

Title page

Title: A quantitative review of health care professionals' questions to a local immunisation advice service: 4299 enquiries from three years.

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Abstract:**Background**

Immunisation advice services can support health professionals by providing rapid access to accurate and reliable current information and advice. The Vaccine Advice for Clinicians Service (VACCSline) is a service for health professionals working within the Thames Valley Area of the United Kingdom.

Methods

We reviewed all 4,299 enquiries received by VACCSline over three years. Queries were summarised by vaccine type and topic of enquiry. Associations with profession and workplace of the enquirer were tested using Fisher exact tests.

Results

Incomplete immunisation status and non-UK schedules were the most common topics of enquiry. Practice nurses were the main service users followed by doctors. Enquiries varied by professional role. Alterations to the immunisation programme led to temporary changes to enquiry content and some more persistent adjustments in the balance of enquiries were identified, such as an increase in enquiries relating to vaccination in pregnancy.

Conclusion

The content of enquiries to VACCSline is broad confirming the need for immunisers to have a wide knowledge base and access to specialist advice to assist with complex scenarios. Systematic data capture provided intelligence to guide training and materials to support immunisers. A wider networked application of this approach could improve support for immunisers.

Background:

Immunisation is a dynamic public health intervention, responding to changes in disease epidemiology and advances in vaccine research. Health care professionals play a pivotal role in achieving high rates of immunisation uptake. Where nurses are confident in their immunisation knowledge, higher levels of immunisation coverage and timely immunisation delivery have been achieved[1]. Alongside general training specialist advice can support clinicians in settings where they are uncertain. Specialist immunisation advice services, provided by a specialist clinical team via telephone or email are recognised as an effective way of providing timely, accurate, and reliable information [2-7].

Health professionals are frequent users of these services, illustrating that they perceive the services to be a valuable resource [5, 6]. The content of enquiries to these immunisation advice services are wide ranging [2] and dynamic with schedule changes and media stories influencing their content [6]. Most immunisation advice services (in the published literature) are aimed at health professionals and the public. There are few data on the nature of health professionals' enquiries alone.

Here we present a quantitative review of health professionals' immunisation enquiries to a local specialist immunisation advice service. The purpose is to describe the range of enquiries received, how these vary by professional immuniser role and setting, over time, and in response to external events such as programme changes and changing epidemiology. We consider that this provides intelligence to guide information and training to immunisers generally and in response to events such as new vaccine introduction.

Materials and methods:***Setting***

The Vaccine Advice for Clinicians Service (VACCSline) is a specialist immunisation advice service for health professionals working in the Thames Valley area of the UK with a population of approximately two million. Set up in 2005, it is a collaboration between the Thames Valley Public Health England Centre and the Oxford Vaccine Group; a vaccine research centre at Oxford University.

Service description

Enquiries are received by telephone, email and occasionally letter. Enquiries are recorded on a dedicated database using standard data entry fields including: enquirer's contact details; main enquiry topic (e.g. contraindications, non UK schedule, vaccine error etc, full list in supplementary

material table 1); types of vaccine (full list in supplementary material table 2); and caller profession. A small team of immunisation advisors, registered nurses with specialist immunisation knowledge, respond to enquiries. For more complicated enquiries expert advice is sought by the immunisation advisors from local academic, vaccinology and clinical specialists. Quarterly audits review selected enquiry topics which are peer reviewed against standards ensuring quality and consistency of advice.

Data and analysis

All enquiries received by the service in the calendar years 2009 to 2011 were included. These were tabulated and cross-tabulated for the standardised data fields, to describe the pattern of enquiries and to assess variation across professional groups.

Fisher's exact tests were used to test for the statistical significance of observed associations including the hypotheses that enquiry topics varied by professional role. Role categorisation included professional group (e.g. nurse or doctor) and work setting (e.g. school nurse or specialist hospital nurses). The impact of changing epidemiology and schedule on topics of enquiry was explored by graphing the pattern of enquiries over time against the major schedule changes and epidemiological events over the study period.

Results:

Total number of enquiries:

A total of 4,299 enquiries were received from the 1st January 2009 to the 31st December 2011. Consecutive yearly totals were 1,574, 1,406 and 1,319 respectively.

Type of professionals:

Practice nurses were the most frequent users of the service (63.6% n=2734) followed by doctors, school nurses and health visitors, with each of these groups accounting for between eight and nine per cent (figure 1). This pattern remained consistent across all years.

Topic of enquiry:

Among the 31 topics of enquiry, those relating to persons with an incomplete immunisation status and non-UK schedule were consistently recorded the most frequently; comprising between 184 (11.7%) and 222 (15.8%) enquiries per year (figure 3, supplementary material). Enquiries about a non-UK schedule involved 88 different countries with 27 of these countries each appearing on only one occasion.

For all three years, travel was the third most frequent topic accounting for 130 (8.2%) to 178 (12.7%) of enquiries per year. Variation was seen in the ordering of the next five most common topics of enquiry each year over the three years. The most frequently occurring topics of enquiry were; vaccine intervals 85 to 109 (6% to 6.9%), administration 37 to 133 (2.4% to 9.46%), which peaked in 2010 but decreased again in 2011 to 80 (6%), contraindication 53 to 74 (4% to 5.26%), vaccine error 47 to 56 (3% to 4.2%) and clinical risk group 41 to 69 (2.6% to 5.2%).

The remaining 1575 (36.6%) enquiries were distributed across a further 23 topics. Enquiries related to vaccination and pregnancy increased over the three year period, comprising 0.44%, 1.14% and 1.52% of enquiries in 2009, 2010 and 2011 respectively (Fisher exact test $p < 0.01$). No consistent trend over time was evident in the other 22 topics.

Type of professional and topic of enquiry:

Specialist and hospital nurses enquired more frequently regarding immune-compromise, doctors relatively more about contraindications and vaccine errors whilst practice nurses and health visitors enquiries more frequently concerned resolving schedules for patients with incomplete immunisations (figure 4, supplementary material). The age of the client to which the enquiry related also reflected the differing roles of professionals and the part of the immunisation programme they were involved in delivering.

Resources that enquirers were directed to:

For 50% of enquiries received, the enquirer was directed to a resource by the immunisation advisor in responding to their question as well as giving substantive advice. The five most frequent resources referred to were: Immunisation Against Infectious Diseases (the Department of Health's green book)[9] (32%); Vaccinating individuals with uncertain or incomplete immunisations algorithm [10] (6%); National Travel Health Network and Centre (NaTHNaC) (website or to contact them directly) 3%; World Health Organisation website (2%) and a Chief Medical Officer letter or update (2%).

Influences to enquiry content:

The topic of the enquiry was frequently related to particular vaccines. For example, 58 of 405 enquiries about hepatitis B vaccine (14.32%) related to vaccine intervals, in contrast to 5.75% (224 of 3,894) for other vaccines.

Some new or seasonal programmes were associated with substantial increases in enquiries with examples shown in figure 2. This figure plots the proportion of enquiries relating to particular vaccines over time along with epidemiological events and programme changes.

Human papilloma virus (HPV): The volume of enquiries relating to HPV vaccination increased greatly in September 2009, the year of introduction in the UK (figure 2, panel a). This increase started shortly before the introduction of the routine and accelerated HPV catch-up programmes [11] and the start of the academic school year. Enquiries relating to HPV vaccine rose again in December 2009, and during March and April 2010, paralleling the second and third doses of the administration schedule. This pattern recurred but at a lower level in the second and third years of the programme with 12 enquiries in each of September and October in 2010 compared to 34 and 44 in 2009. The most common type of enquiry for HPV changed between first and later doses; with contraindications (28) being most common within September and October and vaccine intervals (24) between January and June. In September 2009, following extensive media coverage of the coincidental death of a 14 year old girl who had recently been vaccinated with HPV [12] there was no marked increase in HPV related calls, when comparing the week in which the death occurred with the weeks preceding and following the event.

Influenza: The proportion of enquiries relating to influenza rose each September and remained elevated during the programmes administration (figure 2, panel b). The timing of the peak of enquiries varied between seasons occurring in November 2009, January 2011 and November 2011. As a result of the H1N1 influenza pandemic in 2009, enquiries relating to this began in July, peaking in November before decreasing over the subsequent months, reflecting both the vaccination programme and epidemiology of the pandemic (figure 2, panel b).

Pneumococcal conjugate vaccine: No increase in enquiry volume occurred in relation to the switch from the seven-valent pneumococcal conjugate vaccine (*Prevenar*®) to the 13-valent (*Prevenar 13*®) in March to April 2010 [13].

Local mumps outbreak: A substantial increase in clinical cases of mumps within the Thames Valley in 2010 and 2011, including outbreaks in university students [14] did not lead to an increase in enquiries relating to measles, mumps and rubella (MMR) vaccination for adults.

Discussion:

Main findings of this study

Some topics consistently accounted for a large proportion of enquiries; the most common topics were the management of incomplete immunisations and non-UK schedules. Temporal changes to enquiry content were observed linked to some current and emerging immunisation issues. The enquirer's professional role, and the part of the immunisation programme they delivered, substantially influenced the nature of their questions.

What is already known on this topic

Health professionals use immunisation advice services, the use of which has increased over time [5, 6]. The wide range of topics of enquiry presented to these services reflects the complexity of immunisation. Petousis-Harris and colleagues [6] report on enquiries received by the New Zealand (NZ) immunisation hotline over equivalent periods in 1999 and 2003. Eight major themes were identified within the 4,423 calls reviewed. The topics of enquiries were affected by changes to the immunisation schedule and media stories about immunisation. There are few data on the nature of health professionals' enquiries alone as most immunisation services (in the published literature) are aimed at health professionals and the public. The most common enquiry topics for health professionals reported by Petousis-Harris and colleagues [6] related to immunisation written-resources (30%) in 1999, and information on "other vaccinations" and immunisation related services (44%) and information on catch-up or integration of NZ and international schedules (15%) in 2003. Gust and colleagues [5] reviewed 35,102 (20%) of calls, to the National Immunisation Information Hotline (NIIH) in the USA between 1998 and 2000. They report an increase of 418% over three years for calls from health care providers, concerning the immunisation schedule.

What this study adds

The analysis presented here, provides a comprehensive review of enquiries received by a UK based immunisation advice service for health professionals.

Range of enquiries:

The wide breadth of topics of enquiry, (illustrated in figure 3, supplementary material) highlights the complexity of immunisation. This extensive variety in enquiry content mirrors the observations of other advice services [3, 5-7]. The breadth of enquiries confirms the need for immunisers to have a broad knowledge base and access to computerised information resources, but also to have access to specialist advice to assist with complex scenarios and provide reliable up to date information.

How to deal with incomplete immunisations and non-UK schedules were the most frequent enquiry types to VACCsline and are areas of enquiry common to other services [3, 6]. The frequency of non-UK schedule related queries, and the wide range of countries involved, highlights the need for understanding general approaches to deal with these cases, in addition to country-specific information. The need to have general approaches to apply to vaccination were also highlighted by Finlay and colleagues [2], of the 145 enquiries reviewed in 1996, most were general in their nature. When a recurrent area of queries has been identified, for example: Hepatitis B vaccine intervals, or contraindications to HPV vaccine, it has guided the focus of teaching, with course content updates informed by enquiry based intelligence, and guided supporting materials in a quarterly VACCsline newsletter to clinicians across the Thames Valley and accessible on-line.

Influences to enquiry content:

Changes to the routine immunisation programme triggered enquiries specific to them; as observed by Petousis-Harris and colleagues [6]. The complexity and nature of the change influenced enquiry volume. The increase in enquiries relating to HPV vaccine, in the year the programme commenced may have been driven by it being a recently licensed and new vaccine. Additionally the public confidence in the vaccine was unknown. As the programme moved into its second and subsequent years, a lower volume of enquiries relating to HPV vaccine suggests greater confidence and knowledge within the staff delivering this programme. Not all programmatic changes were associated with an increase in enquiries. The switch to PCV13 (Prevenar 13®) from PCV7 (Prevenar®) resulted in very few enquiries. This finding mirrors that of an audit of calls received over four months in 2004 to a local advice service set up in Bath (UK) to support a switch of vaccine in the primary immunisation schedule; most enquires related to MMR (36/208) and not the changing vaccine (23/208)[3].

Vaccination and pregnancy was the only topic of enquiry in which a significant increase in enquiry volume was observed across the three year period. During this time, two routine vaccinations in pregnancy were introduced: H1N1 influenza in 2009[15] and seasonal influenza vaccination in 2010 [16]. Since our study, pertussis immunisation in pregnancy has been introduced [17] and there is potential in the future for a group b streptococcus vaccine which are likely to further increase the activity and enquiries from, and the need for training of, those immunising and advising pregnant women.

Circumstances other than programme changes that might be anticipated to cause an increase in enquiry volume did not always do so. There was no increase in MMR enquiries during an increase

of mumps cases within the Thames Valley in 2010 and 2011 that included outbreaks among university students. There was no increase in enquiry volume relating to HPV vaccination following the death of a 14 year old with underlying medical conditions recently vaccinated with HPV which was widely reported in the media. This observation is different to the finding of a NZ study which reports that the nature of enquiries received to their service changed according to media stories [6]. This difference may be accounted for by variation in the nature of the events reported by the media and the context surrounding it.

Professional role:

Similar to the finding of Petousis-Harris and colleagues [6] in NZ the most frequent users of VACCsline were practice nurses. This reflects the lead role practice nurses play in the delivery of immunisation programmes within primary care across the UK. Others have not reported the nature of enquires by professionals' roles but combined for health professionals and the public or just health professionals as one group [2, 3, 5, 6]. Within our study the topic of enquires varied across different professional roles (figure 4, supplementary material). Within the UK there is a core competency frame work for immunisation [18] and national minimum standards for immunisation training [19]. Intelligence from context specific enquiries can guide health professionals, extending their immunisation knowledge to reflect the clinical area they are working in.

Continuing professional education and support:

VACCsline aims to support the development of clinicians' knowledge and skills, encouraging them to build their confidence in immunisation practice. The rationale to support advice given is presented along with the source of reference as appropriate. Nurses being confident in their immunisation knowledge was a factor identified in leading to higher coverage and more timely immunisation within primary care settings within NZ emphasising the importance of continued education [1].

Immunisation Against Infectious Disease [9] was the most frequent reference document enquirers were directed to. Enquiries for which answers are accessible in key immunisation reference documents illustrates that enquirers may not know where to access the relevant piece of information, that they wish to consolidate their interpretation and understanding of it, or that they want to check their decisions with someone else given that immunisers are often practicing as lone practitioners.

Implications for practice:

Key points learned from this study are;

- Health professionals need access to specialist immunisation advice
- Systematically capturing enquires allows insight in to the content and pattern of questions and allows reactive provision of information to support different health professionals' current questions
- The complexity of a change to the immunisation schedule has some part in determining the volume of enquiries generated from it
- Some topics of enquiry consistently remain high (management of incomplete immunisations and non-UK schedules) illustrating that health professionals seek support for scenarios they do not regularly encounter

Limitations of this study:

This study has not assessed if the advice from VACCStline has been useful in terms of increasing service users' knowledge and/or impacted on their practice. It has not analysed the effectiveness of the service. The study was limited to one local area. However, having a catchment area with a population of two million makes it large enough for the findings to be robust and given that immunisations follow a largely standard national programme many of the findings are generally informative nationally and perhaps for other countries.

Conclusion:

The VACCStline service aims to support excellence in vaccination by offering consistent high quality advice to immunisers and using enquiry based intelligence to guide further support to immunisers. Analysis and review of this enquiry data has offered intelligence to support clinical staff. It has highlighted the topics of enquiry by different staff groups and their information needs. The Thames Valley Public Health England Centre linking with Oxford Vaccine Group to provide the VACCStline service is an adaption to opportunities available locally. This collaboration allows the advantages of both expertise and local identity and integration with training and other immuniser support. Organisations working in partnership can have greater benefit than working alone [4]. Having a local service is viewed as beneficial by Fisher-Jeffes and colleagues [3] ; although not formally validated this view is shared by the authors of this paper. The general features of this service with enquiry derived intelligence feeding into training and materials to support local immunisers could be

mirrored elsewhere. A network of specialist advice services could maintain the advantages of a local service but also allow exploitation of enquiry based intelligence on a larger population scale, and the sharing of tools developed from this.

Conflict of interest: Andrew J Pollard acts as an investigator for clinical studies conducted on behalf of the University of Oxford, some of which have previously been funded by vaccine manufacturers. Andrew J Pollard does not receive any personal financial support from vaccine manufacturers.

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