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The Impact of QA Methods on Compliance With the Integrated Management of Childhood Illness Algorithm in Niger

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OPERATIONS RESEARCH RESULTS

The Impact of QA Methods on Compliance with the Integrated Management of Childhood Illness Algorithm in Niger

Abstract

In 1996 the World Health Organization (WHO) selected Niger as one of the countries for introduction of the WHO/UNICEF Integrated Management of Childhood Illness (IMCI) algorithm. As with the implementation of any new standard, managers asked, "What is the most effective and efficient method of achieving healthcare provider compliance with the standard?" The purpose of this study was to answer two questions: 1) How can the assessment of quality lead to improved care for sick children in Niger? and 2) How can performance data improve the field implementation of the IMCI algorithm?

A nonconcurrent, prospective case-control study was conducted to test three interventions. One intervention was the structured feedback of provider performance. A second intervention was the use of structured feedback coupled with formal IMCI training. The third was the use of feedback plus the use of quality improvement (QI) teams to resolve provider performance problems related to IMCI care.

Researchers collected data on health worker performance as they provided care for 483 sick children in the Tahoua Department of Niger. Data were collected at lengthy intervals over a period of 15 months using direct observation, interviews with healthcare workers, interviews with mothers and/or caretakers, and physical reviews of healthcare facilities.

Continued on page ii

Table of Contents

Abstract *Continued*

As has been demonstrated in other compliance studies, provider compliance decreased over time in all three test groups. However, when looking at the three areas (assessment, treatment, counseling) of provider compliance included in the algorithm, the degree of compliance decrease differed across algorithm areas and by test intervention.

Feedback alone demonstrated significant short-term improvement relative to problem compliance areas ($p<.05$), while feedback plus IMCI training showed a more balanced improvement across all algorithm areas (overall increase of 27 percent, $p=.05$). Feedback alone, however, was four times less costly than training. The investigation of QI teams revealed that team-based QI work on defined IMCI problems was significantly associated with high levels of compliance ($p=.008$). Study results suggest that feedback of performance and QI teams aid provider compliance with standards, however, only in targeted areas. More needs to be done to integrate QI work and feedback into ongoing IMCI implementation and supervision in order to truly link QA methods and IMCI. The results of the data analysis and suggestions for how QA methods can better support IMCI are discussed in this report.

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The Impact of QA Methods on Compliance with the Integrated Management of Childhood Illness Algorithm in Niger

Edward Kelley, Colette Geslin, Sabou Djibrina, and Maina Boucar

Abbreviations

BASICS	Basic Support for Institutionalizing Child Survival
HCW	Healthcare Worker
HFA	Healthcare Facility Assessment
IC	Junior Nurse
IDE	District Nursing Officer
IMCI	Integrated Management of Childhood Illness
TSSI	Junior Nurse
WHO	World Health Organization

I. Background: IMCI in Niger

The study attempted to assess a set of interventions designed to assist healthcare workers in improving their compliance with the Integrated Management of Childhood Illness (IMCI) standards. The Quality Assurance Project (QAP) funded a study in three districts in Niger, West Africa. QAP and its partner organization, BASICS, have extensive experience in child survival and healthcare systems management work. The development of an innovative model for child healthcare, incorporating the IMCI system and a quality management approach to improving healthcare systems, resulted from their collaboration.

This report examines both the lessons learned regarding implementation of performance feedback and the impact of compliance-related feedback during the 15 months of data collection. This specific approach for communicating standards and improving compliance is compared to formal IMCI training in terms of impact and costs. Finally, this report examines the links between compliance and quality assurance (QA) as demonstrated by facility-based quality improvement (QI) teams. The report examines the impact of IMCI-related QI efforts in detail and discusses possibilities for further linking QA and IMCI.

The World Health Organization (WHO) developed the IMCI algorithmic approach to the management of childhood illness. The approach combines case management and prevention into an integrated package to address the major diseases that kill children worldwide—diarrhea, pneumonia, measles, malaria, ear infections, and malnutrition. These diseases account for more than 70 percent of both visits to healthcare facilities and deaths of children less than five years of age (Kolstad et al. 1998). The algorithm has caused problems both from a clinical and a program management point of view. Studies of the algorithm to date have concentrated on its technical merits (Bern et al. 1997; Kalter et al. 1997; Perkins et al. 1997; Schillinger et al. 1997; Weber et al. 1997), comparing it to a gold standard for assessing the sensitivity and specificity of indicators for diagnosis of individual conditions

(e.g., anemia or protein-energy malnutrition). Even in a research environment where elevated performance would be expected because of the presence of observers in the examination room, preliminary data indicate that compliance with certain algorithmic elements is as low as 60 percent (Simoes et al.1997). This report attempts to document compliance problems as well as suggest methods to improve them.

Niger is located in western sub-Saharan Africa. According to UNICEF's 1998 statistics, it is one of the poorest countries in the world, with a per capita GNP of only $220. Life expectancy at birth, 47 years, is one of the lowest on the continent; the country's infant mortality rate is 191/1,000 live births. Niger's child mortality rates (320/1,000 live births) identify it as the country with the highest child mortality rate in the world (UNICEF 1998). In terms of quality and access, inadequate healthcare coverage is a problem throughout the country: Resource constraints plus the unavailability of drugs severely limit the efforts of providers to deliver effective service, and weak management exists throughout the system (World Bank 1996). Niger is in the "early implementation" stage of its IMCI program, which includes initial pilot district selection; guidelines and training materials adaptation for the local setting; national and district-level instructor training; and district-level planning, training, and healthcare worker follow-up. QAP/BASICS introduced IMCI in 1995, but healthcare workers were not trained until summer 1998, between the second and third data collections. The joint QAP/BASICS project in Niger constructed this design deliberately to evaluate a number of interventions to communicate standards and improve worker compliance. One intervention was the formal WHO/IMCI training course. Other interventions appraised included measurement and feedback of healthcare worker performance and IMCI implementation by quality improvement teams.

Table 1
Client Profile

Gender of Children	10/97	6/98	12/98	Total
Male	88 (44.7%)	59 (52.2%)	123 (58.3%)	270 (56%)
Female	71 (55.3%)	54 (47.8%)	88 (41.7%)	213 (44%)
Total	159	113	211	483

II. Methods

A. Research Design

The research design for this study was a nonconcurrent, prospective case-control study of the influence of alternative performance improvement interventions on compliance with IMCI standards. The unit of analysis was the individual healthcare worker. The degree to which healthcare workers complied with IMCI standards of assessment, treatment, and counseling of sick children and their caretakers defined the quality of care. The interventions tested were structured feedback of health worker performance data, team-based quality improvement, and formal IMCI training. Three districts in the Tahoua Department of Niger, West Africa, participated in the study from October 1997 to December 1998. Researchers collected data at six-month intervals, using direct observations, interviews with healthcare workers, interviews with mothers and/or caretakers, and physical reviews of the healthcare facilities. The joint QAP/BASICS project adapted its data collection methodology from the BASICS Healthcare Facility Assessment (HFA) instrument originally developed by BASICS and John Murray (in conjunction with WHO). Both BASICS and WHO have used this methodology to assess the quality of child healthcare in developing countries worldwide. The research team pretested its tools in Niger prior to the first data collection in October 1997. Researchers compiled data in the field and entered it into EpiInfo for preliminary analysis of key indicators. The SPSS 9.0 system converted and analyzed data sets from the three time periods. The data was then converted and analyzed using SPSS 9.0.

This study is unique in that the typical formula for introducing IMCI, where formal training is the first step, was not followed. The first intervention to be introduced was structured feedback of performance data in all three districts. In two of the districts, quality improvement teams were in place and began work on IMCI-related problems. Later, approximately one year into the study, formal training for IMCI was introduced into the two districts with QI teams. The comparisons discussed in the Results section of this paper examine the impact of feedback on compliance with IMCI over time, the marginal impact of quality improvement on compliance with IMCI, and

the relative cost and impact of feedback alone versus training and feedback. This study design allowed the team to critically assess the typical method of communicating standards versus alternate, "just-in-time" methods and improving compliance with IMCI.

B. Client and Site Profile

Data were collected on 483 children and the care they received over a 15-month period. These children lived in the three healthcare districts that the Tahoua Ministry of Health had selected as pilot sites for implementing IMCI.[2] Each district has from eight to 10 healthcare centers. On three separate occasions, research team members collected data at six-month intervals at all healthcare centers in a given district. Children included in the study were between the ages of two months and five years[3] who arrived at the health center on a data collection day and presented with symptoms addressed by the IMCI algorithm. These symptoms include fever, cough, diarrhea, and ear problems. The average age of the children was 19 months. Data collectors observed the care of 270 male children (56 percent) and 213 female children (44 percent). By observing providers at lengthy intervals over 15 months, the research team hoped to eliminate the effect of bias due to time within the data set. Researchers sought verbal consent from each caretaker who brought a symptomatic child to the data collection site. Table 1 summarizes the profile of children seen.

Table 2
Healthcare Worker Profile

Category of HCW	10/97	6/98	12/98
IC–Level 1	25% (4)	31.8% (8)	38.5% (10)
IDE–Level 2	75% (12)	63.6% (16)	57.7% (14)
TSSI–Level 3	0%	4.5% (1)	3.8% (1)
Total n of HCW	16	25	25
Mean time at current post (months)	29.9 (Range 3–72)	22 (Range 1–90)	20.6 (Range 0–96)
Received a supervision visit in last 6 months	87.5%	95.5%	80.8%
Trained in IMCI	0%	0%	61.5%

Categories: HCW (healthcare worker), IC (junior nurse), IDE (nurse), TSSI (senior nurse)

C. Healthcare Worker Profile

A variety of healthcare workers managed the care of children at the centers. Researchers collected data on workers' experience levels, frequency of supervision, and general knowledge of IMCI. Workers observed were primarily in either the IC (junior nurse) or IDE (nurse) category and had been in their posts nearly two years. A supervisor had visited with most healthcare workers (more than 80 percent in each time period) within the six-month period prior to data collection. The data collection periods were June and October 1997 and June and December 1998. Table 2 presents a healthcare worker profile.

III. Results

Data collectors observed healthcare workers caring for sick children and recorded both the total number of tasks completed by the workers and the total number of tasks completed correctly according to the IMCI standard. Collectors divided the data into assessment-, treatment-, and counseling-related tasks. The research team derived an overall index score for each section of the algorithm by dividing the number of correct completed assessment tasks, for example, by the total number of assessment tasks in the algorithm. In addition, they created an overall index of compliance using the same methodology (in this case, for all tasks within the algorithm).

[2] While the lack of randomization at the district level is a potential threat to the validity of the study's findings, analysis of the demographic profile and the healthcare system in these districts showed that no significant differences existed between the sample and the rest of Niger. Specific strategies to manage threats to validity are available from QAP.

[3] The IMCI algorithm is designed to treat children zero months to five years of age. Separate guidelines exist for the treatment of children between birth and two months of age, but these guidelines have not yet been communicated to healthcare workers in Niger. It was felt that including very young children in the study would skew the performance figures.

A. Impact of Performance Feedback on Compliance

Data collected in June 1997 indicated that healthcare workers (as might be expected given the incipient status of the IMCI program) were performing at extremely low compliance levels. Data collectors notified district management teams and healthcare workers at the facility level of the performance measurement results. In October 1997, researchers collected data again, using the same data collection tools. Interestingly, the results in the districts receiving feedback demonstrated a significant impact on healthcare worker performance in a number of areas. Table 3 displays the changes in four main indicators.

Improvement did not occur in all indicators, but data demonstrate that feedback regarding specific IMCI performance issues had a positive effect on compliance with standards. This was particularly true for assessment-related tasks, such as recognizing danger signs and nutritional and vaccination status. Healthcare worker compliance decreased between June and October 1997 in certain counseling areas, in keeping with their overall poor compliance. Over the entire period of data collection, workers correctly completed only 42 percent of counseling tasks. Poor performance related to counseling mothers and/or caretakers on administering medication, providing nutrition advice for the child, and communicating.

In spite of the positive short-term effect of performance feedback, a noticeable decline in worker performance occurred over time, although ongoing measurement and feedback occurred at four- and six-month intervals. This compliance decline is consistent with several studies examining compliance with standards

Table 3
Four-Month Impact of Feedback on Compliance

IMCI Indicator	06/97 (%)	10/97 (%)	% Difference
HCW checked 1 danger sign	54	88.5	34.5%*
Weight/age checked	7	92.3	85.3%*
Adequate medical counsel given	70	43.6	-26.4%*
Vaccination status checked	41	84.6	43.6%*

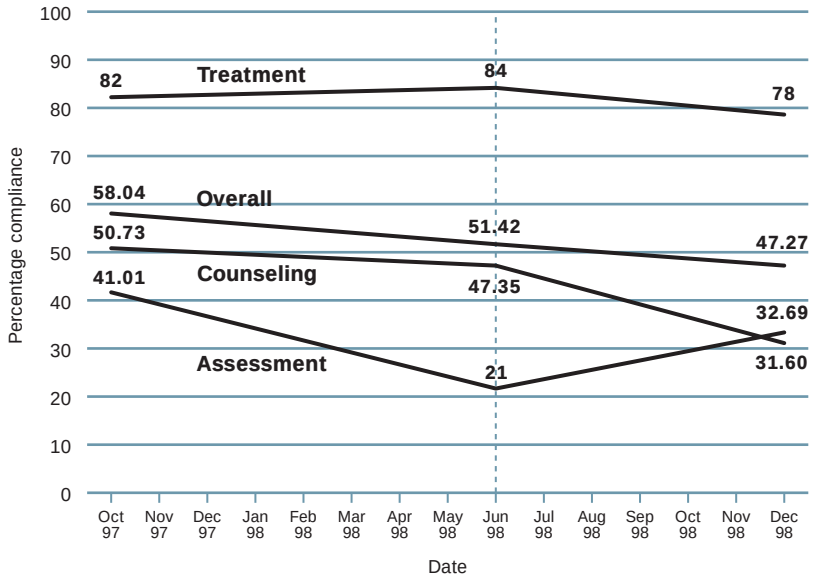
*Significant at p<=.05

Table 4
Overall Compliance over Time

Date	Mean Compliance Level (%)	N	Standard Deviation (%)
10/97	59.9	16	22
06/98	49.7	25	15
12/98	51.7	25	22
Average	52.9	66	20

N = Number of healthcare workers

Figure 1
Compliance with Individual Areas over Time

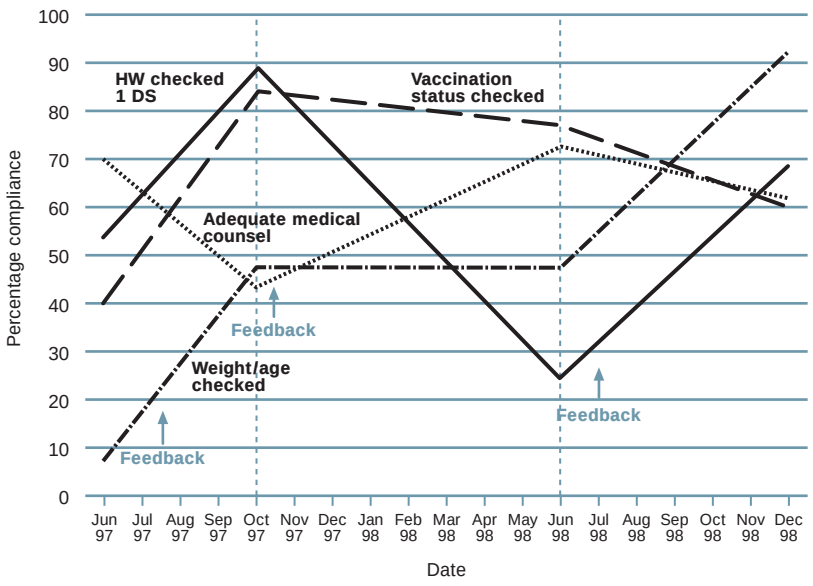


in other settings (Kolstad et al. 1998) and also with the general literature on performance. Healthcare worker overall compliance (the composite measure of assessment, treatment, and counseling compliance) deteriorated over time. Table 4 summarizes overall compliance at different times.

These changes are marginally significant at p=.2. Figure 1 displays how performance within the individual areas of the algorithm (assessment, treatment, and counseling) also deteriorated over time.[4] The data in Figure 1 include observations made from October 1997 to December 1998.[5] Healthcare worker compliance with counseling experienced the steepest drop (18.6 percent) from October 1997 to December 1998. Assessment skills decreased to 22.98 percent, then increased to 32.69 percent. Treatment compliance actually increased slightly before decreasing, an overall drop of 4 percent.

When examining the phenomenon of long-term worker performance decline, we see that even in districts that received performance feedback and showed initial improvement, compliance with IMCI standards eventually deteriorated, even with further feedback. This deterioration was not universal, however. For instance, in Konni the set of four indicators tracked earlier on assessment and counseling skills[6] showed compliance deterioration following the second measurement and performance feedback. Areas that had previously improved deteriorated and vice versa. Feedback enhanced the improvement of healthcare workers' skills in checking for danger signs and evaluating vaccination status and weight for age between June and October 1997. However, compliance with treatment counseling standards deteriorated during that same period. Following a second feedback after the October 1997 assessment, healthcare workers seemed to improve their treatment counseling performances, although other areas of compliance flattened or deteriorated. This tendency to improve in areas where compliance levels lagged persisted throughout the period of data collection. Figure 2 displays this tendency.

Figure 2
Healthcare Worker Compliance over Time in Response to Feedback (Konni)



DS = Danger Sign

[4] The data collection tool did record the clinician's diagnosis, but this was not included in the calculations of compliance, as expert medical assessment of diagnoses were not made. Calculations of correct compliance (done in a percentage) for the different sections of the algorithm were done on the basis of number of correct actions/total number of actions. The number of actions assessed therefore depends upon the individual case and the child's symptoms. Correct treatment was assessed based on ten questions on individual illnesses and one overall treatment question. Correct counseling was assessed on 13 detailed questions and three overall questions.

[5] The June 1997 data are not included in these calculations, because October 1997 was the first time that supervisors used the full data collection instrument to measure health worker compliance. These data give a more representative picture of all tasks associated with correct use of the IMCI algorithm.

[6] The indicators were whether the healthcare worker: (a) checked at least one danger sign, (b) checked weight/age, (c) gave adequate medical counseling, and (d) checked vaccination status.

B. Comparison of Performance Feedback and Training

One obvious method for improving healthcare workers' skills is formal training. IMCI training is the only official method of communicating the algorithm to healthcare workers and is a major part of any country's national implementation strategy. Niger had begun training in August 1998 (because it was in the early stages of implementation) between the third and fourth data collections. The research team attempted a detailed documentation of the attempts (including formal IMCI training) to support healthcare workers who used the algorithm. The study examined changes in overall compliance as a result of training and compared compliance changes between districts that did and did not receive training. Further research in Niger will analyze the impact of training alone on IMCI compliance; time frame restrictions do not permit this analysis here. Given the available data, the research team believes it can draw clear distinctions between feedback alone and training.

Of the 32 healthcare workers initially trained in Niger, one was a "technicien superieur" (highest healthcare worker level), 16 were IDEs, and 15 were ICs. Overall compliance deteriorated in all districts during the study period, as previously noted. Training had a positive effect on performance, however, although the results were not consistent among facilities. A review of the health centers where training took place during August 1998 reveals that two out of five centers increased their overall performances by approximately 25 percent (significant at p=.05). One other center increased its performance by 9 percent (not significant); two other centers actually declined in terms of overall compliance. Interestingly, the average score on the August training post-test was 82.8 percent, well above the average score for overall compliance in the field.

One specific IMCI training concentration area is the correct assessment of danger signs and major symptoms of childhood disease (fever, diarrhea, cough, and earache). Although overall compliance levels improved somewhat, assessment skills increased significantly in the two district facilities that received training as opposed to those that did not. While the general trend of improvement (following training) in assessment skills corresponds with our earlier findings, an analysis of variance shows that these improvements are not statistically significant. Figure 3 displays this information.

When districts receiving training are compared to the one that did not, the impact on assessment becomes more noticeable. In districts receiving training, assessment compliance went from .1998 to .4237 between June and December 1998. At the same time, however, assessment compliance for workers who did not receive training fell from 33 to 29 percent.

To further evaluate the impact of training as a means of increasing performance, we can examine short-term changes in compliance on a composite index of 17 individual assessment and counseling indicators. These represent the set of indicators that were measured consistently since the beginning of data collection in June 1997 (the data collection instruments were slightly altered after June 1997 to accommodate changes in study objectives from caretaker compliance to provider compliance). These indicators include:

Assessment tasks: Checking weight for age; evaluating vaccination status; checking for danger signs of vomiting, unconsciousness/lethargy, convulsions

Counseling tasks: Demonstrating how to administer medication; outlining what danger signs indicate

Figure 3

Assessment Compliance: Training versus No Training

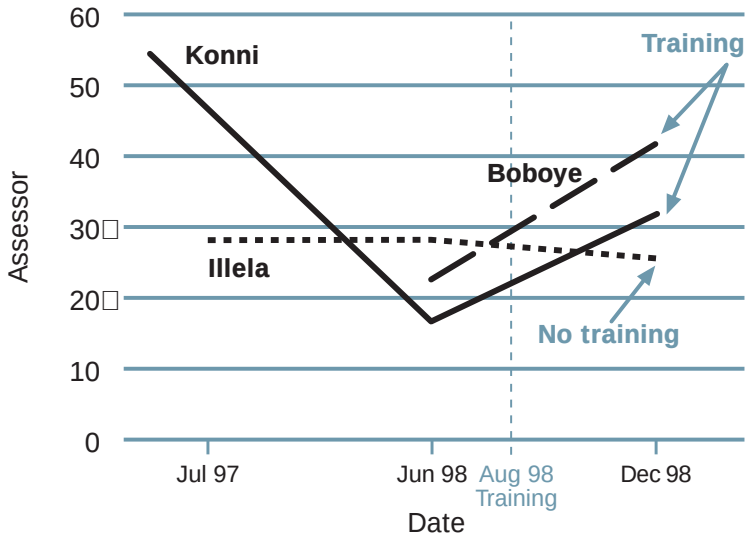


Table 5
Training versus Feedback:
Short-Term Impact on Health Worker Compliance

Intervention	Date	Compliance (17-Task Index)	Change in Compliance
Feedback	6/97	23.7%	
	10/97	13.8%	-10%*
Training and feedback	6/98	21.3%	
	12/98	48.4%	27.1%*

*Significant at p<.05

that the mother should bring the child back to the healthcare center; verifying that the mother understands the instructions; showing respect to the mother.

(This index of compliance with the 17 assessment and counseling tasks should not be confused with the more complete index of overall compliance cited in Figure 1.)

The difference between training and feedback alone on overall compliance is quite noticeable. From June to October 1997, the 17-task index score actually decreased by approximately 10 percent, a significant change at p<.05. This supports our findings that feedback had a significant impact on problem areas but was not successful at consistently improving overall compliance. Training seemed to have a more balanced impact on compliance with IMCI, because the short-term impact of training on the index score was positive. Between June and December 1998, the index score rose over 27 percent, a significant change at p<.05. Table 5 summarizes these short-term changes in compliance.

Performance interventions of training and feedback play different roles within an IMCI program. The data show that in terms of overall effect on provider compliance with standards, training seems to have a larger and more balanced impact.

In addition to evaluating the impact of training and feedback alone, the research team conducted a detailed cost analysis (supplemented with estimates based on actual local work undertaken) to calculate the expense involved in collecting performance data and providing feedback sessions. The average total cost of performance measurement and feedback was $5,546 per feedback intervention (three were included in this analysis). This includes all costs incurred locally for the data collection teams, transportation, per diems, and all other costs for the workshops (preparation of documents and other direct costs such as food and coffee). The costs outlined in this analysis included those that would be borne locally to continue the intervention. This translates into an average of $108 spent per healthcare worker for the feedback intervention.

Table 6
IMCI Training Costs

Cost Area	Percentage of Total IMCI Training Cost
Per diem and honorarium	56
Training kit and supplies	23
Space rental	10
Transportation costs	7
Accommodations	4
Total ($430)	100

IMCI training costs included all those borne locally, such as participants' and trainers' per diems, training kits and supplies, transportation reimbursements, and space rental and refreshments. The average training time in Niger was 11 days; the average class size was 16. The joint QAP/BASICS project developed its cost statistics in November 1998 through data collection and estimation. This translated into $430 per healthcare worker for the 32 workers trained across three sessions. Table 6 shows the cost breakdown per healthcare worker.

C. Impact of Quality Improvement Teams in Improving Compliance

In addition to assessing the impact of performance feedback on compliance, the research team examined how the presence of active quality improvement teams seemed to cause changes in compliance when healthcare workers received feedback. The joint QAP/BASICS project instituted team-based quality improvement activities at the facility level in two districts. The project developed a program of cascade training: It trained staff members at the district management level who then trained and later coached facility-level teams in basic problem-solving skills. Facility-level teams brainstormed, prioritized, and selected opportunities for improvement in service delivery and facility management, and developed solutions to address these opportunities.

QAP trained more than 60 Nigerien QI teams in two districts; 21 of these teams worked on IMCI-related QI cycles. (This analysis included these teams.)[7] The impact of feedback and training was constant because all the facilities, both QI and non-QI, received both. The 21 teams operated at the facility level, using team-based problem-solving techniques to analyze difficult situations and develop solutions. Seventeen quality improvement cycles focused on QI problems, including:

- Low utilization of and inadequate referral rates for nutrition services
- Underperformance in vaccination services, such as incorrect assessment of vaccination status, low coverage for measles vaccinations, and improper referrals
- Low rate of client compliance with treatment instructions
- Poor welcoming behavior and interpersonal communication
- High rate of mortality from diarrhea

Data analysis shows a positive impact on compliance by QI teams. QI and non-QI facilities were compared on the basis of IMCI compliance. The research team chose a target of 75 percent because it considered that figure reasonable for compliance with standards. Facilities performing QI cycles were much more likely to achieve above the target level on overall compliance (chi-square 7.001, p=.008).

The research team also analyzed individual QI efforts so it could examine the relationship between QI and strong IMCI compliance performance in more detail. Researchers compared performance on specific indicators between facilities that were and those that were not engaged in QI-related indicator work.

The data showed that QI facilities were twice as likely to perform above the target on the related IMCI compliance indicator (OR=2, p=.05) than were facilities that had not worked on QI efforts. These data suggest that attempts to improve IMCI performance through QI can have a significant effect.

Much room exists for the further linking of QI and IMCI. A significant relationship is evident between overall compliance levels and QI work at moderate compliance levels (75 percent). At very low and very high performance levels (below 50 and above 90 percent), the relationship between simply working on IMCI-related QI and higher compliance levels is much weaker (p=.816 and p=.886, respectively). This suggests that there are major limitations on the quality improvement model used in Niger vis-à-vis its application to IMCI compliance.

IV. Discussion

There is clearly an issue of assessing performance with a clinical standard, as was done in Niger, when the formal training for that standard has not yet occurred. However, slow implementation schedules and QAP's own research agenda permitted the project to examine an important scientific question: namely, Could assessing quality of care support improvements in the care of sick children, even prior to formal training? After examining the impact of performance feedback on compliance, the research team was able to determine how such knowledge could complement other efforts, such as formal IMCI training, in communicating standards and improving compliance over time. In addition, the research team evaluated how quality assurance methods, using facility-based QI teams, could have a positive impact on specific indicators of care of sick children.

A. Lessons Learned on the Process of Performance Feedback

Nearly the entire district management team and all the healthcare center in-charges in each district (94.1 percent) participated in feedback sessions. The teams conducted the sessions as workshops, which were held at alternating sites in the different districts. At all sessions, the research team with QAP/BASICS staff delivered an interpretation of the results of the data collection. They employed several techniques for disseminating the information collected on IMCI compliance. This type of feedback permitted immediate comparisons and informal benchmarking, or adapting best practices, among the different districts and healthcare centers involved in IMCI implementation. More than 70 percent of the participants held in-depth discussions, in both large and small groups, concerning the researchers' findings. Members of the research team facilitated these discussions, which centered on underperformance in specific

[7] QAP worked in Birni N'Konni and Illéla districts, while BASICS was the original partner with Boboye district. The dissemination of QA methods and approaches have begun in Boboye as well, but only four cycles had been initiated there in late 1998. Consequently, the Boboye teams were at the very early stages of QI work, and their efforts are not included in the analysis.

algorithmic areas and analysis of possible reasons for poor compliance.

Although healthcare workers interviewed were generally positive about the workshops, room exists for refinement of the feedback process. Only 35 percent of workshop participants took part in the small groups that analyzed performance gaps; presentations/reviews of a synthesis of either large- or small-group discussions drew 59 percent of participants. In both June and December 1998, however, additional IMCI implementation work—including new rounds of training—limited the available time for district heads and management teams to attend feedback sessions.

The workshops made significant progress in terms of reviewing problems and making recommendations for improvement, in spite of limited time available for feedback. More than 70 percent of participants felt they had achieved a consensus regarding the overall results for the three districts. Workshops identified priority problems (according to 86 percent of participants) and devised appropriate recommendations for each area of the algorithm (according to 71 percent). There may still be room for further problem analysis because only 64 percent of participants felt that they had received detailed information on compliance problems in their districts and healthcare centers.

When the results of feedback alone are compared to the effects of formal IMCI training plus feedback, the latter seems to have a more balanced impact, because improvements appear in whole areas of indicators rather than single, isolated areas. In addition, training appears to have the largest impact on assessment because the training emphasizes it. This is the most obvious "new" aspect of the algorithm for healthcare workers, particularly in the area of danger-sign assessment. To hone the training curriculum and the practica that healthcare workers engage in during the training, management teams need to emphasize important skills, such as treatment counseling and interpersonal communication. The large difference between training post-test scores and overall compliance scores in the field highlights the discrepancy between declarative knowledge and performance, and it underscores the importance of ongoing assessment of actual worker compliance.

By linking performance feedback to regular supervision, management teams can provide performance information to healthcare workers more regularly without focusing solely on problem compliance areas. The joint QAP/BASICS project and its Nigerien counterparts held a series of workshops in spring 1998 to develop an integrated, structured supervision tool to assess all areas of a healthcare facility. This tool included the evaluation of compliance with IMCI standards and offered a structured approach for observing workers' performances and offering immediate feedback. The project finalized an initial version in summer 1998 for supervisory use in the Tahoua Department. Project members trained at least eight supervisors in the target districts of Birni N'Konni, Illéla, and Boboye in the use of the tool; these supervisors had visited 22 healthcare centers and had used the tool as part of their oversight visits by December 1998. The tool's multiple modules are designed to allow the supervisor flexibility in the areas to be reviewed. Using the tool, the supervisors identified healthcare workers' specific strengths and weaknesses in caring for clients and meeting IMCI standards. IMCI-related tasks were the most frequently observed; approximately two-thirds of the supervisors stated that they worked on QI tasks as part of their oversight. The record of the supervision shows specific feedback included commentary on how the clients were greeted, workers' performances in assessing danger signs, workers' provision of sufficient counseling about malnutrition, and other areas.

The joint QAP/BASICS project evaluation cited tool usage as a method of integrating the assessment and improvement of quality of care into regular supervisory activities (Legros et al. 1999). The evaluation also noted that the tool is not ready for use in the field, because it is divided into multiple modules designed to be used at different times and is more than 80 pages in length. Researchers must further test the tool's validity and feasibility before it becomes a viable alternative as a standard supervision approach to improve workers' standards compliance.

B. The QA/IMCI Model

Management teams must support healthcare workers in the field who are attempting to use the IMCI algorithm. The performance feedback approach was one attempt to provide specific information to workers on their own effectiveness. Information on problems can provide what is commonly referred to as "procedural knowledge," but it does little to supply another major variable in the performance formula: motivation. For this reason, we examined how facility-based personnel helped workers tackle IMCI performance problems as teammates, using systematic QI methods and tools. It does appear that the

application of these QI methods and tools has had a positive effect on IMCI compliance.

At the same time, more can be done to specifically link QI and IMCI in Niger and elsewhere to develop the QA/IMCI model. First, the association between positive performance and use of QI was significant but not exceptionally strong. Second, documentation data gathered over the 18 months of the study indicated that QI teams used the results of performance feedback to identify and develop their improvement efforts only 7 percent of the time. Data used from the Nigerien national health information system (93 percent of QI efforts) and brainstorming (58.6 percent) accounted for the development of the majority of QI efforts. Finally, healthcare workers themselves frequently recommended the linking of performance feedback to QI efforts (12 percent of all comments).

The overwhelming and seemingly intractable problem of childhood mortality in Niger and similar places still remains. Results from the field show the IMCI approach to improving child care to be a scientifically sound method of treating sick children in an integrated fashion. Practical methods for ensuring that this algorithm is properly implemented in the field seem to be lacking, however. To achieve proper implementation, healthcare workers' behaviors must be changed, and such changes do not occur without effort. The analysis of background data pertaining to the health situation of children in Niger reminds us that even with proper compliance with the algorithm, many factors affect preventable child mortality in the developing world. The research results highlight promising methods for improving child care at the facility level in an extremely resource-poor environment. At the same time, these results also highlight the need for continued work in developing models for sustainable improvement in compliance with IMCI standards.

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