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## The ALMANACH Project: Preliminary results and potentiality from Afghanistan

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### ABSTRACT

**Introduction:** ALMANACH (ALgorithms for the MANagement of Acute CHildhood illnesses) is an electronic version of IMCI (Integrated Management of Childhood Illness) running on tablets. ALMANACH enhances its concept, it integrates well into health staff's daily consultation work and facilitates diagnosis and treatment. ALMANACH informs when to refer a child or to perform a rapid diagnostic test (RDT), recommends the right treatment dosage and synchronizes collected data real time with a Health Management Information System (DHIS2) for epidemiological evaluation and decision making.

**Objectives:** Since May 2016, ALMANACH is under investigational deployment in three primary health care facilities in Afghanistan with the goal to improve the quality of care provided to children between 2 months and 5 years old.

**Methods:** IMCI's algorithms were updated in considering latest scientific publications, national guidelines, innovations in RDTs, the target population's epidemiological profile and the local resources available. Before the implementation of the project, a direct observation of 599 consultations was carried out to assess the daily performance at three selected health facilities in Kabul.

**Results:** The baseline survey showed that nutritional screening, vitamin A supplementation and deworming were not systematically performed: few patients were diagnosed for malnutrition (1.8%), received vitamin A (2.7%) or deworming (7.5%). Physical examination was appropriate only for 23.8% of the diagnoses of respiratory or gastrointestinal diseases, ear infection and sore throat. Respiratory rate was checked only in 33.5% of the children with fever and cough, dehydration status was assessed in only 16.5% of the diarrhoea cases. Forty-seven percent of patients received incorrect treatment. Sixty-four percent of the children, before the introduction of ALMANACH, received at least one antibiotic, although for 87.1% antibiotic therapy was unnecessary.

The review of 8'047 paediatric consultations between May 2016 and September 2017 showed that with ALMANACH, malnutrition detection, deworming and Vitamin A supplementation increased respectively to 4.4%, 50.2% and 27.5%. Antibiotic prescription decreased to 21.83% and all children were examined and treated in compliance with the protocols. Conclusion: A survey will be conducted one year after the implementation to validate these initial promising results. If the efficacy of the approach is confirmed, ALMANACH could establish as a powerful innovation for primary health care.

### 1. Introduction

WHO and UNICEF developed the strategy of Integrated Management of Childhood Illness (IMCI) in 1995 with the aim to reduce child morbidity and mortality in countries with poor health infrastructures [1]. This was an innovative integrated approach combining an improved management of common childhood illnesses with proper nutrition and immunization at first-level facilities. The concept behind

was simple and effective: empowering the health workers at primary health care (PHC) to tackle down the five main diseases (malaria, measles, malnutrition, diarrhoea, pneumonia) that were causing 70% of mortality among children under 5. Since its inception, the strategy was introduced in more than 100 countries [2] and the protocols have been successively updated up to the last version of 2014 that is currently in use [3].

Despite that, in 2015 an estimated 5.9 million children still died

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before reaching their fifth birthday, mostly from preventable or treatable conditions [4], since IMCI's implementation, child mortality has more than halved, dropping from 91 to 43 deaths per 1000 live births between 1990 and 2015 [5] but the interest and funding for IMCI have reduced and in many countries the coverage was rarely achieved [6]. Although IMCI was associated with a 15% reduction in child mortality when activities were implemented in health facilities and communities [7], IMCI has suffered from lack of attention and leadership, with more programs focusing on specific child health areas such as immunization and communicable diseases, arguably losing its holistic view of child health [6,8,9].

Only countries with strong government leadership and political commitment were able to support the scaling up of IMCI at national level showing that IMCI was better implemented when the health system context was favorable, a systematic approach to planning and implementation was used and political commitment allowed for institutionalization [6,10–13]. One of the main constraints for the implementation and scaling up of IMCI is considered the adoption of a strategy, based on a “one size fits all” solution: this kind of solutions, not user-centred designed, does not take in account the local epidemiological and health system context and they lack in flexibility and adaptability. Stiff approaches were not able to cope with specific structural weaknesses of the health systems including high staff turnover, lack of supportive supervision and logistics support, moreover, they cannot serve the differing needs of dense urban areas, remote rural areas, emergency contexts, where delivery channels are vastly different [6,14]. Long and heavy training (WHO recommends an 11-day training course) and lack of feedback to health workers [15,16] are other important barriers for a successful scaling up of the strategy. Non-adherence to the guidelines is an additional factor undermining a full-scale implementation of the strategy: health workers tend to trust their own ability to make a correct diagnosis without following the step-by-step procedure [17]; they find the traditional paper-based IMCI too time consuming and they perceive that the use of paper tools may undermine the care givers' confidence in the health workers' skills [18,19].

Keeping in account the pitfalls of the uptake of the IMCI's programs [6], since 2015, the Swiss TPH, initially in collaboration with the Policlinique Médicale Universitaire in Lausanne, has been developing ALMANACH (ALgorithm for the MANagement of Acute CHildhood illnesses). ALMANACH is an electronic and upgraded version of the IMCI available on Android operation system (smartphones and tablets) [20]. ALMANACH belongs to the group of applications named “Clinical Decision Support Systems” (CDSS), tools that analyses medical data to help healthcare providers make clinical decisions at the point of care [21].

ALMANACH's algorithms are used as guidance during the consultation for healthcare providers taking a clinical history and performing physical examinations, leading to the diagnosis and treatment. ALMANACH recommends which examinations to perform, when to refer, when to use a rapid diagnostic test, what treatment to prescribe and at what dosage (based on age and/or weight).

A small atlas of dermatology is also embedded into the tool to facilitate the recognition of skin diseases.

ALMANACH was originally developed in Tanzania in the framework of a pilot implementation study [22] and on the base of a study carried out concerning the epidemiology of fever [23]. In 2016, in partnership with the International Committee of the Red Cross (ICRC), the tool was tailored to the epidemiological profile of the Afghan population in a collaborative partnership with the Afghan Red Crescent Society (ARCS).

ALMANACH was implemented in three ARCS's Basic Health Centres (BHC) in Kabul province: two BHCs (BHC 1 and BHC 2) in May 2016 and one in (BHC 3) August 2016. BHC 1 and 2 lie in an urban setting, BHC 3 is located in a rural environment less than 20 km from Kabul. All the BHCs have a medical doctor in charge of the consultation which is provided during working days in the morning.

## 2. Methodology

ALMANACH's algorithms are initially drawn on paper, starting with WHO's algorithms developed for IMCI, and successively updated in accordance with evidence-based medicine, the national guidelines (especially guidelines for malaria, nutrition and therapeutic national protocols), the local epidemiological profile of the population and the resources available at the health facilities in terms of staff, drugs supplied and laboratory. Algorithms for new diseases or signs not included in IMCI, like eye and skin diseases and jaundice, have been added and any changes in diseases patterns and antibiotic resistance have been taken into account. The paper version of the algorithms is digitalized through Visio© (Microsoft Visio, Microsoft inc., 2010) and shared with the Afghan health authority for being validated. Only after validation, algorithms are computerised into a tablet. We use open-source softwares: CommCare© (Dimagi inc.) to computerise the algorithms and to collect and synchronize data, an in-house interface to link CommCare to DHIS 2 [24] and DHIS 2 to report and analyse the data.

Translation into users' language is a crucial part too. ALMANACH in Afghanistan was carefully translated in Pashtun to avoid any misunderstanding by a senior Afghan physician. Jargon was avoided and the concepts were simplified to ease the understanding.

For health staff already familiar with the IMCI guideline, the training is developed in two days: one day theoretical and one day practical at the implementation site allowing health workers to become acquainted with the use of the tablet under the supervision of the implementers with real patients.

In terms of resource, ALMANACH relies on a few but critical elements: a continuous supply of essential drugs as already required by the IMCI program, little equipment (thermometer, baby scale, MUAC tape), health staff available, electricity to charge the tablet at least once a day and an internet connection (at least G2) to allow synchronization and upload the data. The Afghan version of ALMANACH combines the use of algorithms with RDTs for malaria, typhoid fever, Group A Streptococcus (GAS) and urine dipstick in order to confirm the clinical diagnosis. Other laboratory tests available can be integrated into the algorithms. In case RDTs are missing, ALMANACH is able to provide diagnosis on a presumptive way.

To better organize the workflow, the Afghan version of ALMANACH is set up to work with a triage-consultation approach through the synchronization of two tablets via Wi-Fi. One healthworker (usually the midwife) is in charge of the “triage”: to screen for the danger signs, to weigh the children, check for the vaccination card, deworming and vitamin A and to assess malnutrition with the MUAC. Children with one danger sign or suffering severe acute malnutrition are immediately referred.

In terms of data collection, ALMANACH synchronizes the data collected at the health facility level with DHIS 2 at any time an internet connection is available without passing by a paper format, giving the health manager reliable information in terms of tables and graphs in real time. Jointly to this remote control, an ICRC's medical field officer supervises the implementing facilities at least once per month. At any supervision visit, the availability of drugs and equipment to run the project are checked and any problem regarding the use of ALMANACH reported. If important gaps are recognized, specific trainings and workshops are organized to strengthen the capacity of the users. Epidemiological data from the implementation sites are weekly screened and in case of abnormality (i.e. increase of cases of measles or dysentery) a special investigation in the field is timely triggered. To ensure the confidentiality of patients, all data collected are related to the on-going consultation and they are erased from the tablet once uploaded to the server. No name, surname, address or any other information to track down the child is collected; therefore, it is not possible at the moment to use ALMANACH for patients follow up and to monitor chronic disease. This specific consideration for confidentiality was due to the security situation of Afghanistan and directly requested

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