vaccinations |
| Croatia | No | - | - | When a child is not vaccinated on time, parents receive an extra invitation by post or by phone |
| Denmark | Yes | National | Yes | Digital reminders. Letters are only sent to parents on rare occasions |
| Finland | Yes | National | No | Some of the municipalities do use reminder systems like phone txt messages. Others use tools like web pages, regional news papers, announcements in the major shop notice boards etc. |
| France | Yes for 2% of the population | National | Yes | 1.15 million people are covered by an IIS and they receive reminders by email* |
| Greece | No | - | - | By phone, mail or sms. |
| Italy | Yes | Regional | Yes | Varies by Region. It is recommended that regional IIS have, as one of the minimum requirements, the possibility to send reminders via text messages (SMS). Another minimum requirement for regional IIS is the availability of a mobile APP for citizen services, including vaccination appointments and vaccines received. |
| Latvia | No | - | - | Health care professionals send reminders to their patients usually via SMS or by phone |
| Malta | Yes | National | No | The IIS generates notifications if appointment has been missed by 2 months |
| Netherlands | Yes | National | Yes | IIS generates a letter to parents and a digital message to clinicians |
| Norway | Yes | National | No | Biyearly reports to the municipalities including unvaccinated children is the tool to follow-up on unvaccinated children |
| Romania | Yes | National | Yes | Through the IIS, clinicians are reminded to call their patients |
| Slovakia | No | - | - | Primarily by SMS |
| Slovenia | Yes | National | No | If the child is not vaccinated on time, parents receive an extra invitation by post or by phone |
| Spain | Yes | Regional | Yes [‡] | Mainly send by letters, SMS and/or phone calls |
| Sweden | No | - | - | Child Health Care Centres (pre-school) and School health care contact parents about vaccinations |

-: this question was not answered or not relevant

* The IIS is operated by a non-profit organisation (mesvaccins.net) and an IT company

‡ Only in some regions

Table 2. Countries with an IIS in place and features of the IIS

| Countries | Can the IIS be used to: | | | | | |
|------------------|---|---|------------------------------------|---|---|--|
| | Remind individuals due to vaccination (recipients /parents) | Remind that vaccination was not received at recommended age | Remind clinicians to call patients | Identify unvaccinated children in an outbreak | Identify children not fully vaccinated according to age | Communication on new vaccines, safety etc. |
| Belgium/Flanders | No | No | No | Yes | Yes | Yes |
| Denmark | Yes | Yes | No | Yes | Yes | No |
| Finland | - | - | - | - | - | - |
| France | Yes | Yes | Yes | Yes | Yes | Yes |
| Italy | Yes | Yes* | Yes* | Yes* | Yes* | No |
| Malta | - | - | - | - | - | - |
| Netherlands | Yes | Yes | Yes | Yes | Yes | No |
| Norway | - | - | - | - | - | - |
| Romania | No | No | Yes | Yes | Yes | Yes |
| Slovenia | No | Yes | Yes | Yes | Yes | No |
| Spain | Yes st | Yes st | Yes st | Yes st | Yes st | Yes st |

-: this question was not answered

*probably possible in some regions †

This is applicable to some regions

When asked if vaccination reminder systems are well accepted in the population, 14 out of 17 countries answered yes, Italy and the Netherlands did not answer this question, while Austria does not know yet. Most countries answered that they were not aware of any barriers towards certain types of reminder systems; however, a few countries mentioned language, social and religious barriers. In three out of 17 countries, reminders are translated to foreign languages in order to reach individuals with foreign background; four countries answers “no” to this question, seven countries answered that it is not relevant to translate the reminders and finally two countries did not answer this question.

Table 3. Acceptance and translation of reminders

| Countries | Does the population accept that reminders are send out | Translation of reminders to other languages |
|------------------|--|---|
| Austria | Not known yet | Not relevant |
| Belgium/Flanders | Yes | Yes |
| Croatia | Yes | - |
| Denmark | Yes | Yes |
| Finland | Yes | Not relevant |
| France | Yes | No |
| Greece | Yes | Not relevant |
| Italy | - | - |
| Latvia | Yes | Not relevant |
| Malta | Yes | Not relevant |
| Netherlands | - | - |
| Norway | Yes | No |
| Romania | Yes | No |

| | | |
|----------|-----|--------------|
| Slovakia | Yes | Yes |
| Slovenia | Yes | No |
| Spain | Yes | Not relevant |
| Sweden | Yes | Not relevant |

Additional descriptive information provided by the countries

Countries with an IIS in place

Austria

The Austrian IIS is currently not fully rolled out with all its features, but the documentation of COVID19 and since autumn 2021 also influenza vaccinations within the IIS is obligatory by law. All other vaccinations can technically already be documented within the IIS, but there is no obligation for it and not all health care practitioners have access to the system yet. Regarding a reminder system, it is planned, that this will be part of the IIS at a later roll out stage; timeline and details are not fixed yet. Identification of people due to be vaccinated will be based on information gathered in digital records of people's vaccination history and the recommendations of the Austrian NITAG. It is planned that reminders will be given each time people access their digital vaccination record beginning 3 months before the scheduled due date until vaccination has been performed. With regards to the COVID-19 vaccinations, reminders have been sent out in form of paper-based letters to anyone being completely unvaccinated in December 2021.

Belgium/Flanders

All vaccinations are registered in the IIS. If necessary, data extraction can help to identify unvaccinated people. Clinicians and vaccinators can check vaccination status of a patient.

If parents do not show up for follow-up consultations at well baby clinics, the clinics can call the parents. School Health Services should check vaccinations at each consultation and offer catch-up vaccination or at least inform parents of the lacking vaccinations.

Communication on updated information on new vaccines, safety issues, updated policies etc., will appear as express information on the homepage when logging in to the IIS-system

Translation of reminder information: Catch up vaccination information (leaflets and letters for authorisation for vaccination) is available in Dutch (native), English, French, Russian, Turkish, Arab, Dari, Farsi, Pasjtoe (via website scientific organisation)

In Flanders, vaccination is quite well accepted and the IIS helps the follow-up on the vaccination programme. People can check their own vaccinations from the system in a separate health information system for which the IIS is the source. Regarding barriers towards certain vaccination reminders, it was only for HPV vaccination where barriers were observed in some orthodox Jewish communities.

The IIS is used for Covid-19 vaccinations (both in Flanders and Walloon) and to automatically send info for creation of the Covid-19 vaccination certificate.

Denmark

A new reminder scheme was introduced for children born after 1 August 2019, where a “recommended vaccination scheme” is created for each new-born child in the Danish immunisation information system (Danish Vaccination Register (DVR)). Two weeks before the scheduled time of any childhood vaccination, both parents/the parents who hold custody of the child/the guardian (below coined “the parent”) will receive a digital mail reminding them to schedule an appointment for the childhood vaccination. One month after the planned vaccination date, automatic follow-up will check if the vaccination has been administered; for example, it will be checked if 4-month-old children have received their 3-month vaccinations. If a vaccination was not registered in the DVR, another reminder about the missed childhood vaccination will be sent to both parents. In case of delayed vaccination, the system will automatically take into account the minimum intervals separating the vaccines. In this way, general practice and parents are encouraged to ensure that the vaccines are given in a timely manner. In case doubt arises about which vaccine a child may not have received, the parents must contact their GP, who administers childhood vaccines in Denmark. Parents are given the opportunity to opt out of these reminders, but it requires that they contact their GP. For parents who are not receiving digital mail, the letters are sent as standard surface mail.

Who is covered by the new reminder scheme?

- Children born after 1 August 2019 are allocated a vaccination schedule at birth.
- Children who turn 4 years old as of 1 November 2019 are allocated a vaccination schedule comprising of the 4-, 5-, and 12-year vaccinations (MMR2, DTaP-IPV booster and HPV 1 and 2). Furthermore, children who turn 12 years old as of 1 November 2019 are allocated a vaccination schedule comprising of the 12-year vaccines (HPV 1 and 2).

Children who are not included in these groups will continue to receive written reminders based on the existing scheme at 2 years, 6½ years and 14 years of age if the children lack one or more of the vaccinations recommended under the Danish childhood vaccination programme. These written reminders will be phased-out gradually as all children are included in the new reminder scheme.

Finland

The municipalities are in charge of arranging the immunizations and vaccination practices. Some of the municipalities do use reminder systems like phone txt messages. Others use very old fashion tools like www pages, regional newspapers, and announcements in the major shop notice boards. The autonomy of the municipalities (approx. 300 of them) makes it a difficult with a questionnaire like this, as there is no complete picture of what is being done in all municipalities. To get detailed information requires a special study.

Regarding barriers towards certain reminder systems, Finland has not done surveys or special research in this area, so precise knowledge of barriers is not available.

France

A non-profit organisation (mesvaccins.net) and an IT company now operate an IIS system and regional authorities and some professional unions fund the application. About 1.15 M of the French population is enrolled in the system.

The recipient receives a mail, 1 month before the date of expected vaccination. A reminder is sent 1 month later after this date in case the person was not vaccinated. A person can refuse to receive the notification.

The clinician doesn't receive automatically the reminders sent to his patients but the health professional can look up the reminders sent to his patients. It is important to note that the reminder system is linked to a decision-support system for immunisation; therefore, the system can identify eligible people according to different criteria such as age, previous vaccinations etc.

This IIS system is updated in real time and comprehensive, thanks to a dedicated interface updated by a team of experts. To update the analysis-decision system, there is no need to ask the IT team for changes. There is an updated database of all the vaccines available in the IIS. There is also a web interface with all relevant information on vaccine policy.

Discussions are on-going to implement widely this system through a national health agency or institution.

When asked if any studies could identify change in coverage in relation to introduction of reminders, it was mentioned that an unpublished study has shown an increase of the vaccine coverage during a measles outbreak.

For the remaining 98% of the French population there is no reminding system in place. Eleven vaccines are mandatory for infants, but parents are not automatically reminded, but they won't be able to put their child in day care or school without vaccination.

For the remaining 98% of the French population there is no reminding system in place. However, the Health insurance could send reminders to people for some vaccinations. Eleven vaccines are mandatory for infants, likewise, Health Insurance sends reminders to the parents for these vaccinations. Children are not admitted to day-care or school without vaccinations.

Italy

In Italy, each region (21 regions in total) has its own IIS, which may differ from that of other regions. A survey conducted in 2016 investigated the differences between the regional IIS and results are available at the following link: <https://pubmed.ncbi.nlm.nih.gov/29465145/>.

In 2018, the National Vaccine Registry was established with the aim of ensuring the correct evaluation of vaccination coverage. The registry is useful both for monitoring the implementation of vaccination programs in place throughout the national territory, consistently with the current national vaccination calendar, and to provide information to national, EU and international bodies in the performance of functions and tasks related to health protection, also through the development of indicators for comparative purposes. The National Vaccine Prevention Plan (PNPV) 2017-2019 identified the minimum data set of information that regional registries must collect and feed into the national registry.

The minimum requirements for a regional vaccination registry software application are:

- Complete computerized management of the agenda for appointments with a printing service for reminders to be sent
- Presence of an SMS service for sending reminders for appointments.

- Availability of a mobile APP (for smartphone and tablet) for citizen services: news, information on vaccines and vaccine-preventable diseases, geolocation of vaccination centers, appointments and vaccinations performed.
- The Ministry of health has developed some Apps. The first free App developed by the Ministry of Health with the purpose of promoting vaccination prophylaxis in the country was a vaccination planner. The App has the goal to remind parents of upcoming vaccinations for their children directly on their smartphone or tablet. The App indicates which vaccinations children need and when, according to National Vaccine Prevention Plan. It is also a useful reminder of the doses of vaccines already administered to the child.

There are 21 different regional IIS and unfortunately we do not have details of each system. As already mentioned, there is a minimum set of information/functions that each registry must collect/ provide. Not all functionalities that are specified in the questionnaire are available in each regional IIS, but there are some minimum requirements

The Netherlands

The Dutch National IIS contains all people in the Netherlands between 0-19 years of age with their current address. This IIS contains an algorithm that calculates a vaccination forecast for each patient according to the rules of the National Immunization Program. This algorithm makes use of a multitude of parameters, e.g. the current age of the patient, the desired intervals between consecutive vaccinations, the vaccinations that were administered in the past, etc.

Reminders to parents / children:

- When a new-born reaches the age of 2 weeks, the IIS automatically sends a message to a printing company to produce a paper letter. This letter is an invitation to the parents for the DTaP-IPV-Hib-HepB, Pneumococcal, MMR and MenACWY vaccinations.
- At the age of 3 years and 9 months parents are automatically reminded with another letter for the DTaP-IPV booster vaccination.
- At the age of 9 years an invitation is sent for the MMR and DTaP vaccination.
- At the age of 10 years an invitation is sent for the HPV vaccination.
- At the age of 14 years an invitation is sent for the MenACWY vaccination.

If a child hasn't received the recommended vaccinations, an automatic recall will be sent to the child/parents after 4-6 months.

Reminders to clinicians:

- All Youth Health Care Services have their own Electronic Health Records, which communicate by HL7 messages with the national IIS. The vaccinations administered are registered in the EHR and sent to the national IIS. In addition, clinicians can lookup the vaccination status in order to find out if vaccinations were administered elsewhere and to look up the vaccination forecast.
- The reminders and recalls that are sent at the age of 9, 10 or 14 years to the child by a paper letter are also sent to the HER of the Youth Health Care Service in their region automatically by HL7 messages.

Malta

Appointments are given for the next dose at the time of vaccination. The IIS generates notifications if appointment has been missed by 25 days, followed by a phone call.

No cultural, social or religious barriers are identified.

Norway

The administration of the child immunisation programme is decentralised, so reminders for vaccination are given by public health clinics at the municipal level. Norwegian Institute of Public Health (NIPH) provides quality reports twice a year to all municipalities. These give an overview of the unvaccinated children in that municipality. This is a tool to follow up children that for some reason haven't followed the child immunisation programme as recommended.

Barriers to the reminder systems in place are not identified.

Romania

Reminders are sent to clinicians therefore they are the key actors; they are reminded to call patients for next vaccination through RENV/ National Electronic Vaccination Register <https://renv.ro/renv/login.php>.

Communication on safety issues, out of stock, new vaccines, new policies etc. is posted on INSP website <http://www.cnscbt.ro/index.php/situatia-stocurilor-de-vaccinuri>.

Regarding barriers towards vaccine reminder, no hard-to-reach communities were mentioned.

Slovenia

Slovenia did not yet actually introduce any specific reminder system at national level. At systematic health checks, children will receive the recommended vaccines. If the child is not vaccinated on time, parents receive an extra invitation by post or by phone from their health care providers.

Clinicians and vaccinators can check vaccination status of their patients in the IIS.

Barriers towards the reminders used in Slovenia are not identified.

Spain

Spain reports having a decentralised healthcare system; currently there are 19 immunisation information systems, one for each region.

At the end of 2020 a unique national immunisation information system specific for COVID-19 vaccination coverage (REGVACU) was set up and receives daily data from the vaccines administered and registered in the different regional information systems. This central system is still not in place to obtain data on vaccine coverage of the vaccines included in the routine immunisation schedule of Spain so far.

Vaccination reminder systems are currently in place in most regional IIS's and the most widely reminder methods used are letters, SMS and telephone calls.

Barriers to the reminder systems in place are not noticed.

Countries with no IIS in place

Croatia

In Croatia we have regular systematic health checks for children and, among other things, on those health checks children receive vaccines according to the National Immunization Program. If the child is not vaccinated on time, parents receive an extra invitation by post or by phone.

We did not notice any barriers towards the reminders used in Croatia.

Greece

Health care professionals of the private sector take the responsibility to send a reminder to inform their patients about their next vaccination before the age of vaccination. This is done either by phone, mail or SMS.

Greece is not aware of any barriers towards the reminder system in place

Latvia

Health care professionals send reminders to their patients usually via SMS or by phone
There are no cultural, social, religious, or other barriers for certain reminder systems

Slovakia

No IIS is in place, but reminders are sent out, mostly by SMS at recommended age at vaccination. Many people who have low social status do not have Internet. This is the reason why it is not possible to use e-mail.

Slovakia is preparing a National Vaccination register, which will be available in 2022. There is no uniform reminder system; Paediatricians use Mobil contact, SMS and sometime email. Slovakia checks vaccination rate once per year during September.

Slovakia mentions that there might be social barriers towards reminders.

Sweden

Individuals are contacted before recommended age of vaccination. Pre-school children have scheduled visits at the Child Health Care centres. Parents to schoolchildren are informed about planned vaccinations by school health care. Parents to children who have missed the scheduled vaccination are contacted by child or school health care.

Sweden mentions that language can be a barrier.

Discussion

All 17 countries report that patients/recipients are reminded about vaccinations, however the systems in place vary between countries. Phone and SMS are the most widely used reminders according to this survey probably because this is a very efficient way to reach people also in remote/isolated areas whereas email require that a well-functioning internet is available. Reminders by phone, SMS and email are used in countries with and without an IIS in place. In some countries, an algorithm is setup in the IIS to identify children/recipients due to vaccination or missing a vaccination. In Denmark, all individuals above 15 years of age have a digital mailbox where they receive mail from the public sector; therefore, almost all vaccine reminders to the parents are digital. The Netherlands have a similar national system where the algorithm generates a reminder letter that is send to parents reminding about childhood vaccines while clinicians are reminded digitally. In Romania, the national IIS reminds clinicians to call the parents/recipients about their next vaccination.

However, health systems and vaccination policy are not necessarily a national responsibility. In some large European countries, e.g. Italy and Spain, each region has their own IIS that often differs between regions (7). In other countries, immunisation programmes including reminders are even more decentralized and managed by the municipalities and here baby clinics and school health care play a role in reminding about scheduled vaccinations.

Based on the answers in this questionnaire, it is not possible to identify if one reminder method is more efficient compared to another. In both a Canadian and an Australian study, the authors concluded that tailoring reminders/recalls to the needs and preferences of the target population could maximize the effectiveness of these systems (4,5). This indicates that it is not crucial how people are reminded: what is important is to tailor the reminders as much as possible to reach people and to make sure the reminders are accepted by the recipients. Jong et al. also suggested that it is important to explore how modern technologies can be integrated into the reminder/recall systems.

In 14 of 17 countries, reminders are well accepted by the population. Surprisingly, only three countries answered that reminders were translated to other languages to reach parents with limited knowledge of the language spoken in each of the countries. A Danish study has shown an association between knowledge of the Danish language among non-Danish parents and the probability that a child is vaccinated (8). Jong et al. also showed that language barriers should be addressed (4).

WP5 focus on IIS and a national IIS that receives coverage data on a regular basis facilitates national vaccine coverage estimation while regional IIS can help local authorities to keep track of individuals who are due to or miss a vaccination. In general, national and regional IIS are helpful when frequent vaccine coverage updates are necessary and to identify unvaccinated children in an outbreak or individuals who miss a vaccination through digital messages, paper letters or SMS generated automatically by an algorithm running as part of the IIS. However, an IIS is also important during planned health checks where clinicians can look up patients to explore if vaccinations are missing according to the national vaccination schedule.

In conclusion, all 17 countries replied that patients/recipients are reminded about vaccinations and that reminders are well accepted. However, based on the answers in this questionnaire it is not possible to identify if one method is more efficient compared to another. Translation of reminders to other languages could be considered to further improve coverage.

Recommendations for future reminder systems

Target population

Tailoring the reminders to reach the relevant population requires that countries are aware of who are the individuals that did not receive the recommended vaccines. It could be a subset of the children in each birth cohort, individuals with foreign background, a religious belief that result in scepticism towards vaccines, or populations receiving news and other information from social media posted by groups against vaccination. Identifying this group might require very different approaches e.g., some groups can probably be identified through the IIS in place, GPs, schools or baby clinics. However, in other situations, it might be necessary to setup surveys to understand the reasons for not receiving the recommend vaccines. Approaching these different populations require very different methods, which needs to be appropriately explored before setting up a reminder system.

How to remind about vaccinations

Phone and SMS seems to be the most widely used method to remind about upcoming or missed vaccinations, but regardless which method is used, it is important that the relevant authority (e.g. baby clinics, schools, GPs, municipalities etc.) have updated contact information on parents in order to be able to send out timely reminders, e.g. before the child is due to vaccination. However, sending SMS to parents who do not speak/understand the language or to parents who are against childhood vaccines will probably not improve vaccine coverage, in these situations face-to-face meeting or smaller meetings in the local community might the way forward and here it is important that any language barriers are addressed.

In countries/regions, where an IIS is in place it is often possible to send out reminder automatically based on algorithms that identify children who are due to vaccination. However, the situation is the same with and without an IIS, if parents do not understand the reminders due to language barriers it is important that they can download or request the reminders in a language they understand or, when necessary, setup face-to-face meetings or small meetings in the local community.

Adapt reminders to local settings

In order to set up a sustainable vaccination reminder system it is important to take into account how the health systems and vaccination policy is organized in each country; e.g., if the recommendations regarding vaccine schedules are regional, then the reminder systems should also be a regional matter. In addition, it is important to be aware of any historical background that can explains how the population react towards proposed vaccinations and vaccination reminders.

It is also important to be aware that one reminder system will not fit all countries. The reminders should be tailored to reach the relevant populations and it might be necessary to have more than one system in place to reach very different populations.

Over time, new vaccines might be introduced and perception of vaccines in the population might change, therefore the reminder system in place should be flexible in order to adapt to these changes, to insure sustainability.

It might be valuable to evaluate the reminder system in place every 2-5 years in order to improve the system, e.g. how many responded after receiving a reminder, how many reminders were required per



Co-funded by
the Health Programme
of the European Union

vaccine dose, were the vaccines received more timely after the reminders were introduced and did coverage increase. It is also important to follow up on the effort to reach populations who did not receive the recommend vaccine and to adjust the strategy if the approach is not accepted.

References

1. Szilagyi P, Vann J, Bordley C, Chelminski A, Kraus R, Margolis P, Rodewald L. Interventions aimed at improving immunization rates. *Cochrane database Syst Rev* [Internet]. 2002 Oct 21 [cited 2021 Dec 14];(4). Available from: <https://pubmed.ncbi.nlm.nih.gov/12519624/>
2. Jacobson Vann JC, Szilagyi P. Patient reminder and patient recall systems to improve immunization rates. *Cochrane database Syst Rev* [Internet]. 2005 Jul 20 [cited 2021 Dec 14];2005(3). Available from: <https://pubmed.ncbi.nlm.nih.gov/16034918/>
3. Suppli CH, Rasmussen M, Valentiner-Branth P, Mølbak K, Krause TG. Written reminders increase vaccine coverage in Danish children - Evaluation of a nationwide intervention using the Danish Vaccination Register, 2014 to 2015. *Eurosurveillance* [Internet]. 2017 Apr 27 [cited 2021 Mar 15];22(17). Available from: <https://pubmed.ncbi.nlm.nih.gov/28488995/>
4. Jong KM, Sikora CA, MacDonald SE. Childhood immunization appointment reminders and recalls: strengths, weaknesses and opportunities to increase vaccine coverage. *Public Health* [Internet]. 2021 May 1 [cited 2021 Dec 15];194:170–5. Available from: <https://pubmed.ncbi.nlm.nih.gov/33951552/>
5. Thomas S, Durrheim D, Islam F, Higgins H, Cashman P. Improved childhood immunization coverage using the World Health Organization's Tailoring Immunization Programmes guide (TIP) in a regional centre in Australia. *Vaccine*. 2022 Jan 3;40(1):18–20.
6. Derrough T, Olsson K, Gianfredi V, Simondon F, Heijbel H, Danielsson N, et al. Immunisation Information Systems - useful tools for monitoring vaccination programmes in EU/EEA countries, 2016. *Euro Surveill* [Internet]. 2017 Apr 27 [cited 2021 Dec 28];22(17). Available from: <https://pubmed.ncbi.nlm.nih.gov/28488999/>
7. D'Ancona F, Gianfredi V, Riccardo F, Iannazzo S. Immunisation Registries at regional level in Italy and the roadmap for a future Italian National Registry. *Ann Ig* [Internet]. 2018 [cited 2021 Dec 9];30(2):77–85. Available from: <https://pubmed.ncbi.nlm.nih.gov/29465145/>
8. Voss, Sidsel Skou; Nørgaard, Sarah Kristine Nørgaard; Chaine, Manon; Valentiner-Branth P. Hvilke grupper af børn har behov for en målrettet vaccinationsindsats Maj 2021 [Internet]. [cited 2021 Dec 17]. Available from: https://apps.who.int/immunization_monitoring/globalsummary/schedules

Appendix 1

Email sent to JAV-partners:

Dear EU- JAV participants

One of the determinants for non-vaccination in children is lack of vaccination reminders. As part of the work in WP5, we will explore the existing European vaccination reminder systems e.g. if there are reminder systems in place and what channels are used (e.g. immunisation information systems (IIS), emails, SMS, letters etc.), how the reminders are sent out and to who, and the timing and frequency of the reminders.

We have developed a **short questionnaire** with a few open questions where we ask you to describe how your reminder system is setup. It will be helpful if you make a description including:

- **Which vaccines are included in the reminder system** e.g. are all/some childhood vaccines, all/some vaccines for adults included etc.
- **How you identify** individuals who are due to be vaccinated and/or individuals who did not receive the vaccine at the recommended age
- **How often** parents or adults are reminded that it is time for a given vaccine
- Are reminders sent out **before the scheduled due date or after the recommend age of vaccination?**
- **Other relevant information** to understand how you system works

An example of how a description of a vaccination reminder system could look is attached.

We are also very interested to hear if you have any surveillance data, studies or surveys that show coverage at the time the reminder system was introduced in order to understand if vaccination coverage changed following the introduction of the reminder system.

Below is a link to the **Survey on European vaccination reminder systems** Link:

<https://surveys.enalyzer.com?pid=t5messge>

If you are not the person who can answer the questionnaire, please forward it to the relevant person(s).

Regions within the same country may have different vaccination reminder systems in place. One region might have an immunization information system (IIS), where reminders are sent out regarding upcoming vaccinations and another region might use a system based on SMS services. If this is the case, please answer the questionnaire for each reminder system.

We would be happy to receive your answers **before the 3 September 2021.**

If there are any questions, please do not hesitate to contact me.

Kind regards,

Hanne-Dorthe

Appendix 2

Survey on European vaccination reminder systems

1. Which country / region do you represent?
2. Please provide your name, email and telephone number in case we need to ask any clarifying questions
3. Is there an IIS in place in your country/region?
4. Is the IIS national or regional?
5. Who is the owner/responsible for the IIS?
6. Is the IIS used to remind recipients/parents about vaccinations?
7. Can automatic reminders be sent from the IIS to people who are due for a vaccination?
8. Please provide a brief description how this works
9. Can automatic reminders be sent from the IIS to people who did not receive a vaccination on the recommend age?
10. Please provide a brief description how this works
11. Can automatic reminders be sent from the IIS to the clinician to call a patient for the next vaccination?
12. Please provide a brief description how this works
13. Does the IIS have a built-in decision support system/decision tree that assists the clinician in identifying which vaccines to give the recipient based e.g. on age, previous vaccination, allergies, travels and risk factors?
14. Please provide a brief description how this works
15. In the event of a disease outbreak related to a vaccine-preventable disease, is the IIS able to identify unvaccinated individuals in the outbreak?
16. Please provide a brief description how this works
17. Does the IIS have a function to identify individuals who are not fully vaccinated according to age?
18. Please provide a brief description how this works
19. Does the IIS allow communicating updated information on new vaccines, updated policies, safety concerns, out-of-stock situations etc. to the clinician?
20. Please provide a brief description how this works
21. Is there a description of your reminder system available on the homepage of your Public Health Institute, Ministry of Health or a similar homepage?
22. Please provide this description in English or a link to the description

23. When the immunization information system is NOT used for vaccination reminders, please describe how you remind individuals that it is time for vaccination, individuals who did not receive the vaccine at the recommend age etc.
24. For countries where an IIS system is being piloted, please indicate the plans for vaccination reminder systems foreseen
25. Where no IIS is in place, are reminders sent out to inform an individual about the next vaccination?
26. Please provide a brief description how this works: e.g. individuals are contacted by phone / letter/ email/ SMS. Individuals are contacted before / after recommend age of vaccination etc. If a description in English is available at the homepage of your Public Health Institute, Ministry of Health or a similar homepage, please provide a link to this description
27. Barriers regarding implementation of reminders. In general, does the population accept that reminders about vaccinations are sent out?
28. Please describe any cultural, religious, social or other barriers for certain types of reminder systems
29. Is reminder information translated to other languages in order to reach individuals of foreign background?
30. Please indicate which other languages
31. Do you have any studies or surveillance systems that show vaccine coverage over time?
32. Can these studies/systems indicate changes in coverage in relation to the introduction of reminder systems? Please make a brief description or provide a link
33. If you have any additional comments that you would like to share to help us better understand the situation in your country, please write them here
34. Thank you for your participation