Realist evaluation of the Integrated electronic Diagnosis Approach (IeDA) for the management of childhood illnesses at primary health facilities in Burkina Faso

Evaluation
October 2018
**Executive Summary**

**Background**

Recent advances in Information and Communication Technologies (ICT) could potentially transform health care services in low- and middle-income countries. However, the experience with using such technology to improve adherence to the Integrated Management of Childhood illness (IMCI) guidelines is limited.

From 2014, Terre des hommes, in partnership with the Burkinabe Ministry of Health (MoH), implemented the Integrated Diagnosis Approach (IeDA) package of interventions in primary health facilities of two regions of Burkina Faso with the objective of improving health care workers’ (HCW) adherence to the IMCI guidelines. An evaluation was performed by an independent team from the London School of Hygiene and Tropical Medicine (LSHTM), United Kingdom, and Centre Muraz, Burkina Faso. The aim of the realistic evaluation was to identify the potential mechanisms for change within the IeDA programme and specify how they are able to change existing social processes within primary health care facilities.

**Methodology**

The realistic evaluation was embedded within the stepped wedge trial in order to explain some of the results of the trial and explore research questions identified during the trial. The methodology first focused on implementation evaluation and then on mechanism of change and context.

The implementation evaluation aimed to document how the implementation of IeDA was organised and achieved, and how the intervention was received. This implementation evaluation focused on fidelity, dose delivered (completeness), dose received (exposure), reach (participation rate) and recruitment. The context evaluation aimed to document factors external to the intervention that may have acted as moderators of implementation and outcomes, i.e. as facilitators or barriers to IeDA implementation and affecting REC use. In particular, we paid attention to potential unanticipated factors. Social, political, resources and logistical factors were screened and added throughout the study. Various sources of information were used: individual interviews and document review (project documents as well as national policy documents).

For the implementation evaluation, a set of process research questions were defined prior to the evaluation and according to the IeDA theory of change. Most of the information collected was triangulated from different sources. This was particularly important as the data were collected retrospectively hence subject to recall biases. A combination of electronically documents review and in-depth interviews were conducted in 2017. In order to capture social phenomena such as management decisions and interactions between individuals, an in-depth qualitative research approach was adopted. Various sources of data were used by the investigator during data collection that took place between January 2016 and October 2017. The combination of several data sources proved valuable to the research. Direct observation in health centres generated elements of information that helped to identify their problems and needs to the research. Direct observation in health centres anytime support is needed.

Regarding the process of implementation, we noted a good coherence between the initial theory of change developed by the implementers (MoH and Tdh), the project management team’s vision and district health teams and health centres team’s practice. Indeed, in line with their vision, the project management team motivates the health centre staff involved in child consultations (e.g. nurses, midwives and nurse assistant) through effective and regular support, dialog to identify their problems and needs in using the REC and full recognition of their role in improving child consultations.

**Results**

The actual activities of the intervention can be summarised as follows: (i) Development and implementation of improved versions of the REC; (ii) Provision of a six-day training course on IMCI guidelines and REC; (iii) Development of a quality assurance mechanism; (iv) Monthly supervision of every health centre benefiting by the district health team; and (v) Development of a health information system. We also found important additional activities that organically appeared during the implementation of the intervention: the creation of a support system to respond to breakdowns and questions on the software and the tablet; district meetings at least once a year to enable district health teams and heads of health centres to discuss about performance and find concrete solutions; creation of eLearning modules on IMCI available on tablets for continuous knowledge development; an inclusive and team approach associating in the implementation process not only nurses but also any other staff who is directly or indirectly involved in managing child consultations; and good accessibility of top Tdh managers to district health teams and in a certain measure to Heads of health centres anytime support is needed.

**Table: the three CMO configurations related to IeDA**

<table>
<thead>
<tr>
<th>Context</th>
<th>Mechanism</th>
<th>Outcome (students)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. Availability of a support team to be responsive to healthcare staff questions.</td>
<td>M1. Promoting amongst healthcare workers “doing the right thing the right way” approaches</td>
<td>O1. Notions of quality in childhood illnesses routinised during consultations</td>
</tr>
<tr>
<td>C2. In health centres where the nurse is assisted by at least two other members (nurse assistants or outreach workers) and where management flexibility is allowed</td>
<td>M2. Clear distribution of roles before and during child consultations (including triage, weight and size measurements, consultation and counselling)</td>
<td>O2. Efficient organisation of the health team</td>
</tr>
<tr>
<td>C3. Strong consensus amongst stakeholders on the benefits of introducing REC</td>
<td>M3. Introducing at primary health care level the notion of individual accountability and responsibility and collective contribution to the wider system.</td>
<td>O3. Sustained use of REC as a routine practice</td>
</tr>
</tbody>
</table>

During the later phases of the analysis, we found that the adoption process can be grouped according to their key mechanism and this led to the description of parallel CMO configurations, each with their own outcome.

Our analysis identified three CMO configurations that indicate causal pathways between sets of management practices and use of REC and we modified the MRT accordingly:

The adoption of a computer-based decision support tool by health staff at primary health care will be enhanced by having a leadership focusing on building wide consensus from surrounding stakeholders (local health teams to conduct supervisions is quite limited due to their budget restrictions and limited access to vehicles – volume of resources that will not increase in the near future).

During the later phases of the analysis, we found that the adoption process can be grouped according to their key mechanism and this led to the description of parallel CMO configurations, each with their own outcome.
and national authorities) on the benefits of such an innovation and having a wide range of actors fully and truly engaged in the directions the project could take. This necessitates a system promoting flows of information between all levels of the health system where transparency of information is valued.

The introduction of such innovation needs to occur in an environment flexible enough to provide space to staff make decisions on the distribution of clearly-defined tasks to staff make decisions on the distribution of clearly-defined tasks. The supportive environment is based on reciprocity and acknowledges individual contributions to the wider system. Conditions for such environment to be promoted by a leadership that creates a decentralised decision space where initiatives are respected.

On the other hand, the innovation, REC, needs to be flexible enough to take into account the constant changing policy environment and the emerging needs and requests from its users. The REC is adapted when perceived by users and district managers as being encompassed within a broader quality improvement strategy where health staff is sensitised to the importance of quality and their capacity to address quality issues at their own level.

The introduction of the REC needs to be accompanied by a supportive atmosphere and environment (including community and policy makers support), which can be translated by peer support and district authorities support, and availability of support services responding to software or hardware issues. The supportive environment is based on reciprocity and acknowledges individual contributions to the wider system. Conditions for such environment to be promoted by a leadership that creates a decentralised decision space where initiatives are respected.

Despite a large reduction in under-five child mortality (from 180 per 1,000 live births in 1990 to 83 per 1,000 live births in 2010), sub-Saharan Africa failed to reach Millennium Development Goal 4 target of 60 deaths per 1,000 live births (United Nations Inter-agency Group for Child Mortality Estimation 2015). In 1999, the World Health Organisation (WHO) developed the Integrated Management of Childhood Illness strategy (IMCI) (Black, Morris et al. 2003). This strategy provides an algorithm to guide health workers through a systematic clinical assessment of sick children with the aim of improving the diagnostic classification and the treatment of these children (Bass, Toole et al. 1994, Nguyen, Leung et al. 2013, Rakha, Abdelmoneim et al. 2013) and hence reducing mortality (Jones, Steketee et al. 2003, Rakha, Abdelmoneim et al. 2013).

However, effective implementation of IMCI is often constrained by poor adherence to the guidelines (Bryce, Victora et al., Derenzi, Parikh et al. 2008, Horwood, Voce et al. 2009). Previous studies have reported that adherence to the guidelines decreases over time due to inadequate initial training, shortage of staff and insufficient supervision (Chaudhary, Mahany et al. 2006, Rowe, Onikpo et al. 2010). Takada et al. (2007) have noted that health care workers typically find the IMCI chart booklet burdensome and try to work from memory, resulting in a decrease in quality of care. Chaudhary (2005) demonstrated that the adherence of health workers improved with supervision. However, regular supervision of health workers after training is often lacking, (Horwood, Voce et al. 2009, Mugaia, Mutale et al. 2010) partly due to the lack of resources. Burkina Faso introduced the IMCI strategy in 2003. However, an evaluation conducted in 2013 found that only 22% of nurses working in primary care facilities had been trained in IMCI (Kouanda and Baguiya 2013). Only 28% of children were assessed for three danger signs as recommended by (IMCI), and only 15% of children were correctly classified (Kouanda and Baguiya 2013). About 30% of children were correctly prescribed an antibiotic for suspected pneumonia or oral rehydration salts (ORS) for diarrhoea and 40% were correctly referred (Kouanda and Baguiya 2013).

In 2014, Terre des Hommes (TdH), a Swiss non-governmental organisation, together with the Ministry of Health (MoH), launched the Integrated electronic Diagnosis Approach (ieDA) intervention with the objective of improving adherence to IMCI guidelines in public primary health centres in two regions of Burkina Faso. In this paper, we present the design of a mixed methods evaluation of this intervention.

Burkina Faso is composed of 13 regions and 70 health districts. The public health system is characterised by a three-tier service structure: (i) at the first level are the districts with 2,000+ health centres (Centre de santé et de promotion sociale (CSPS)) and the 104 district hospitals (Centre médical avec antenne chirurgicale (CMA)), (ii) at the next level are the nine regional hospitals (Centre hospitalier régional (CHR)), and (iii) finally the third level is comprised of the three national teaching hospitals (Centre hospitalier universitaire (CHU)) (DGS/DGSSS 2012).

The IMCI approach was implemented only at the first level of the pyramid, i.e. in health centres. These facilities deliver a minimum package of services defined by the Ministry of Health comprising both preventive (e.g. vaccinations, antenatal care, health education, and promotion of proper nutrition, hygiene and safe water) and curative measures (e.g. treatment of common illnesses, maternal and child consultations). CSPSs are governed by a management committee (comité de gestion) composed of members of the community. The district health management team is in charge of supervising CSPSs and analysing routine data collected in them (Ministère de la Santé 2011).

**The Electronic Register of Consultations (REC) and the ieDA intervention**

The “electronic register of consultations” or “Registre Electronique de Consultations” in French (REC) was designed in 2010 by Tdh (Deflaux 2010). The REC software, based on the CompCare software language, is installed on the open access CommCare platform developed by Dimagi (Deflaux, Agagilate et al. 2014). The REC guides health workers through the IMCI algorithm. By doing so it aims to improve adherence of nurses to the clinical protocol and to provide the local health district and the MoH with routine data on the management of childhood illnesses. The first versions of the REC were piloted in 2011 and 2012 in fifty-two primary health facilities located in two districts in the Nord region and perceived by 90% of users (nurses) as being a supportive tool during consultations (Yameogo, Stoll et al. 2011). An additional pilot district, Yako, was added in the Boucle du Mouhoun region in 2014 and 2015. Following the pilot phase, the MoH requested Tdh to expand the implementation of the REC to the remaining health districts of both regions.

In order to do so, Tdh launched in 2014 the ieDA intervention, which includes the following five
The research methodology

The IeDA intervention is being evaluated using a mixed-methods study design composed of the following three interlinked studies (see Figure 1) (Blanchet, Lewis et al. 2016):

1. a stepped-wedge trial to evaluate the effect of IeDA on adherence to IMCI guidelines in primary health facilities;
2. a cost-effectiveness analysis (CEA) to assess the value for money of the delivery of IeDA;
3. a realistic evaluation to understand the implementation process, the mechanisms by which the IeDA intervention leads to change and to identify factors that may affect these mechanisms at health centre and community levels.

These three studies are taking place in a total of eight health districts across the Nord and Boucle du Mouchon regions, with the three districts where Tdh piloted the REx excluded from the evaluation.

We structured our study in four steps:

- the formulation of the middle Range Theory, the design of the study, the data analysis and presentation of the results. A realistic evaluation starts from a middle range theory (MRT), which is understood as “theory that lies between the minor but necessary working hypotheses (…) and the all-inclusive systematic efforts to develop a unified theory that will explain all the observed uniformities of social behaviour, social organisation and social change” (Merton 1968). The MRT states how the intervention leads to which effect in which conditions. The MRT can be formulated on the basis of existing theory and past experience. If the latter is not available, exploratory-on site research can be done to unearth the models used implicitly by the stakeholders to make sense of the intervention, what Pawson and Tilley called “folk theories” (Pawson and Tilley 1997). Through individual interviews and focus groups discussions, the key elements of the problem and the intervention, the expected outcomes and potential moderating factors are to be identified (Donaldson 2007). Additional information was derived from programme documents. A literature review identified studies reporting causal chains, moderating factors and unintended outcomes, allowing a plausibility check of the preliminary MRT. The result is then again discussed with the stakeholders and results in the MRT that will be tested.

Regarding design and research methods, realistic evaluation is neutral (Pawson and Tilley 1997); the hypotheses as expressed by the MRT are guiding the choice of data to be collected and the methods and tools to be used. Most theory-driven evaluations in healthcare use the case study design and combine quantitative and qualitative methods. Pawson and Tilley (1997) call the working hypothesis that emerge during the analysis phase "Context-Mechanism-Outcome configuration" (CMOC). For Pawson and Tilley, issues of context and mechanism are crucial elements to consider in any realistic evaluation as they help to explain 'what works, for whom and in what circumstances. For these authors 'what works' is not of itself a helpful question as: 'programs work (have successful 'outcomes') only insofar as they introduce the appropriate ideas and opportunities ('mechanisms') to groups in the appropriate social and cultural conditions ('contexts').'

They summarise their approach to evaluation through the use of a formula: Context + Mechanism + Outcome (CMOC) and subsequently focus considerable attention to describing the specific characteristics of contexts and mechanisms during the evaluation.

For Pawson and Tilley, the context embraces a wide variety of elements such as: ’Programs are always introduced into pre-existing social contexts and…these prevailing social conditions are of crucial importance when it comes to explaining the successes and failure of social programs. By social contexts, we do not refer simply to the spatial or institutional location into which programs are embedded. So whilst indeed programs are initiated in prisons, hospitals, schools, neighbourhoods, and car parks, it is the prior set of social rules, norms, clues and interrelationships gathered in these places, which sets limits on the efficacy of program mechanisms’.

Mechanisms in their turn are not merely interventions or actions but theories: 'which spell out the potential of human resources and reasoning' and can be translated into a programme of evidence-based action. For the researcher, ‘identifying mechanisms involves the attempt to develop propositions about what it is within the program which triggers a reaction from its subjects’.

Consequently, adopting a realistic approach means two things:

- the researcher to identify the potential mechanisms for change within a programme/ intervention and specify how they are able to overcome or change existing social processes.
- The researcher to specify the social and cultural conditions necessary for the change mechanism(s) to operate as well as locating them in different contexts. There may be multiple combinations of mechanisms and contexts that could facilitate action in the desired direction.

The task for the researcher is to distil the key potential mechanisms and contexts and examine how they interact in practice. It is also important to note that the generation of particular ‘change mechanisms’ can fulfil different functions in different evaluation contexts. For example, realistic evaluation can be used in circumstances where it is possible to establish more control over the context. These may be circumstances where there is a considerable body of evidence about the performance of different interventions and what is sought is the opportunity to test the workings of these mechanisms within pre-specified and selected contexts. However, in other circumstances, there may be relatively little evidence about how a particular intervention will operate because it is new and its use is not restricted to contexts defined by the researcher. In these circumstances, the task for the researcher is to identify the potential mechanisms and contexts as well as examining how they interact in practice.
Formulation of our MRT

We formulated our MRT on the basis of an explorative study of the pilot districts where iEiDA was first tested. During that study, interviewees indicated the importance of the characteristics of the innovation as a driver for use and the importance of the facility setting as a physical and organisational structure. We also found indications that the perception by communities was a determinant factor that influenced health providers’ behaviour to adopt and use iEiDA. A second source of inspiration is the realist synthesis of 36 peer-reviewed papers we conducted on the factors influencing the use of electronic Computer-Based Decision Support Systems (eCDSS). It highlighted the interrelation between the properties of the innovation itself with the organisational environment. The contextual factors that influenced negatively the use of eCDSS were: financial incentives; competing programmes; previous knowledge and use of IT; high clinician turnover; link of eCDSS to an ordering system; and individual patient preferences for treatment. The complexity, lack of a relative advantage, and incompatibility of eCDSS with workflow, current practice and beliefs of clinicians was associated with low use of eCDSS. Trialability and change valence did not influence eCDSS use.

Implementation evaluation

The implementation evaluation aimed to document how the implementation of iEiDA was organised and achieved, and how the intervention was received. This implementation evaluation focused on fidelity, dose delivered (completeness), dose received (exposure), reach (participation rate) and recruitment (Saunders, Evans et al. 2005). Fidelity is about comparing what happened in practice in the four districts to what was planned in iEiDA project documents (Moore, Audrey et al. 2015). We decided to prioritise in the analysis the a limited number of key interventions of iEiDA, selected according to the intervention theory of change and the opinion of main stakeholders: tablets and REC availability, IMCI/REC training, supervision and the sequencing of these activities. (Bonnell, Fletcher et al. 2012, Moore, Audrey et al. 2015).

Mixed methods: embedded realistic evaluation

The realistic evaluation approach is defined by Pawson and Tilley (1997) as a series of principles and theories. However, the authors do not provide any guidance on how to translate these principles into research methods (Rycroft-Malone, Fontenla et al. 2010). Indeed, they advocate for methodological pluralism and the use of mixed methods.

Using more than one research method can generate a more accurate analysis of the phenomena being studied (Morse 2003). Mixed methods (MM) research is defined as “the combination of quantitative and qualitative approaches that provide a better understanding of research problems than either approach alone” (Creswell and Plano Clark 2007). In particular, we paid attention to potential unanticipated factors. Social, political, resources and logistical factors were screened and added throughout the study. Various sources of information were used: individual interviews and document review (project documents as well as national policy documents).

Context evaluation

The context evaluation aimed to document factors external to the intervention that may have acted as moderators of implementation and outcomes (Pawson and Tilley 1997), i.e. as facilitators or barriers to iEiDA implementation and affecting REC use (Moore, Audrey et al. 2015). In particular, we paid attention to potential unanticipated factors. MM have been extensively described in the literature and be summarized as follows: (i) MM gives the opportunity of providing an overall understanding of the nature of the theory-of-change model and how it actually operates. A quantitative and qualitative approach is required to explore the research questions and deal simultaneously with the inductive and deductive theoretical drives (Marchal, Westhorp et al. 2013).

Quantitative data and qualitative data are collected concurrently: quantitative numerical data is collected from questionnaires and clinical observation and qualitative data (text data, transcripts and memos) from open-ended questions included in semi-directed interviews, focus group discussions, documents review and observations. In this research, qualitative and quantitative methods are mixed throughout all phases of the project from the design stage through data collection to data interpretation.
Realistic evaluation design and research methods

Conceptual framework

The study's theoretical framework integrates various components, including the four areas that play a role in protocol-based care in general and related impact on stakeholder outcomes: patients, health staff, service providers and policy makers:

1. What are the properties of the REC tool?
2. How was the approach implemented and the tool used?
3. What is the impact of the approach and its unintended consequences?

Study design

In order to capture social phenomena such as management decisions and interactions between individuals, an in-depth qualitative research approach was adopted. According to Fitzpatrick and Boulton (1984 p. 107), qualitative research “is used where it is important to understand the meaning and interpretation of human social arrangements such as hospitals, clinics, forms of management or decision making”. Qualitative research aims to generate concepts and theories that can be generalisable (Green 2008) - what Yin called “analytic generalisation” in opposition to “statistical generalisation” (Yin 2003 p. 92). In real-life contexts, qualitative research and, more particularly, case study methodologies are known to be appropriate for understanding and interpreting complex causal links in natural setting interventions (Keen and Packwood 2000).

Data collection

Various sources of data were used by the investigator during data collection that took place between January 2016 and October 2017. The combination of several data sources proved valuable to the research. Direct observation in health centres generated elements of information that helped to identify new issues or verify assumptions. The analysis of project reports from health facilities helped analyse the implementation of IeDA and the vision of the project by managers. In addition, interviews and focus group discussions provided evidence in relation to the perceptions, in-depth opinions and understandings of actors intervening in IeDA.

In-depth interviews were conducted with 154 individuals including 92 healthcare workers from health centres, 16 officers from district health authorities, 6 members of health centre management committees. In addition, 6 focus groups (on average 11 people per group) were organised with mothers and carers.

The sampling procedure was chosen according to the objectives of the study: generating theories and concepts rather than generalising findings to a wider population. Therefore, a purposive rather than a probabilistic sampling method was deliberately used by the investigator (Patton 1999, Bowling and Ebrahim 2000). Purposive sampling is used when researchers "seek out groups, settings and individuals where ... the processes being studied are most likely to occur" (Denzin and Lincoln 1994 p. 292).

For the implementation evaluation, a set of process research questions were defined prior to the evaluation and according to the IeDA theory of change (Oakley, Strange et al. 2006). Most of the information collected was triangulated from different sources. This was particularly important as the data were collected retrospectively hence subject to recall biases. A combination of electronically documents review and in-depth interviews were conducted in 2017.

Data analysis

The initial coding was based on a preliminary list of codes inspired by the MRT and on additional ideas that emerged from the fieldwork. In a second round of analysis, some themes and patterns emerged. In order to structure them as CMO configurations, we found it useful to borrow categories from theory-driven evaluation (Chen 1990). We described the intervention in terms of content and application, and the intended and actual outcomes. We drew on our interviews, observations and document analysis to differentiate the vision (what the team wants), the discourse (what they say) and the actual practice (what they do). We described the organisational climate perceived by staff in terms of procedures, structures and incentives (Schneider, Gunnarson et al. 2004). In order to indicate how the intervention worked, we analysed both the context and the intervening mechanisms and attempted to identify the essential conditions.

In terms of implementation evaluation, we analysed the concepts of fidelity (How much has IeDA been delivered as intended? What has not been delivered?), dose delivered (What parts of IeDA were delivered most and least successfully to DHMT, primary healthcare facilities and healthcare workers?), dose received (Which content and activities of IeDA were attended best by participants?), reach (What proportion of the intended healthcare workers was effectively exposed to IeDA?) and recruitment (What was conducted to encourage adherence to IeDA activities and REC use?).

Table 1: Number and profile of individuals interviewed during the realistic evaluation

<table>
<thead>
<tr>
<th>Profile</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare workers</td>
<td>92</td>
</tr>
<tr>
<td>Health district officers</td>
<td>16</td>
</tr>
<tr>
<td>COGES</td>
<td>6</td>
</tr>
<tr>
<td>Carers</td>
<td>5 Focus group discussions, 9 individual interviews</td>
</tr>
<tr>
<td>Drug stock managers</td>
<td>3</td>
</tr>
<tr>
<td>Village representatives</td>
<td>2</td>
</tr>
<tr>
<td>Community health workers</td>
<td>6</td>
</tr>
<tr>
<td>Regional health authority</td>
<td>1</td>
</tr>
<tr>
<td>Health centre maintenance officer</td>
<td>2</td>
</tr>
<tr>
<td>Traditional chief</td>
<td>2</td>
</tr>
<tr>
<td>MoH Officers</td>
<td>6</td>
</tr>
<tr>
<td>TDH</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>154 Interviews + 5 focus group discussions</td>
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</table>
The management vision

We analysed the views of the implementation team members at MoH and Tdh to understand their respective roles, the implementation process and the effect they aim to achieve. The vision is well shared between senior MoPH officers and Tdh managers: the introduction of the REC aims to support the scaling up of IMCI in Burkina Faso with the ultimate goal of improving adherence to IMCI protocol and quality of child health services at primary health care level. But this vision has evolved over time with the implementation of iLeDA to encompass new dimensions. As well as improving adherence to IMCI protocol at health centre level, the vision of the project also included aspect related to centralisation and availability of patient data to decision makers for remote monitoring, targeted supervisions and tailored trainings. As managers describe it, it also fills a gap in the health information system in Burkina Faso and aims to influence the way health centres are managed. Data is put at the centre of the management processes and made available from 2017 to district managers and health centre managers in order to guide their decisions and tailor their supervision and coaching visits.

At the health centre level, there is clear consensus with management level on the IMCI adherence aspect of the project. "When we use the REC, we have to follow each single step of IMCI. This means that we scan all the health problems of a child. This requires that we ask all the IMCI questions and help us have a global diagnosis. This is a better management of the child" (Nurse in health centre).

However, the vision of management on centralisation of data for better management is not really as being part of the vision of health centre staff (nurses and nurse assistants). They rather mentioned another data-related aspect of iLeDA that is central to them: the REC gives them access to patient medical history: "If a child comes for consultation, we type his/her name and the name of his village, and we retrieve his history in a few seconds. This is impossible with the manual registry" (nurse, health centre).

The actual intervention

Based on the analysis of interviews and project documents, we found that the list of activities that really constitute what the intervention is about goes beyond the original vision. The project has been very dynamic experiencing several stages of changes mainly guided by the feedback received from the users. Tdh has put in place dialog mechanisms with healthcare staff in order to ensure that the evolution of the tool and project take into account users’ feedback.

The original activities identified by the implementation evaluation are as follows: (i) Delivery of IMCI and REC training; (ii) Provision of tablets and solar kits; (iii) IMCI/REC supervision session at facility level; (iv) Organisation of Quality Improvement sessions; and (v) Use of REC during child consultations.

Between May 2015 and December 2017, the intervention evolved. Several activities and tools were added during the year 2017 primarily to improve knowledge and data use for management and clinical care: (i) development of dashboards at health centre level; (ii) supply of a second tablet to larger health centres; and (iii) online learning modules on IMCI. The REC itself evolved several times during the project period experiencing several software improvements on the tablet and the backend of the tool (data analysis) resulting in several consecutive versions of the REC.

Intensity of implementation

We analysed the actual implementation of iLeDA using the framework described in the method section. Each activity was analysed in terms of implementation. Between March 2015 and December 2017, all the health centres in the 17 districts were supplied with one tablet and one solar kit in total, 608 health centres were covered. Regarding the provision of a second tablet, only 25 tablets were distributed as a second tablet with only one supplied during the year 2017.

In terms of training, it was originally planned to train all HCW on IMCI/REC. By the end of 2017, Tdh and MoH managed to train 88% of the nurses (both State and Certificate), their primary target as they are the ones who are supposed to conduct child consultations and use IMCI, according to national MoH policies. Over the years, the training strategy was extended to other cadres as the implementers realised that, on the ground, other cadres take over for consultations when nurses are not available at the health centre (on holiday, sick leave or training). The innovation is that the project managers did not hesitate to negotiate with MoH an exception measure for the project to adjust the national policy on IMCI, based on information from health centres on whom is involved in conducting consultations. As a result, the project managers included in the initial training midwives, midwives assistants and even outreach workers.

In terms of supervision, 90% of supervision was conducted as planned every month. All stakeholders reported that recruiting and retaining supervisors who had enough time to dedicate to supervision activities was highly challenging in most districts.
The political and policy context

The political context

A Coup d’État occurred in September 2015 and caused a few interruptions in the implementation of leDA activities. At that time, leDA had been deployed in two new districts, Toma and Solenzo districts. All activities were paused for five weeks, which primarily impacted the supervisions and the training of healthcare workers. It also created uncertainties amongst project managers and health district managers on the future and how the leDA project would be implemented, and the whole government was changed.

The policy context

Free healthcare policy initiative

During the course of the project, a new policy emerged, which would potentially directly affect the utilisation of health services at health centre level. A free healthcare policy for children under 5 was nationally formulated in September 2015 with a Law establishing a compulsory Universal Health Insurance (Conseil National de la Transition 2016). Following the implementation of this policy, the number of consultations in health centres increased as shown in Figure 3.6. It is likely to have had a negative impact on the workload of health care staff in health centres and the systematic use of REC, which might have been the case in Toma district. The introduction of the new policy coincided by the start of the malaria season. According to nurses interviewed, the period of adaptation to the new workload lasted around 7 months as soon as the malaria season ended and they had time to reorganise their services. In other words, the utilisation of REC was not deeply and durably impacted by the new policy.

Staff turnover

leDA was implemented in rural remote areas, where healthcare workers usually do not want to spend more than a few years and where staff turnover was anecdotally said to be high. For example, in Taito district, it was reported that up to 95% of newly arrived staff were healthcare workers coming straight from nursing school with no previous experience. During interviews, district managers estimated that newly arrived staff worked during an average of three years in the district before asking to be transferred to another district. Staff turnover was also seen as a challenge for Tdh who worried about training staff and sustaining the utilisation of REC in each health centre.

In July 2017, all health care workers working in the four districts where leDA had been implemented, 31% of healthcare workers (62 out of 198) who were asked to use the REC had not benefited from the IMCI/REC training. This was exclusively explained by staff turnover: nurses who had been trained by the leDA project had been transferred to other districts and replaced by staff who had not received the initial IMCI/REC training. To triangulate the information, all 40 health centres were surveyed to understand staff turnover. It was found that 36% of nurses had been changed within the last 12 years, period of time corresponding to the first IMCI/REC training. Anecdotally, district managers confirmed that the rate is constant every year. This means that every 12 months, around 40% of the nurses or midwives move to another facility (most of the time outside the district).

The innovation attributes

Health systems are viewed as complex systems (Institute of Medicine 2001, Pisek and Greenhalgh 2001). Complex systems are systems with a high number of elements or actors that interact with each other in ways that are not always predictable following the introduction of an innovation (e.g. a new health intervention) (Borgatti, Everett et al. 1990, Rihani 2002). Introducing an innovation into a complex adaptive system (e.g. a health centre) can produce extensive changes in various socio-technical aspects of the system, including tasks of individuals, relationships between actors or management mechanisms (Greenhalgh 2008, Blanchet 2013).

An innovation is defined in this paper as “an idea, practice or object that is perceived as new by an individual or other unit of adoption” (Rogers 1995). The process generated by the introduction of an innovation is described by Rogers (1995) as an “innovation-decision process”.

Diffusion of innovation theory can help explain how the continuation of activities is related to the attributes of activities as innovations. Beyond the description of an innovation as a newness, Rogers (1995) showed that innovations are characterised by five attributes:

1. relative advantage - individuals assess innovations by comparing the expected advantage of the new initiative with the benefits provided by the previous one that it replaced;
2. compatibility - an innovation is perceived as compatible when the new idea or technology introduced by the innovation is consistent with the mandate of the adopters or the adopting system and does not require significant modifications from the adopters (Aubert and Hamel 2001, Denis, Hebert et al. 2002);
3. complexity - the perceived difficulty in understanding a new idea or using a new technology. A complex innovation can also be an intervention which involves a high number of actors (Grilli and Lomas 1994, Denis, Hebert et al. 2002);
4. triability - the notion that an innovation can be tested on a small scale (Veton, Sharma et al. 1999); and
5. observability - the degree to which the results of the innovation are visible (Grilli and Lomas 1994, Rogers 1995).

The leDA intervention and more specifically the technological innovation, the REC, the CDSS provided to nurses at the start of the project on small laptops and later on tablets was analysed in relation to Rogers’ attributes: comparative advantage, compatibility, complexity, triability and observability.

Comparative advantage

In terms of comparative advantage, the REC was compared by healthcare workers to the previous situation where only paper-based version of the IMCI was available. We know from the trial that IMCI paper-form was used for 68% (916/1,343) of the consultations in the control arm respectively, while the REC was used in nearly all consultations (97%, 674/694) The healthcare workers highlighted the advantages of the REC, which is described as a tool covering several functions. The REC has been well accepted by healthcare workers and has become a routine tool in their practice to the point that healthcare workers contribute to the maintenance of the tool, regular synchronisation and do not hesitate...
takes more time than only focusing on protocol is followed step-by-step The community really perceived a treatment and the prescription. Huge no need anymore to search in the classification, the medicine you mentioned by the carer. The REC have access to the protocol without the healthcare workers to directly complete the consultation. The software developed for the project uses conditional logic where the following questions and steps depend on the answers previously registered by the healthcare worker and no skip option where every variable needs to be recorded to enable the healthcare worker to progress to the next step. The district officers as well as the healthcare workers recognised that the tool is well designed and enables the healthcare workers to directly have access to the protocol without searching for the right information, commonly called “autonomy and decision power”. As a result, the ‘machine’, brings its own independent opinion on the top of the healthcare worker’s opinion.

“If you directly register the child in the REC, it [the REC] provides the classification, the medicine you need to prescribe, even the dose. So no need anymore to search in the documents (ie IMCI paper protocol). So to me, it is much easier like this: you ask questions, record the answer and this is the prescription. Huge advantage!” (Healthcare worker)

Another advantage of the REC is the capacity to generate a patient registry and even the medical history of the child. The information from the previous consultation are recorded in the patient file. The paper-based hinging previously used could not make this task possible. Thanks to the patient history function, the healthcare worker can refine his/her consultation and ask further questions to the carer. This function is well appreciated by the community who understands the advantage of having access to the medical history of patients. Access to the medical history of the child is probably the most visible function from the perspective of the carer.

“Once they [the nurses] type the name of the child, they can see a lot of information as they already can tell the age”. (Mother)

Another important function of the REC is the centralisation and sharing of data (including monthly reports). The patient registry is saved on the tablet, saved on a cloud and shared with district and national authorities.

“Of REC was one of the main concerns from the national policy makers considering the limited level of computer literacy of their staff at primary health care level. It appears that the use of the tool is as effective as the traditional paper protocol, but less time consuming. The district officers as well as the healthcare workers recognised that the tool is well designed and enables the healthcare workers to directly have access to the protocol without searching for the right information, commonly called “autonomy and decision power”. As a result, the ‘machine’, brings its own independent opinion on the top of the healthcare worker’s opinion.

The tool is well designed and enables the healthcare workers to directly have access to the protocol without searching for the right information, commonly called “autonomy and decision power”. As a result, the ‘machine’, brings its own independent opinion on the top of the healthcare worker’s opinion. The community really perceived a change in the way consultations are delivered. The fact that the IMCI protocol is validated and step-by-step takes more time than only focusing on the single symptom expressed by the patient. The REC is, above all, an eCDSS tool that guides healthcare workers in their clinical decisions and help them respect the recommended IMCI protocol. Step-by-step decisions the clinicians need to make throughout the course of the consultation are guided by the software that forces the consultant to follow each step of the protocol in order to be able to complete the consultation. The software developed for the project uses conditional logic where the following questions and steps depend on the answers previously registered by the healthcare worker and no skip option where every variable needs to be recorded to enable the healthcare worker to progress to the next step. The district officers as well as the healthcare workers recognised that the tool is well designed and enables the healthcare workers to directly have access to the protocol without searching for the right information, commonly called “autonomy and decision power”. As a result, the ‘machine’, brings its own independent opinion on the top of the healthcare worker’s opinion. The tool is well designed and enables the healthcare workers to directly have access to the protocol without searching for the right information, commonly called “autonomy and decision power”. As a result, the ‘machine’, brings its own independent opinion on the top of the healthcare worker’s opinion.
coaching following the training and after practice in order to be able to ask questions, understand some of the troubleshooting methods when the software or tablet has issues and verify they are doing the correct tasks.

The feedback loops established by Tdh to accompany healthcare workers can see the improvements made compared to the previous in order to facilitate their work. The healthcare workers really understand that they are the key players in this project and that their voice and views are recorded and analysed to improve the usability of the tool.

The utilisation of REC becomes very complex when the system breakdowns. It happened that in the middle of the consultation, the software froze or the system shut down deleting all information registered during the consultation. We also observed that heads of facilities were recorded and analysed to improve its absence due to a breakdown is much part of routine practice that the introduction has become so rationalisation system to monitor the quality of the consultations. Indeed, in 2017 were introduced demonstration videos.

Observability
In terms of observability (i.e. the possibility for the users to perceive visible benefits), interviewees listed quite a few aspects. First, the healthcare workers realised that the use of REC lead to a more rational prescription of medicine and reduced over-prescription, which is usually the result from community pressure. The presence of the REC protocol provides vis-à-vis the community arguments and a rationale for the healthcare worker for not prescribing drugs when not necessary (for example when the child has a simple cough).

On the other hand, the healthcare worker through the use of REC has a better understanding of and adherence to the IMCI protocol as skipping steps are impossible with REC. The healthcare workers have the feeling that they really follow the IMCI protocol as they should do. As a result, healthcare workers feel more confident in their own classification and prescription.

"Without the REC, there are many questions we used to forget. But here, all the questions are listed and you cannot skip any of them. So to me, I think that we better manage patients. For example, when a child comes with a simple malaria, you can without the REC forget to identify anaemia." (Healthcare worker)

For the district team, the introduction of the REC does not only mean the introduction of a new technology but is really rather seen as the scaling up of the IMCI strategy.

"We have to say that before we introduced the REC, even if some IMCI departments are using it, there were only two health centres [out of 28] that were using IMCI and within the health centre, only nurse had been trained in IMCI and tried to used it during consultations. So you can imagine the proportion of children consulted with IMCI was quite low. After the introduction of REC, which was preceded by an IMCI training for all agents, I can say that now all CSPs use IMCI during consultations and more than one agent per health centre." (District Officer)

"It is really a positive change because with the REC it is really the IMCI strategy that is rolled out, which means that we introduce the IMCI forms during every consultation." (District Officer)

The REC is also a dynamic tool, which evolves with the policies and can support the dissemination of new policies at reduced cost. For example, during the course of the project in 2016, a revised version of the national IMCI protocol was introduced by MoH. The protocol was then supposed to be rolled out by the MoH, which requires dissemination of the document and ideally refreshers for all health staff. With the REC, a revision of the protocol in the software and the upload of the revised protocol on each tablet were the only tasks necessary to a full roll out of the revised protocol.

From the perspective of the healthcare workers, nurses or nurse assistants, the REC also represents a tool supporting continuous development through e-learning tools. Indeed, in 2017 were introduced online training modules with short demonstration videos.

"For example, in terms of respiratory infections, to check whether a child has a stridor, you can click on the REC to watch a short video with a specific case of stridor. The REC provides a few more extra details on what information we need to check to confirm a stridor. They are plenty of details provided." (Healthcare worker)

Another new management practice introduced by iEaDA is team work. The utilisation of the REC is more efficient when two staff are involved to conduct consultations. In several healthcare centres, we even observed that peer support was organised in order to enhance individuals practice and knowledge. Peer support was suggested by the Quality Assurance activities and coaches as an approach to enhance quality.

The iEaDA is seen by the health district officers as the introduction of a quality care approach at primary health care level. The iEaDA project of adherence strategy to IMCI promotes a comprehensive assessment of the child health, moving away from a classification based on the most visible and apparent symptoms.

"With iEaDA, it helps screen more comprehensively the health conditions of the child. It helps change the practice of health agents. Sometimes, there are consultations when, maybe. We don’t take enough time to consult the child or ask all the right questions to the mum. But with that [REC], as everything is indicated, we have to follow each step and this contributes to improve the behaviour of healthcare workers. So this is a great advantage for us." (District Officer)

"When you see on the walls the ideas of changes and the solutions. You can see a weekly programme and the indicators displayed." (Head of health district)

The quality of care approach promoted by MoH and Tdh goes beyond the improvement of individual practice and behaviour change. A real support system was put in place engaging each level of the health system in the implementation and promotion of quality of care practices. This required the involvement of a wide range of actors ranging from national actors from all levels and sectors of the health system (different departments at MoH including family medicine, statistics and information) and international donors and United Nations agencies as well non-governmental organisations and civil society organisations and individuals (opinion leaders, religious leaders). Many of these actors were involved and engaged at each stage of the project to share views on the next steps of the implementation and scaling-up of iEaDA. The recognition of everybody’s voice created an atmosphere of mutual support and trust within health centres and between healthcare staff and district health teams. There is general perception that the iEaDA has been implemented with genuine will from healthcare staff to make it work.

"The culture of performance and quality needs to start from the institutional level. We need to be able to support the institutional level, which means the national, district and health centre levels." (Tdh)

The behaviour of health workers is also influenced by the new accountability system introduced de facto by the REC. Indeed, every healthcare worker needs to log in every time they use the REC. The information officer at the district level can easily retrieve this information in case of problem. This is a significant change in the Burkinabe public service culture as for the first time this information can be used to identify malpractice (if needed).

The high level of commitment from a wide range of actors generated more autonomy for the practices and created a devolution of powers and responsibilities within the health system to monitor the quality of the services provided. Even most Heads of the health centres have a sense that it is their responsibility to monitor the quality of the consultations performed by their team. This integration of the governance system to the lowest level of the health system is a real achievement and contribution towards the routinisation of the REC at the primary health care system of Burkina Faso.

"I keep an eye on the ones who use REC and when I go around, I select the patients already consulted and check whether their name is recorded or not. If they are not registered, I call the agent and explain that all the patients need to be registered." (Head of health centre)

"The person who leads the consultation has to provide his personal details, which helps identify who is in charge of the consultation, so we know the proportion of consultations performed by nurses, as we can have an eye on how much they did and how much they didn’t do it. And when there are problems, we can identify which person has difficult conduct correct consultations." (District Officer)

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After categorising the primary data in the form of CMO configurations, a realistic evaluation seeks to examine the link between these findings and the middle range theory it set out to examine. In practice, we searched the causal pathways between the adoption and utilisation of the REC and prescription and the various management practices and dynamics in health centres.

A summary of the intervention and its outcomes

Our interviews and document review showed that the MoH and Tdh managers defined good performance as health teams who systematically used the REC, had a good score in correct classification and prescription and were able to improve over time through self-learning. In contrast (7), district health teams defined good performing health centres as health centres who were systematically using the REC, experienced limited service interruption due to system breakdown or drug stockout and were able to report their results in time. These two different definitions compared to MoH and Tdh managers, had less emphasis on quality of care but rather concentrated on the actual activities (including the initial IMCI/REC) and good accessibility of top Tdh managers to district health teams and in a certain measure to Heads of health centres anytime support is needed.

Regarding the process of implementation, we noted a good coherence between the initial theory of change developed by the implementers (MoH and Tdh), the project management team’s vision and district health teams and health centres team’s practice. Indeed, in line with their vision, the project management team motivates the health centre staff involved in child consultations (e.g., nurses, midwives and nurse assistant) through effective and regular support, dialog to identify their problems and needs in using the REC and full recognition of their role in improving child consultations. All these practices conducted by the project management team are applied to all health centres (good coverage) without any distinction of location and health cadres (good external fit) and these practices are reinforcing each other (good internal fit). Concerning the latter, this was achieved by Tdh and MoH by regular assessment of the CMO configurations related to IeDA.

The actual activities of the intervention can be summarised as follows: (i) Development and implementation of improved versions of the REC; (ii) Provision of a six-day training course on IMCI guidelines and REC; (iii) Development of a health information system. We also found important additional activities that organically appeared during the implementation of the intervention: the creation of a support system to respond to breakdowns and questions on the software and the tablet; district meetings at least once a year to enable district health teams and heads of health centres to discuss about performance and find concrete solutions; creation of eLearning modules on IMCI available on tablets for continuous knowledge development; an inclusive and team approach associating in the implementation process not only nurses but also any other staff who is directly or indirectly involved in managing child consultations; and good accessibility of top Tdh managers to district health teams and in a certain measure to Heads of health centres anytime support is needed.

Analysis

The first CMO can be summarised as: with the support of a support team responsive to healthcare staff questions and needs (C1), promotion amongst healthcare workers of “doing the right thing the right way” approaches (M4) in order to routinise notions of quality in childhood illnesses by the use of management practices (O4). The project is trying to influence practice of health care workers by moving away from “simply doing”. The awareness from MoH and Tdh that reducing the child mortality with the same level of resources from government can only be achieved by improving quality of care, which in the context of the project relates to correctness of classification and prescription. This also concerns the shift from output indicators to quality and outcome indicators, which implies an organisational culture change within MoH staff. So many practice changes expected by the implementers can be achieved through the introduction of innovative management approaches. The project management team set up an initial training programme, which guides every health staff through the IMCI guidelines emphasizing on the importance of good practice and quality of care. In addition to the initial training, regular supervision was put in place to complement initial training with in service-supervision. This was accompanied by quality assurance module where health centre to conduct child consultations. Realistic evaluation improves external validity of a case study by describing the implementation context. During the study, we found several potentially important elements in the context of primary health care in Burkina Faso in the two regions of Boucle du Mouhoun and Nord. First, all health centres in the two regions were staffed by at least one nurse (depending on health centre’s size) who were all aware that management of childhood illnesses is an important priority at primary health care, which was emphasized by the introduction of a national free healthcare policy on child health care during the course of the project. Second, the initial training of healthcare workers on IMCI was planned to be complemented by regular supervisions and coaching after initial training. Third, staff turnover of nurses is very high in rural areas of Burkina Faso making challenging the progressive development of nurses’ skills on IMCI. Finally, the capacity of district health teams to conduct supervisions is quite limited due to their budget restrictions and limited access to vehicles - volume of resources that will not increase in the near future.

CMO configurations

During the later phases of the analysis, we found that the adoption process can be grouped according to their key mechanism and this led to the description of parallel CMO configurations, each with their own outcome.

Table: the three CMO configurations related to IeDA

<table>
<thead>
<tr>
<th>Context</th>
<th>Mechanism</th>
<th>Outcome (students)</th>
</tr>
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<tbody>
<tr>
<td>C1. Availability of a support team to be responsive to healthcare staff questions and needs</td>
<td>M1. Promoting amongst healthcare workers “doing the right thing the right way” approaches</td>
<td>O1. Notions of quality in childhood illnesses routinised during consultations</td>
</tr>
<tr>
<td>C2. In health centres where the nurse is assisted by at least two other members (nurse assistants or outreach workers) and where management flexibility is allowed</td>
<td>M2. Clear distribution of roles before and during child consultations (including triage, weight and size measurements, consultation and counselling)</td>
<td>O2. Efficient organisation of the health team</td>
</tr>
<tr>
<td>C3. Strong consensus amongst stakeholders on the benefits of introducing REC</td>
<td>M3. Introducing at primary health care level the notion of individual accountability and responsibility and collective contribution to the wider system.</td>
<td>O3. Sustained use of REC as a routine practice</td>
</tr>
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</table>

The second CMO configuration can be summarised as follows: a health centre team where the nurse is assisted by at least two other members (nurse assistants or outreach workers) and management flexibility is permitted (O2) when the roles of each member are well distributed before and during child consultations (M2). Key practices in this set include creating open discussions and dialog between all health team members on how the consultation should be organised considering the introduction of a new tool, the electronic tablet, and quality assurance session. In order to be more efficient, a triage is conducted in the waiting room by a nurse assistant or an outreach agent who identifies the children in critical condition and take child measurement (e.g. size). This reinforces open relationships between health centre staff and contributes to solving practical problems and build solidarity between staff members. The quality
assurance sessions are built around context elements in the three configurations.

The new MRT
Our analysis identified three CMO configurations that indicate causal pathways between sets of management practices and use of REC and we modified the MRT accordingly:

The adoption of a computer-based decision support tool by health staff at primary health care will be enhanced by having a leadership style that includes building wide consensus from surrounding stakeholders (local and national authorities) on the benefits of using such an innovation and having a wide array of actors fully and truly engaged in the directions the project could take. This necessitates a system promoting flows of information between all levels of the health system where transparency of information is valued.

The introduction of such innovation needs to occur in an environment flexible enough to provide space to staff make decisions on the distribution of clearly-defined tasks within the team in order to better adapt their work to the new situation. On the other hand, the innovation, REC, needs to be flexible enough to take into account the constant changing policy environment and the emerging needs and requests from its users. The REC is adopted when perceived by users and district managers as being encompassed within a broader quality improvement strategy where health staff is sensitised to the importance of quality and their capacity to address quality issues at their own level.

The introduction of the REC needs to be accompanied by a supportive atmosphere and environment (including community and policy makers support), which can be translated by peer support and district authorities support, and availability of support services responding to software or hardware issues. The supportive environment is based on reciprocity and acknowledges individual contributions to the wider system.

For such environment to be promoted by a leadership that creates a decentralised decision space where initiatives are respected.

The introduction of the innovation is combined with a multiplicity of management practices including role distribution, team work, problem solving approach and task monitoring (hard) and training, supervision, support and recognition (soft).

Based on the mechanism of perceived organisational support, such combinations lead to a reorganisation of the health team and the distribution of roles before and during the consultation, and positive atmosphere that includes recognition of each team member, organisational commitment and sense of belonging. Every new comer starting in the health centre or the district are fully integrated into this new organisational culture and benefit from the same support and recognition.

Conditions for such management changes to work include open dialog at all levels of the system, a minimum of resources to cover the support services and supervision and regular discussions focusing on solving problems faced by health centre teams.

Lessons for policy and practice
This project reinforces the point that in a successful diffusion of innovations (such as in the case of leDA), it is necessary to combine the introduction of technology with support and management mechanisms. It also shows that in management of healthcare workers, it is important to mix different management practices. It also important to highlight that managers’ attitude plays a great place in the success of the intervention: open dialog and respect are crucial dimensions. This is aligned with the findings from other studies.

Regarding the mechanisms, our findings relate to the analysis of Evans and Davis (2005) who situated the underlying mechanisms of high commitment management at the level of the internal social structure of the organisation. Such practices improve knowledge, practice and skills but also exert effects at the level of relationships between team members but also with line managers (in this case, the district health managers). Weak ties are strengthened, reciprocity is established and shared mental models contribute to a stronger organisational culture (Granovetter 1973, Eisenberger, Hutchinson et al. 1986). Finally, a balanced management approach is costly, especially in management time (supervision, dialog, problem-solving sessions). It requires reasonable financial resources and a management capability to deal not only with administration but also with the less tangible issues of relationships, organisation culture and motivation of staff.

Methodological lessons
We used a realist evaluation approach as we see health facilities as primarily being social entities. Evans argues that realist evaluation is well suited to investigate change in such social system (Pawson and Tilley 1997). However, appealing as it is, realist evaluation poses a number of challenges for the researcher.

The most critical issue is the attribution paradox. In complex systems, the behaviour of people is determined by many interlinked factors. Health professionals act under influence of their professional norms, social pressure, management interventions and their intrinsic motivation. Assessing the exact contribution of a set of management practices to overall performance is virtually impossible. What realist evaluation can do is to stimulate the researcher to describe a detailed picture of the causal web that includes the multiple determinants and to categorise these as intervention, underlying mechanism and context. In our case, we argue that open dialog, training and support services are essential, but we don’t know which among these sets is the most important and in which setting.

The MRT is used in realist evaluation to clarify key findings. An MRT cannot cover all possible explanations of a phenomenon. A realist evaluator does not pretend to provide the ultimate evidence that the intervention works. Rather, the MRT aims at enlightening the decision-maker, a process of utilisation of research that may be the most frequent in case of social research. In such cases, a pragmatic position should be taken whereby one tries to refine the MRT as much as practically possible with the explicit aim of providing options for improvement or scaling up rather than reaching a perfect understanding of the intervention as such.

Discussion and Conclusion
This study offers interesting insights on how the introduction of one computer-based decision support tool combined with management support practices created new work practices.

The introduction of the REC needs to be accompanied by a supportive atmosphere and environment (including community and policy makers support), which can be translated by peer support and district authorities support, and availability of support services responding to software or hardware issues. The supportive environment is based on reciprocity and acknowledges individual contributions to the wider system.

Conditions for such environment to be promoted by a leadership style that includes building wide consensus from surrounding stakeholders (local and national authorities) on the benefits of using such an innovation and having a wide array of actors fully and truly engaged in the directions the project could take. This necessitates a system promoting flows of information between all levels of the health system where transparency of information is valued.

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