Revision of the National Action Plan in Response to Poliovirus Importation in Korea

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Abstract
The polio outbreak in China in 2011 makes it necessary to revise the 2010 polio National Action Plan (NAP) in Korea. The revised plan was provided after evaluation of the 2010 NAP, literature reviews, and expert advice. It was discussed and confirmed by the Polio National Certificate Committee (NCC). The revised NAP (2012 NAP) has structured the action to take by patient phase and the role of each institution. It also provides the specified classification and management actions on the contacts. It includes a new recommendation of one-time additional immunization for the contacts regardless of the immunization history. The 2012 NAP could provide an effective countermeasure if there are imported poliomyelitis patients in Korea.

1. Introduction
In 2010, polio outbreaks occurred in countries in Central Asia that had had no previous outbreaks (e.g., Tajikistan, Kazakhstan, and the Russian Republic) [1]. Korea has no report of patients infected with wild poliovirus since 1984 [2], but the possibility of outbreak due to imported cases has prompted establishment of the National Action Plan (NAP) for response to poliomyelitis importation [3]. Since then, there was an outbreak in the province in China which borders Pakistan in 2011 [4]. Concerns about imported poliomyelitis and the response plan in Korea has led to the 2010 NAP being reconsidered. As a result, more concrete and systematic contents are necessary to enhance the 2010 NAP.

The revision of the 2010 NAP with consideration of foreign cases was arranged and discussed by the Polio National Certificate Committee (NCC). This paper aims to introduce the NAP revision process with this background.

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2. Process of the Revision of the NAP

The 2010 NAP cannot be evaluated and revised based on performance with real patients, therefore we have selected the items for revision through literature reviews, field health workers comments, and experts’ advice. In this revision we aim to provide specific guidelines to each agency and agent for systematic responses on a case-by-case basis in the event of an epidemic in Korea. The revision was discussed and confirmed by the first polio NCC.

3. Results

3.1. 2010 NAP evaluation

The 2010 NAP is composed of five categories: surveillance, investigation, risk assessment, outbreak response, and evaluation/documentation. Outbreak response, the key domain, is divided and described into six subgroups and includes the work sheet to characterize the patient’s epidemiology and trace the contacts.

The 2010 NAP includes a basic principle for management of infectious disease epidemics and the laboratory diagnosis, duration of isolation, classification of the contacts, and immunization proposed on a medical basis. Furthermore, it includes the advisory committee’s review and risk of communication to consider the impact one patient might make when there has been no case in Korea since 1984.

However, management and surveillance could be fortified by patient phase but it is not suggested because we do not have a specific standard between suspected and confirmed patients. Also, the level of management of the contacts should change by intensity of contact. We intended to minimize possible overreactions in cases of low transmission. Outbreak response should be simultaneous and comprehensive by related agencies, and it is necessary to provide comprehensive reactions by agency countermeasures for prompt and systematic responses (Table 1).

3.2. Major revision

3.2.1. Countermeasures by patient phase

Polio case is a significant matter in public health and society, so that an active rapid containment strategy in the early stage is necessary, but over-countermeasures in the low transmission stage should be minimized. In this

| Category | Key contents                                                                 | Result of evaluation                                           |
|----------|-----------------------------------------------------------------------------|---------------------------------------------------------------|
| 1. Reporting suspected case | NIDS, AFP surveillance system                                                | Adequate                                                      |
| 2. Case investigation | Within 24 h of case reported Identify source of infection, *Include work sheet | Adequate                                                      |
| 3. Expert meetings | Advisory board, review agenda, role                                          | Need to change advisory board                                 |
| 4. Outbreak response |                                                                 |                                                        |
| (i) Case isolation | Confirmed, suspected case isolation Isolation duration Contact precaution | Need to specify the classification criteria for suspected cases and confirmed cases. Need to classify roles of agencies by case stage (suspected or confirmed) |
| (ii) Management of potential contacts | Contact classification (household, HCW, public) Quarantine duration Immunization | Need to provide the contact classification and management. |
| (iii) Immunization | Case contact immunization                                                    | Need to recommend immunization by case stage                  |
| (iv) Cleaning and disinfection | Disinfect the toilet and materials used by the case during his/her infectious period Stool management of the case during isolation |                                                        |
| (v) Enhanced surveillance | Laboratory surveillance fortified for all virus laboratories Enhanced period: at least 6 mo after the last case | Need to fortify surveillance area by case stage |
| (vi) Risk communication | Basic principle *Sample notification letter includes documentation |                                                        |

Table 1. 2010 National Action Plan key contents and result of evaluation

*AFP = acute flaccid paralysis; HCW = health care workers; NAP = National Action Plan; NIDS = National infectious disease surveillance.
regard, patients are classified into suspected and confirmed cases and major countermeasures are structured in the key components of response, patient management, contact management, and surveillance fortification.

The suspected cases are treated under isolation while the stool test is being examined. The contacts are vaccinated and undergo hygiene education and the area is placed under intensive surveillance. If the suspected case is identified as a confirmed case, then he/she should undergo the isolated treatment and the stool test every week for loss of infectivity. The contacts are isolated, tests are taken for confirmation with additional vaccination, and the intensive surveillance area is expanded to the whole nation (Table 2).

3.2.2. Role of agency

If a case is reported, the major response agencies are classified into treatment, field response, central coordination, and expert committee. The necessary countermeasures are determined by patient phase. Significant matters in the public health perspective require the expert committee’s approval (Table 3).

3.2.3. Criteria of classification and management of the contacts

The situation and intensity to contact a patient varies. The 2010 NAP only classified contacts on a general level ("household", "healthcare workers (HCW)", "public"), with no consideration of other situations and the intensity of contact.

In the revised 2012 NAP, "toilet contact" was added, which considers those who shared the same toilet with the patient in the infectious period. Among HCW contacts, the person who contacts the patient with personal protective equipment belongs to public contact. Due to the high possibility of importation, passengers in the same airplane or ship are included in the contact classification.

| Case classification definition and major activities of case/contacts management, surveillance according to case classification |
|---------------------------------------------------------------|
| **Suspected case** |
| • Reporting suspected case to NIDS<sup>a</sup> |
| • Identify Poliovirus gene |
| **Confirmed case** |
| • Virus isolation in stool<sup>b</sup> |
| **Case management** |
| • Isolation in hospital |
| • Case investigation: identify infection routes and contacts |
| • Confirmation test: stool<sup>c</sup> culture |
| **Contact management** |
| • Contacts classification*: hygiene education |
| • Immunization<sup>d</sup> |
| • Contact quarantine and lab(stool, serology) test |
| • Immunization<sup>d</sup> |
| **Enhance surveillance** |
| • Local area |
| • National area |
| • Duration: the onset of last patients up to 6 months later |

NCC = National Certificate Committee; NIDS = National infectious disease surveillance.

<sup>a</sup> Epidemic investigation officer finally confirmed the suspicious case
<sup>b</sup> Collect the stool within 3 days after contact, with an interval of 24-48 h.
<sup>c</sup> Household contacts, HCW contacts(Medical staff, laboratory workers), toilet contacts, public contacts
<sup>d</sup> Apply for Table 5 classification
<sup>*</sup> NCO(National Certificate Committee) finally confirmed the confirmed case
Intensity of contact occurs in the descending order of: household contact, toilet contact, HCW contact, and pubic contact. The highest risk contacts (household contacts) are quarantine in the home and perform confirmation tests and immunization. The next highest risk contacts (toilet contact and HCW contact) are to take a confirmation test and immunization without quarantine. Finally, those who have had public contact receive immunization only (Table 4).

3.2.4. Immunization

According to the 2010 NAP, contacts with a complete polio immunization history do not need to have additional immunization. Although literature review does not provide evidence of immunization being able to prevent disease after exposure to poliovirus [5], it has been reported that one-time polio vaccination for the immunized person boosts the immunization reaction and reduces the virus discharge from the intestine and pharynx of infected people [6]. Furthermore, in Australia, one time immunization was given to the contact regardless of past history when an imported polio case occurred in 2007 based on this report [7]. The 2012 NAP added one IPV (Inactivated Polio Vaccine) immunization to all contacts of the suspected case. If a person was vaccinated less than 1 month previously, he/she is exempt from one-time immunization, because the minimum immunization interval for the polio vaccine is 1 month. In the confirmed stage, the contacts should be given the necessary additional immunization (Table 5).

4. Discussion

Korea has not witnessed a patient infected with poliovirus since 1984, so it might be thought that poliomyelitis is an eliminated disease in Korea, but as in China [4] and Australia [6], it is a feasible scenario to have an incidence caused by an imported case and for this to turn out to be an outbreak.

Hence the Korea Centers Disease Control and Prevention made an NAP for imported polio in 2010, which was revised and systemized in 2012. The revised 2012 NAP has classified the suspect cases and confirmed cases, provides roles and countermeasures by agencies, and has provided specific classification and management items for contacts, so that the field workers can easily utilize the guidelines.

In the future, to enhance the ability of the field workers with these guidelines, we will continue to provide on-the-job education to them, and conduct research into polio immunity to provide evidence, which in turn may necessitate another revision.
Table 4. Contacts classification, quarantine, and management protocol

| Contacts classification | Definition | Quarantine and management |
|-------------------------|------------|---------------------------|
| Household               | Family of the case<br>Persons living with the case and sharing the toilet <br>(for dormitory and inmates) | Quarantine at home<br>Quarantine period: until there have been two consecutive negative stool cultures<sup>c</sup> <br>Serology test: prior to immunization<br>Immunization | |
| Toilet                  | People sharing the toilet with the case during his/her infectious period<sup>b</sup> | No quarantine<br>Stool culture<sup>c</sup>: until there are two consecutive negative stool cultures<br>Immunization | |
| HCW<sup>a</sup>         | Medical staff in contact with the case during the infectious period<br>Laboratory workers handling the specimens of the case | No quarantine<br>Stool culture<sup>c</sup>: until there are two consecutive negative stool cultures<br>Immunization | |
| Public                  | Co-workers of the case (school, company, etc.)<br>Passengers on the same aircraft, ship and trains<br>Hospital contacts other than medical staff during the infectious period<br>Primary responder | No quarantine<br>Immunization | |

<sup>a</sup>When coming into contact with the case in the infectious period without protective equipment, and if the case is isolated and HCWs contact him/her with protective equipment, it is classified as 'public contact';<sup>b</sup>Infectious period: from 11 days prior to the onset of symptom up to 6 weeks later;<sup>c</sup>Collect the stool within 3 days after contact, with an interval of 24–48 h. HCW = health care worker.

Table 5. Recommendation of polio immunization by case classification

| Suspected case contacts | • One time IPV immunization to all contacts<sup>a</sup> <br>• In children, completion of IPV by minimal interval |
|-------------------------|----------------------------------------------------|
| Confirmed case contacts | • The case of unknown or incomplete immunization history was total 3 times IPV done every 4 weeks<br>• In children, completion of IPV by minimal interval |

IPV = inactivated polio vaccine.

* If a person was vaccinated less than 1 month previously he/she is exempt

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