

Improving adherence rates to a cocooning program

A pilot experience in Italy

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Keywords: pertussis, prevention, newborns, cocoon, transmission

Cocoon is defined as a strategy to reduce the risk for transmission of pertussis to newborn infants by vaccinating household members including parents and siblings. Programmatic challenges make implementation of cocooning program complex. At the local health care unit “ASL Napoli 1 Centro,” a one-year pilot project to evaluate the newborn contacts adherence to a cocoon strategy was started on May, 1st 2011. Healthcare providers (HCPs) offered for free a dTpa booster dose to newborns parents (mothers were immunized after delivery) and household contacts. Until June 30th, overall only 7 dTpa booster doses out of 261 newborns (2.6%) were administered for cocooning. Then, an improvement in communication strategy to the families was introduced by preparing specific information leaflets, increasing the HCPs devoted to the cocoon, and focusing the interaction with families during the visiting time at the maternity ward. Overall, 601 out of 762 (78.8%) contacted new mothers received dTpa booster. Cocoon high acceptance rates could be reached providing that proper communication tools and enough skilled HCPs were engaged in the interaction with the families. This report is, to our knowledge, the first to document successful implementation of pertussis cocooning in an Italian setting.

Pertussis (whooping cough) is still a major public health problem,¹ even in countries with high rates of vaccination coverage as Italy. Close contacts represent a significant source of infection for infants not vaccinated or incompletely immunized, in which the severity of the clinical picture may be relevant.^{2,3}

The trend of pertussis in Italy, as measured on the basis of the spontaneous reporting surveillance system, showed a slow but steady decline, from about 30,000 cases a year in the 1950s (with a rate of 50 cases/100,000), to 6,500 cases in the 1990s, and 1 case/100,000 in 2009.⁴ The most striking reduction was observed after the adoption of acellular pertussis vaccination in the Children National Calendar of Vaccinations in 1999. Official pertussis vaccination coverage rates available in the 0–24 mo of age range were 96% in 2009; in 2008, a cluster sampling survey conducted among adolescents (cohort born in 1991) revealed a three doses vaccination coverage of 45.6%.⁵ Nevertheless, since 2009 a consistent increase of notifications of whooping cough in the younger age group (< 1 y of age) was observed.⁴ As far as the pertussis hospitalization rates in Italy are concerned, the Hospital Discharge Forms (HDF) database recorded in the period 1999–2009 7,768 hospitalizations for pertussis (principal diagnosis), of which 57.4% involved subjects younger than 1 y of age; in the same age-class the number of hospitalizations surpassed 800

cases/100,000. The proportion of hospital admission of subjects of < 1 y has increased from 46.4% in 1999 to 66.9% in 2009.⁵ While bearing in mind some passive surveillance system limitations such as underreporting (the underreporting of pertussis in adolescents and adults may range between 10 to 500 times)^{6–8} the case definition based on clinical assessment, the difficulties in laboratory diagnosis, it can be concluded that available data in Italy highlight the high number of pertussis cases among children under one year of age, too young to be fully protected.

It has been reported in by different Authors that > 50% of infants with pertussis studied were infected by a relative, being brothers /sisters considered the source of infection in 20–30% of the cases.^{9–11} Mothers play a prominent role in transmitting the infection, probably due to the greater exposure of the newborn mainly in the time frame before childhood vaccinations; fathers as source of infection scored very closed to other familiar contacts (siblings, grandparents, etc.) however “parents” as a whole are considered the primary cause of pertussis transmissions to newborns.^{9–11} “Cocoon” is defined as a strategy to reduce the risk for transmission of pertussis to newborn infants by vaccinating household members including parents and siblings.¹² In other words, the cocoon strategy provides for the indirect protection of infants from infection through

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Submitted: 11/26/12; Revised: 01/18/13; Accepted: 01/26/13
<http://dx.doi.org/10.4161/hv.23795>

Table 1. Adherence to the cocoon strategy before and after the improvement in communication

| | Before From 2011, May 1 st to June 30 th | | After From 2011, July 1 st to October 15 th | |
|----------------|----------------------------------------------------------------------|-----|-------------------------------------------------------------------------|------|
| | Number/all | % | Number/all | % |
| Mothers | 3/261 | 1.1 | 168/425 | 39.5 |
| Fathers | 3/261 | 1.1 | 87/425 | 20.4 |
| Other contacts | 1/261 | 0.3 | 26/425 | 6.1 |
| Overall | 7/261 | 2.6 | 281/425 | 66.1 |

immunization of the population that surrounds them (i.e., the “cocoon”) during the first months of life, represented primarily by parents, and with minor role by siblings and other contacts partners.¹² Cocoon is recommended in many countries such as USA, France, Germany, Belgium and the United Kingdom.¹³ In Italy, the cocoon strategy is mentioned in the Immunization Schedule Proposal for Adults and the Elderly released from the Italian Society of Hygiene, Preventive Medicine and Public Health¹³ and recommended in some Regional Immunization Calendars.^{14,15}

The economic sustainability of the cocoon strategy was assessed in different international studies including Italy, proving it to be cost-effective and even cost-saving in some cases,^{9,16-18} but not in USA according to CDC analysis.¹⁹

In principle the cocoon is a simple and effective strategy; further, it is worth noting that, among the advantages of the cocoon, the increase in vaccine coverage for a booster dose of tetanus and diphtheria in adults, both recommended every 10 y in Italy, should be added. A number of clinical experiences on the implementation, effectiveness or cost-efficacy of the cocoon strategy have been performed either in large hospital setting or in physicians’ offices. However, cocooning programs proved to be a labor-intensive and logistically difficult initiative to implement, mainly due to the displacement of the pregnancy caregivers and the immunization process. Different studies were conducted to verify the feasibility of the cocoon strategy, mainly by measuring the adhesion of families to the proposed booster dTpa, or its effectiveness.²⁰⁻²⁶

In the Italian health care system organization, the Local Health Unit (LHU) is the operational site where most of the health care items are managed, being the Prevention Department (PD) its section which is accountable for planning, managing and evaluating the immunization activities. However, to guarantee operational effectiveness, the PD may involve other health care providers in providing immunization services to the population, such as hospital wards or offices, LHU primary care services (Districts), family pediatricians (FPs) or general practitioners (GPs).

At ASL Napoli 1 Centro (LHU Na1), a project was set up to verify whether a pertussis cocoon strategy could have been implemented within an Italian health care center and to measure the rates of acceptance of vaccination by the new mothers and the newborns contacts.

Within the LHU Na1, the project was arranged at District 32 (to target adults contacts), involving 4 HCPs as full time-working

team, and at the Department of Obstetrics and Gynecology (DOG), Evangelical Hospital “Villa Bethany” (to target newborns parents and contacts) involving 2 HCPs as 2 d/week working team. The project was classified and framed in the routine activity as diphtheria-tetanus-acellular pertussis (dTpa) booster dose in adults is recommended country-wide and vaccines were used within the approved indications in the label. The project time frame was from May, 1st 2011 to April, 30th 2012. The staff was trained by a senior physician in District 32 on pertussis burden of disease and cocoon strategy and invited to check their personal immunization log for pertussis. All detected adverse events had to be reported to LHU Na1 according to the national adverse event reporting system. A dTpa booster shot was offered free of charge^{27,28} to all parents of babies born at DOG and all healthy subjects pertaining to District 32, which were expected to have close contact with infants. Mothers were immunized after delivery. An information letter was sent by LHU to all the FPs and GPs working in the project area.

In the period May–June 2011, only 7 doses of dTpa booster were administered within the project out of 261 newborns. Therefore, the Project Team decided to invest in communication to families by: a) increasing the staff at the DOG vaccination point by moving 2 staff units from District 32 and extending the counseling devoted time at DOG b) placing the staff activities during the ward visiting hours, encouraging interaction with the families c) preparing printed leaflets/hand outs to support staff communication on pertussis, containing information on pertussis disease, transmission, prevention, immunization target and the benefit for newborns of immunization of contacts. A consistent increase in acceptance of the dTpa booster by households was immediately registered; in Table 1 the differences in immunization acceptance before and immediately after the implementation of the new communication course are reported. In the whole duration of the project, a dTpa booster dose was administered to 601 mothers (78.8%) of the 762 contacted, and among them 356 (46.7%) included both parents (Table 2). Overall, in the project period, only 762 families out of 1888 newborns (40.3%) were contacted by any staff member to be counseled on cocoon strategy. No adverse events were recorded after immunization within the project.

The cocoon strategy is under debate due to the operational barriers to implement it and the generally sub-optimal adherence from families. Recent findings in Canada led the Authors to even question the relevance of the cocoon strategy due to very high number of subjects needed to vaccinate to prevent 1 death for pertussis in newborns²² and CDC recommended to focus the prevention programs on immunizing pregnant women, while keeping cocoon as a complementary activity.¹⁹ Nevertheless, the epidemiology of pertussis in newborns is striking and before the dTpa immunization of pregnant women may achieve consistent confidence among healthcare providers and women or new vaccines are available (i.e., monovalent pertussis vaccine approved for newborns), the cocoon strategy seems to remain a proper pragmatic approach that can be implemented; only with extended pertussis immunization of children, adolescents and adults will pertussis be controlled.

Which lessons did we learn from this cocoon pilot experience? First, communication contents and efforts are crucial to obtain a consistent adhesion to the strategy from families, mainly by mothers; such a result is in line with most of the recently reported cocoon experiences where efforts were required in terms of counseling to families to reach a compliance rate ranging between 11% and 75%²⁰⁻²⁶ and rates reached at our Institution (78.8%) place among the highest reported in cocoon projects.^{20,23-25} The 2nd lesson learned is that the cocoon work flow needs to be designed as closed as possible to the routine one, otherwise the rate of contacted family may remain suboptimal unless consistent staff resources are introduced. In this perspective, the hypothesis proposed by the Italian Working Group on Cocoon of offering cocoon to the families during the 1st immunization visit of the newborn¹³ (around 8 weeks of age in the Italian Schedule) may be worthy being the immunization coverage of children in the 1st year of life in Italy > 95%. Further, the HCPs devoted to infants/children immunization are familiar with vaccination counseling and this is a factor known to increase parents' acceptance.^{20,23,24} Third lesson learned, the dTap booster dose have to be offered free of charge for the families; even though a control group was not considered, such high adhesion rates could have never been reached had the parents/families to pay for the booster dTap dose, even if a low price was requested. Such a result came out also in a survey on cocoon implementation carried among the PDs, where 83% of respondents throughout Italy agreed that the National Health care System should offer dTap booster dose free of charge.²⁹ As a matter of fact, the latest National Immunization Plan recommends and funds a dTap booster in adults once in a lifetime, being dT recommended every 10 y.²⁸ Fourth and last, the role of FPs and GPs is probably crucial in supporting the cocoon strategy; the vast majority of (if not all) the families received information on the risk of pertussis and the cocoon strategy for the first time from the project team at the hospital ward; had the parents being preliminarily counseled by FPs and/or GPs, the adhesion rate

Table 2. Overall adherence to the cocoon program by newborn contacts

| | Number/ all | % |
|----------------------------------------------------------------------------------|-------------|------|
| Vaccinated mothers/ all interviewed parents | 601/762 | 78.8 |
| Both parents vaccinated/ all interviewed parents | 356/762 | 46.7 |
| Both parents vaccinated + at least 1 contact vaccinated/all interviewed contacts | 240/762 | 31.4 |
| Vaccinated contacts/all interviewed contacts | 47/497 | 9.4 |

might have been even higher. Again, the crucial role of FPs and GPs in the cocoon strategy implementation was acknowledged in the PDs survey (complete agree 75.4%).²⁹ Further, a contribution on communicating the value of cocoon strategy to women before, during or just after their pregnancy may arise also from gynecologists, even though generally less familiar with pertussis immunization programs.

In conclusion, this report is, to our knowledge, the first to document successful implementation of pertussis cocooning in an Italian setting. Although it is not possible to identify a single cocoon organizational model at national level,²⁹ hopefully the pilot experience reported here may offer some pragmatic suggestions to support local implementation of further pertussis cocoon strategy projects.

Disclosure of Potential Conflicts of Interest

The authors declare that Federico Marchetti and Pasquale Piscopo are employed in the Medical Department of GlaxoSmithKline S.p.A Italy, while no conflict of interest is intended for the other authors.

Preliminary results of the project were presented at EuroVaccine 2011, European Center for Disease Control and Prevention, 5 December 2011, Stockholm, Sweden. (available at http://ecdc.europa.eu/en/eurovaccine/Pages/call_posters.aspx - last accessed November 2012).

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