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The determinants and outcomes of good provider communication: a cross-sectional study in seven African countries

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Abstract

Objectives: To determine the extent of provider communication, predictors of good communication, and the influence of provider communication on patient outcomes in seven sub-Saharan African countries.

Design: Cross-sectional, multi-country study.

Setting: Data from recent Service Provision Assessment (SPA) surveys from seven countries in sub-Saharan Africa. SPA surveys include assessment of facility inputs and processes as well as interviews with caretakers of sick children. These data included 3,898 facilities and 4,627 providers.

Participants: 16,351 caregivers visiting the facility for their sick children.

Primary and secondary outcome measures: We developed an index of four recommended provider communication items for a sick child assessment based on World Health Organization guidelines. We assessed potential predictors of provider communication and considered whether better provider communication was associated with intent to return to the facility for care.

Results: The average score of the composite indicator of provider communication was low, at 38% (standard deviation [SD]: 28.1). Fifty-four percent of caregivers reported that they were told the child's diagnosis, and only 19% reported that they were counseled on feeding for the child. Caregivers' educational attainment and provider pre-service education and training in integrated management of childhood illness were associated with better communication. Private facilities and facilities with better infrastructure received higher communication scores. Caretakers reporting better communication were significantly more likely to state intent to return to the facility (relative risk: 1.17, 95% CI: 1.15, 1.20).

Conclusions: There are major deficiencies in communication during sick child visits. These are associated with lower provider education as well as less well-equipped facilities. Poor communication, in turn, is linked to lower satisfaction and intention to return to facility among caregivers of sick children. Countries should test strategies for enhancing quality of communication in their efforts to improve health outcomes and patient experience.

Strengths and limitations of this study

- This study combines data from health facility surveys with reports from patients on their experience. This unique combination allows us to assess the association between communication and characteristics of health facilities, providers and patient populations.
- In addition to empirically assessing extent and predictors of communication, this analysis is able to look at outcomes related to future behaviors, including satisfaction with the health system and intent to return the facility for future care.
- This is a large multi-country study that assesses communication across different levels of healthcare and in many settings. However, a limitation of this study is that it is cross-sectional and cannot determine causality in assessed relationships.

INTRODUCTION

Healthcare utilization has increased in many low-and middle-income countries (LMIC) in the past decade as a result of national and international focus on improving access to services.[1] However, such gains in utilization are not always matched by improvements in health outcomes, which are still disproportionately poor in LMIC.[2] This may be due to low quality of healthcare patients receive once they reach the health system.[3 4]

Measures of the quality of healthcare are typically analyzed in three domains: infrastructure, process, and outcome.[5] The process of care can be further divided into technical quality of clinical care and patient experience, or interpersonal quality.[6] Technical quality refers to the application of clinical medicine to a specific health problem, while patient experience measures focus on responsiveness of the health system to the patient's non-health needs. The World Health Organization's (WHO) 2000 World Health Report and subsequent theoretical work have defined the following eight domains of patient experience: dignity, autonomy, confidentiality, communication, choice of provider, timely attention, quality of basic amenities, and social support.[7 8]

Provider communication is a particularly important component of patient experience. Strong communication between providers and patients may enable patients to disclose relevant information and to adhere to prescribed treatment.[8 9] There is evidence in high-income countries that strong provider communication is associated with measures of technical quality.[9 10] In addition, better provider-patient communication is associated with better perceived and objectively measured patient health outcome.[11 12]

Despite growing evidence of the influence of patient-provider communication on caregiver behaviors and health outcomes in high-income settings, the quality and impact of provider communication in LMIC is not as well documented. The different structure of the health care system and distinct social contexts warrant caution in assuming that the relationships found in one environment will be reflected in the other.[13]

Understanding the determinants and outcomes of patient communication is essential in LMIC, which bear a disproportionate burden of childhood morbidity and mortality and stand to gain the most from improvement in provider-patient communication if the link between communication and outcomes is found to be strong.[2 14] We therefore had two objectives for this analysis. First, we described provider communication and its predictors during visits for sick children in health facilities across seven sub-Saharan African countries. Second, we quantified the association between provider communication and key outcomes of a healthcare visit: caregivers' satisfaction with and impressions of the visit, caregivers' intent to return to the facility if the child does not improve completely, and caregivers' recommendation of the facility to family and friends.

METHODS

Data collection and survey design

This analysis uses data from the Service Provision Assessment (SPA) surveys, which are conducted by the Demographic and Health Survey (DHS) Program.[15] These health facility-

based surveys have been completed over the past 10 years in seven countries in sub-Saharan Africa (Kenya in 2010, Malawi (2013), Namibia (2009), Rwanda (2007), Senegal (2012-2014), Tanzania (2015), and Uganda (2007)). The SPA surveys include assessment of facility inputs and processes and health worker interviews as well as direct clinical observations and client exit interviews. This analysis focuses on data from client exit interviews for visits for sick children.

SPA survey selection follows a two-stage design. Except in Rwanda, Namibia, and Malawi, where a census of all public facilities was conducted, each country's health facilities were randomly sampled after stratifying by type of facility (e.g., hospital or health center) and managing authority. Hospitals tend to be oversampled in SPA surveys. Within each health facility, patients were selected using systematic sampling. The anticipated number of patients to be seen on the day of data collection was divided by 15 to determine the interval length needed to sample 15 patients from the facility.[15] Survey weights are assigned to each child to account for both the facility and patient stages of sampling such that the weighted sample should be representative of the population of all clients seeking care. We scaled weights within each country to maintain the sample size.[15] Health workers observed providing care were interviewed about their education and training; sampling weights were similarly calculated to ensure a representative sample of health care providers.

Measurement of provider communication

We used the 2014 WHO guidelines for the integrated management of childhood illness (IMCI) [16] to identify essential elements of provider communication during sick child visits. The primary requirements of provider communication in the IMCI guidelines are clear statement of the child's diagnosis and of the recommended treatment and follow-up plan. To capture these elements we defined four indicators of quality communication: provider told the caregiver the child's illness, told the caregiver the symptoms that would indicate a need for immediate return to the facility, scheduled or discussed a return visit, and counseled the caretaker on feeding the child. These indicators were assessed using the caretakers' recall of this communication following the clinical consultation. We excluded three indicators that addressed communication of medication for the child, as these indicators may in some cases be endogenous with provision of good technical quality (provision of an appropriate treatment plan.) We calculated communication quality as the proportion of the four items performed for each visit.

Covariates

To identify determinants of good communication, we selected predictors identified using recent literature and shown on our conceptual framework (Figure 1). At the patient level, these included both the caregiver and child's socio-demographic characteristics. In order to capture potentially different treatment, by the child's presenting illness, we assessed the reasons for the child's visit as stated by the caregiver (fever, cough, diarrhea, vomiting, feeding problems, sleeping problems, and convulsions). At the provider level we assessed providers' education (both number of years of pre-service education and whether they had received recent, in the past one to two years, IMCI-related training), providers' cadre (doctor or clinical officer versus nurse versus other), how long they have worked as a clinician, and whether the provider is a manager. At the facility level we looked at whether the facility had received recent supportive supervision, the level of infrastructure available (an index of 22 items including water and electricity), the level of management support (an index of 7 items including whether quality assurance activities

are routinely carried out), whether the facility was public or private, and the level of the facility (comparing hospitals to non-hospitals).

We assessed the relation between communication and outcomes related to the caregivers' experience: caregiver satisfaction, caregivers' intent to return to the facility, caregivers' recommendation of the facility, and caregivers' perception of whether there were problems with the care provided. Caregivers were asked to rate their satisfaction with the services received on a three-level scale (very satisfied, more or less satisfied, or not satisfied). We dichotomized the variable as "very satisfied" versus "not very satisfied." Caregivers were also asked what they would do if the child did not get completely better or became worse. We coded caregivers responses as either "return to this facility" or "not return," where not returning could include going to another facility, another health worker, a traditional healer, or just wait (e.g. do not see a healthcare provider.) Caregivers' were also asked whether they would recommend this facility to a friend of family member. Finally, caregivers were asked whether certain aspects of care were major, minor, or no problem for them. We dichotomized these responses into either "problem" or "no problem."

Data analysis

We first explored the level and potential predictors of provider communication in the seven countries. We calculated descriptive statistics of the population-averaged indicators of interest using data weighted to represent the health system in each country. We screened each potential indicator in a linear regression of provider communication, controlling for country and clustering at the provider level. We retained all covariates significant at $p<=0.05$, removing those that were highly correlated with other retained predictors.

We then assessed the predictors of communication using generalized hierarchical linear regression models. Hierarchical models enable assessment of the association of both patient- and provider- or facility-level characteristics with the communication index, as well as calculation of the variation in the outcome attributable to the client versus provider. The first model included only country fixed effects, the second model added individual-level elements, and the third model included individual-, provider-, and facility-level elements with country fixed effects. We used the MIXED command with the MLE option in Stata 14.1 (StataCorp LP, College Station, TX) for all models. We included a random intercept for provider and calculated the intraclass correlation coefficient (ICC). The ICC is interpreted as the proportion of the total variation in the outcome that is due to provider-level variation.

While the SPA surveys aim to collect data from multiple patient visits for each provider, this is not always the case. Over the seven countries surveyed, there were 559 providers (4%) where only one child visit was observed. For these providers, the contribution at the child-level cannot be calculated; we corrected for this by preventing the stratum from contributing to the variance at the child-level.

The second part of our analysis assessed the potential effects of provider communication on patient outcomes using generalized estimating equations. We calculated risk ratios using a log link, exchangeable correlation structure, and robust sandwich estimator to account for clustering

at the provider level. A fixed effect for country was included in the unadjusted models, and patient-, provider-, and facility-level covariates were included in adjusted models.

All analyses were conducted using Stata 14.1 (StataCorp LP, College Station, TX.) The institutional review board at the Harvard T. H. Chan School of Public Health determined this analysis to be exempt from human subjects review.

Sensitivity analyses

We conducted multiple sensitivity analyses to assess the robustness of the results to the methods used for missing data and model specification. To ensure results were not affected by missing data, we conducted multiple imputation and repeated the analysis on 20 imputed datasets (Appendix 1). We also removed providers with a single clinical observation to better assess variation within versus between providers. Finally, we repeated the model using sampling weights accounting for the provider's probability of inclusion in the sample. Results for these final two models are presented in Appendix 2.

RESULTS

A total of 16,351 outpatient visits for sick children from 3,898 facilities and 4,627 providers were included in this analysis. On average, children were 20 months (1.7 years) old at the time of their visit. Fever was the most common reason caretakers cited for the visit (74%). Forty-one percent of the healthcare providers were nurses, and 16% of the visits included were at hospitals (Table 1).

Table 1. Client, provider, and facility characteristics for outpatient visits for sick children in seven sub-Saharan African countries

	Weighted N or mean	% or SD
Total visits	16,351	
Total providers	4,627	
Total facilities	3,898	
Visit-level		
Caregiver's age (years)	28.1	8.2
Caregiver is female	13,744	91.2%
Caregiver's education		
None	3,705	22.7%
Any primary	8,700	53.3%
Any secondary	3,430	21.0%
Any tertiary or higher	493	3.0%
Caregiver is child's parent	14,445	89.0%
Child's age (months)	20.3	15.2
Child is female	7,904	48.5%
Client paid for visit	6,768	41.4%
Duration of visit (minutes)	12.9	15.8

Reasons caregiver brought child to the facility[1]		
Fever	11,893	73.5%
Cough	11,101	68.1%
Diarrhea	4,897	30.2%
Vomit	4,082	25.2%
Problems feeding	3,724	23.0%
Excessive sleepiness	3,515	21.7%
Convulsions	652	4.0%
Provider-level		
Provider is female	7,551	46.2%
Provider's years of education	15.0	2.9
Provider's years since graduation	9.9	10.0
Provider years in this facility	4.7	6.4
Provider's cadre		
Doctor or clinical officer	7,480	45.8%
Nurse	6,632	40.6%
Non-clinical staff	2,224	13.6%
Provider is a manager	9,986	61.5%
Received recent training on sick child care	6,331	38.9%
Number of in-service training topics covered in past 3 years	5.0	3.4
Facility-level		
Private facility	3,461	21.2%
Hospital	2,620	16.0%
Received supportive supervision in last 6 months	12,378	76.2%
Infrastructure index[2]	0.57	0.17

SD, standard deviation; IMCI, integrated management of childhood illness

Notes:
Data from Rwanda and Namibia are self-weighted and in Malawi a non-response weight is used. Data from Kenya, Senegal, Tanzania, and Uganda are weighted to reflect sampling probability.
For some rows, denominators differ from the total N owing to missing data.
[1] Caregivers could report multiple reasons for bringing the child to the facility for services
[2] Mean proportion of 22 items including water, ambulance, electricity, phone, toilet, cleanliness, wait room, system for maintenance, sharps disposal, waste disposal, sterilized equipment storage, consumables storage, no expired medications, medication storage, medication supply, stock ledger, pourable water, soap, gloves, sharps box, surface disinfectant, and hand disinfectant

The average score on the composite indicator of provider communication was low, at 38%, with a standard deviation of 28.1 percentage points. In 21% of visits the caregiver reported that the provider did not complete any of the communication tasks, whereas 4% of caregivers reported the provider completed all communication tasks. Fifty-four percent of caregivers reported that

they were told the child's diagnosis, and only 19% reported that they were counseled on feeding for the child (Figure 2).

While most of the variables included in the full model assessing factors contributing to provider communication had a statistically significant association with patient experience, the effect size was generally small (Table 2). On average, caregivers who had achieved tertiary education experienced provider communication that rated 4.1 percentage points better than those with no education. On the provider side, providers who had received training in selected child health topics in the past one to two years, providers who were managers, female providers, and nurses all scored higher on the communication scale. These associations were all modest, with training having the largest association with an increase of 4.3 percentage points on the communication scale. Observations in private facilities, those that had received a supportive supervision visit, and those with better infrastructure were also associated with better communication scores. The patient- and provider-level characteristics included in the model were able to account for minimal variation between providers. Most of the variation in the communication index was due to unexplained patient-level variation and random error, with 34% of variation in the full model due to provider-level effects.

Table 2. Results of the multilevel linear regression of provider communication during sick child visits in seven sub-Saharan African countries[1]

	Model 1		Model 2		Model 3	
	β	95% CI	β	95% CI	β	95% CI
Visit-level						
Caregiver's age			0.11	0.06, 0.16	0.10	0.05, 0.15
Caregiver's education						
No school			Reference		Reference	
Any primary			0.96	-0.17, 2.09	0.79	-0.34, 1.92
Any secondary			3.92	2.58, 5.27	3.55	2.20, 4.90
Any tertiary or higher			5.07	2.76, 7.38	4.09	1.75, 6.44
Caregiver is child's parent			2.72	1.32, 4.13	2.73	1.33, 4.13
Caregiver paid for the visit			1.90	0.73, 3.08	0.64	-0.60, 1.89
Duration of the visit (minutes)			0.10	0.07, 0.12	0.09	0.07, 0.12
Reason for visit was child vomiting			1.70	0.78, 2.61	1.73	0.82, 2.64
Reason for visit was fever			1.09	0.17, 2.00	1.27	0.36, 2.17
Provider-level						
Provider's years of education					0.35	0.11, 0.58
Provider's years since graduation					0.05	-0.03, 0.12
Number of years provider worked in this facility					0.05	-0.06, 0.16
Provider's cadre						
Doctor or clinical officer					Reference	
Nurse					2.66	0.86, 4.46
Other					-2.18	-4.87, 0.52
Provider is a manager					2.81	1.49, 4.13
Provider is female					2.04	0.73, 3.35
Received training on IMCI					4.33	2.88, 5.79
Number of in-service training topics in past year					0.13	-0.10, 0.35
Facility-level						
Private facility					3.92	2.33, 5.51
Supportive supervision visit last 6					1.77	0.35, 3.19

months						
Infrastructure index					4.10	0.00, 8.19
Country						
Kenya 2010 (reference)	Reference		Reference		Reference	
Malawi 2013	-0.61	-2.88, 1.67	1.20	-1.07, 3.48	0.75	-1.57, 3.07
Namibia 2009	4.74	2.01, 7.48	3.91	1.15, 6.68	4.31	1.39, 7.23
Rwanda 2007	-10.55	-13.28, -7.82	-9.73	-12.47, -7.00	-9.20	-12.06, -6.33
Senegal 2013-2014	-3.13	-5.54, -0.73	-2.04	-4.44, 0.36	-2.25	-5.17, -0.66
Tanzania 2015	7.38	5.28, 9.48	8.16	6.05, 10.26	9.46	7.32, 11.60
Uganda 2007	9.46	6.34, 12.58	11.02	7.92, 14.11	11.15	8.07, 14.23
Random effects						
Variance between providers	275.2		260.8		244.9	
Intraclass correlation between providers (p)	0.362		0.351		0.337	
Total observations	15,039		15,039		15,039	

Notes:

CI, confidence interval; IMCI, integrated management of childhood illness

[1] The outcome, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

The provider communication index was significantly associated with all assessed outcomes (Table 3). Patients who reported a perfect score on provider communication were 1.20 times as likely to be very satisfied with their visit than patients whose provider scored zero on the communication index (95% confidence interval: 1.16, 1.24). There was also a strong association between provider communication and a patient's stated intent to return if the child did not get completely better: risk ratio 1.17 (95% confidence interval: 1.15, 1.20). Adjusting for potential confounders did not change the measures of effect. The results were robust to the performed sensitivity checks (Appendix).

Table 3. Associations between provider communication and caregivers' satisfaction with- and ratings of- care

	Percent of caregivers reporting outcome by communication score		Unadjusted results[3]			Adjusted results[4]		
	Score is zero	Score is complete	RR[1]	95% CI	N[2]	RR[1]	95% CI	N[2]
Very satisfied with the services	73.0%	85.4%	1.20	1.16, 1.24	13,752	1.20	1.16, 1.24	12,811
Would recommend the facility to others	95.2%	99.3%	1.04	1.03, 1.06	13,616	1.05	1.04, 1.06	12,690
Would return to facility if child does not get completely better	84.5%	95.0%	1.17	1.15, 1.20	16,294	1.18	1.15, 1.21	15,001
No problems with:								
The ability to discus problems or concerns	85.1%	90.7%	1.10	1.08, 1.12	16,300	1.09	1.07, 1.12	15,006
Amount of explanation received for problem/treatment	82.3%	91.0%	1.15	1.13, 1.17	16,281	1.15	1.12, 1.17	14,992
Treatment by staff	89.7%	91.9%	1.05	1.03, 1.07	16,288	1.05	1.03, 1.07	14,992
Quality of the exam and treatment	83.9%	87.1%	1.12	1.08, 1.16	5,838	1.12	1.08, 1.16	5,188

Notes:

CI, confidence interval

[1] The exposure, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

[2] Questions on caregiver satisfaction and whether they would recommend the facility were not asked in Rwanda and Uganda. The question on quality of the exam and treatment was only asked in Kenya, Rwanda, and Uganda

[3] Adjusted for country.

[4] Adjusted for patient-, provider- and facility-level characteristics: caregiver's age, caregiver's education, caregiver's relationship to child, payment for visit, duration of visit, reason for visit, provider's education, time since provider graduated, time provider worked in this facility, provider's cadre, provider's managerial role, provider's sex, providers receipt of IMCI training and in-service training, facility management, supportive supervision, facility infrastructure and country.

DISCUSSION

Across more than 16,000 visits for sick children in seven sub-Saharan African countries, provider communication was poor. These findings from nationally representative surveys of facilities corroborate findings of inadequate provider-patient communication, low quality of technical care, and poor provider effort from smaller studies in LMIC.[17-19] Additionally, there is evidence that higher communication is associated with both higher client satisfaction and intent to return to care.

We found a number of client- and provider-level factors with modest, but statistically significant associations with patients' report of provider communication. Most of the variation in communication was due to differences between patients, rather than differences between providers, which reflect similar findings from a study in the UK.[20] The level of reported provider communication increased with caregiver's education. Visits with caregivers who had some secondary school were rated four percentage points higher on communication than visits with caregivers who had no formal education. There are several possible reasons for this association. Educated caregivers may be more likely to initiate communication with providers or may have a higher capacity to understand providers and remember what has been communicated. Alternatively, providers may make a choice about what to communicate based on the education level of caregivers. Regardless of the etiology for the disparity, it is important for providers to recognize it and focus on improving communication with individuals with lower education using methods that improve patient understanding. While there are many examples of successful interventions for improving patient-provider communication in high-income countries, there are few in LMIC.[21] Job aids may be one way to aid in provider communication and patient understanding, particularly amongst patients and caregivers with low educational attainment.[19]

Providers with fewer years of training, such as counselors and community health workers, were less likely to provide high quality communication. These findings highlight the importance of assessing provider communication, as well as technical care and health outcomes, when evaluating the impact of task-shifting responsibilities from doctors and nurses to staff with less training. Visits with nurses were associated with better communication than both clinical officers and non-clinically trained providers. Training on sick child care was associated with slightly better communication, which supports results from a more detailed but smaller study on the impact of IMCI training on the quality of counseling provided in sick child visits in Mali.[22] However, the increase in communication found here was small: only four percentage points. A systematic review of randomized control trials of communication interventions for healthcare providers, primarily within the United States, found that communication interventions can have a positive effect on provider-patient communication, with the effect stronger for more intensive interventions.[23] Successful trainings in U.S. programs included demonstration of communication skills, observation, constructive feedback, and opportunities for clinicians to review their own responses.[21 23] While two reviews of IMCI training in LMIC found that both recent training and the length of training had little effect on the provision of technical quality indicators,[24 25] there is some evidence that training interventions focused on patient-centered communication may have positive effects on communication in SSA.[26] Our results combined with those from communication interventions in high-income countries suggest the potential for using training to improve provider-patient communication.

We found that higher provider communication was related to patients' satisfaction and intent to return. While the association of strong patient-provider communication with an increase in patient adherence to prescribed treatments and recommended prevention processes has been extensively documented,[27-29] this is the first evidence from a multi-country study in sub-Saharan Africa documenting the association between strong provider communication and patient satisfaction and planned behaviors.

This study has several limitations. First, these data were collected during visits when providers knew that they were being observed. It is possible that the Hawthorne effect could have affected healthcare provider behavior, particularly because there were fewer than five patient observations for each healthcare provider.[30] However, if healthcare providers were indeed performing to the best of their capabilities during these observed visits, then it is even more concerning that the levels of quality observed were so low, as these results would represent the upper bound of care quality. Second, in many of the regions studied, multiple languages are spoken, and in some cases the provider and caregiver may not share a common language. While language congruency is not measured in the SPA, we do not anticipate this to be an issue in the majority of clinics. Third, the indicators on the communication index are measured from the patient perspective, and we cannot determine if the items were not communicated by the provider or if they were communicated and not heard or understood by the patient. Understanding this difference may provide insight into which interventions would be most effective. However, from a measurement perspective, the literature defines patient experience as patient defined, and thus patient experience measures, including communication, are most accurately measured from the patient perspective.[31] Finally, the associations identified in this analysis cannot be interpreted causally.

Our findings are the first cross-country, nationally representative assessment of the predictors and outcomes of provider communication during visits for sick children. While there was variability between the countries in the level of provider communication, the general trends were consistent: provider communication was low, and improved provider communication was associated with higher patient satisfaction and higher intention to return to the same facility. It is possible that these results are generalizable to similar countries in the region.

The results highlight the importance of testing strategies that enhance clinical communication as a means for improving outcomes and patient experience in LMIC. Because communication gaps appeared to be higher for caregivers with lower education, these strategies could focus on targeting this population. Additional entry points for strategies for improving clinical communication may be in focusing on staff without strong clinical training and those in public facilities.

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Author contributions: EL and MEK developed the study question. EL conducted all analyses and drafted the manuscript. EL, HHL, and MEK contributed to the analysis plan, revised the manuscript, and approve of the final version for publication.

Data sharing statement: All data used in this analysis are publically available from the Demographic and Health Survey Program (http://dhsprogram.com/data/index.cfm#CP_JUMP_13446). Statistical code can be obtained from the authors upon request.

REFERENCES

1. Scott KW, Jha AK. Putting quality on the global health agenda. The New England journal of medicine 2014;**371**(1):3-5 doi: 10.1056/NEJMp1402157[published Online First: Epub Date]|.
2. Wang H, Liddell CA, Coates MM, et al. Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;**384**(9947):957-79 doi: 10.1016/S0140-6736(14)60497-9[published Online First: Epub Date]|.
3. Kruk ME, Larson E, Twum-Danso NA. Time for a quality revolution in global health. Lancet Glob Health 2016;**4**(9):e594-6 doi: 10.1016/S2214-109X(16)30131-0[published Online First: Epub Date]|.
4. Sobel HL, Huntington D, Temmerman M. Quality at the centre of universal health coverage. Health policy and planning 2016;**31**(4):547-9 doi: 10.1093/heapol/czv095[published Online First: Epub Date]|.
5. Donabedian A. The quality of care. How can it be assessed? Jama 1988;**260**(12):1743-8
6. Campbell SM, Roland MO, Buetow SA. Defining quality of care. Social science & medicine 2000;**51**(11):1611-25
7. Valentine N, Darby C, Bonsel GJ. Which aspects of non-clinical quality of care are most important? Results from WHO's general population surveys of "health systems responsiveness" in 41 countries. Social science & medicine 2008;**66**(9):1939-50 doi: 10.1016/j.socscimed.2007.12.002[published Online First: Epub Date]|.
8. World Health Organization. *The world health report 2000 : health systems : improving performance*. Geneva: World Health Organization, 2000.
9. Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. BMJ Open 2013;**3**(1) doi: 10.1136/bmjopen-2012-001570[published Online First: Epub Date]|.
10. Anhang Price R, Elliott MN, Zaslavsky AM, et al. Examining the Role of Patient Experience Surveys in Measuring Health Care Quality. Medical Care Research and Review 2014;**71**(5):522-54 doi: 10.1177/1077558714541480[published Online First: Epub Date]|.
11. Kelley JM, Kraft-Todd G, Schapira L, et al. The influence of the patient-clinician relationship on healthcare outcomes: a systematic review and meta-analysis of randomized controlled trials. PloS one 2014;**9**(4):e94207 doi: 10.1371/journal.pone.0094207[published Online First: Epub Date]|.
12. Stewart MA. Effective physician-patient communication and health outcomes: a review. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 1995;**152**(9):1423-33
13. Blaise P, Kegels G. A realistic approach to the evaluation of the quality management movement in health care systems: a comparison between European and African contexts based on Mintzberg's organizational models. The International journal of health planning and management 2004;**19**(4):337-64 doi: 10.1002/hpm.769[published Online First: Epub Date]|.
14. World Health Organization. Children: reducing mortality. Secondary Children: reducing mortality January 2016. http://www.who.int/mediacentre/factsheets/fs178/en/.
15. Service Provision Assessment (SPA) Overview. Secondary Service Provision Assessment (SPA) Overview. http://dhsprogram.com/What-We-Do/Survey-Types/SPA.cfm.

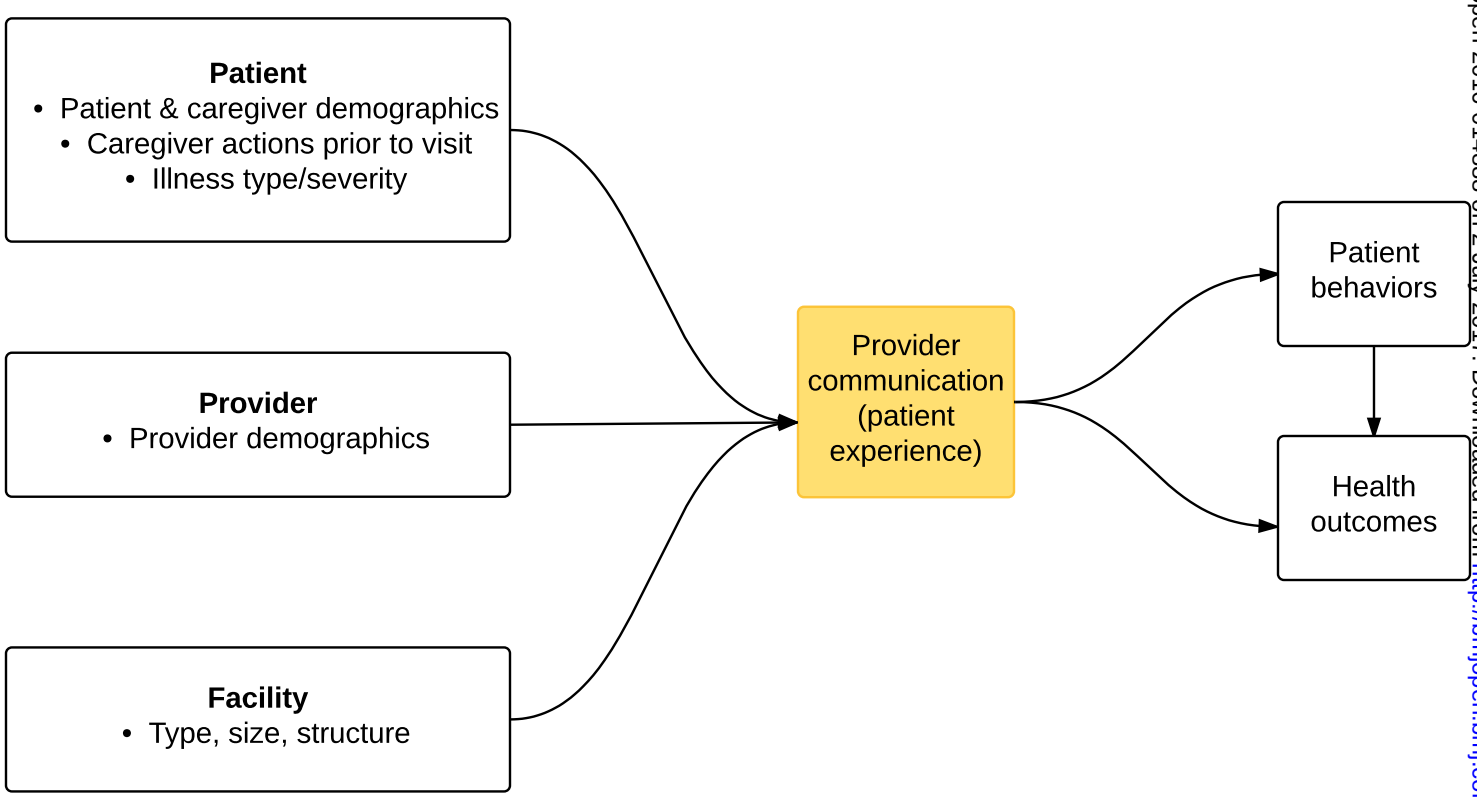
16. WHO. Integrated management of childhood illness Chart Booklet: World Health Organization, 2014.
17. Das J, Hammer J. Quality of Primary Care in Low-Income Countries: Facts and Economics. Annual Review of Economics 2014;**6**(1):525-53 doi: 10.1146/annurev-economics-080213-041350[published Online First: Epub Date]|.
18. Das J, Gertler PJ. Variations in practice quality in five low-income countries: a conceptual overview. Health affairs 2007;**26**(3):w296-309 doi: 10.1377/hlthaff.26.3.w296[published Online First: Epub Date]|.
19. Jennings L, Yebadokpo AS, Affo J, et al. Antenatal counseling in maternal and newborn care: use of job aids to improve health worker performance and maternal understanding in Benin. BMC pregnancy and childbirth 2010;**10**:75 doi: 10.1186/1471-2393-10-75[published Online First: Epub Date]|.
20. Salisbury C, Wallace M, Montgomery AA. Patients' experience and satisfaction in primary care: secondary analysis using multilevel modelling. Bmj 2010;**341**(oct12 1):c5004-c04 doi: 10.1136/bmj.c5004[published Online First: Epub Date]|.
21. Levinson W, Lesser CS, Epstein RM. Developing physician communication skills for patient-centered care. Health affairs 2010;**29**(7):1310-8 doi: 10.1377/hlthaff.2009.0450[published Online First: Epub Date]|.
22. Gilroy K, Winch PJ, Diawara A, et al. Impact of IMCI training and language used by provider on quality of counseling provided to parents of sick children in Bougouni District, Mali. Patient education and counseling 2004;**54**(1):35-44 doi: 10.1016/S0738-3991(03)00189-7[published Online First: Epub Date]|.
23. Rao JK, Anderson LA, Inui TS, et al. Communication interventions make a difference in conversations between physicians and patients: a systematic review of the evidence. Medical care 2007;**45**(4):340-9 doi: 10.1097/01.mlr.0000254516.04961.d5[published Online First: Epub Date]|.
24. Huicho L, Scherpbier RW, Nkowane AM, et al. How much does quality of child care vary between health workers with differing durations of training? An observational multicountry study. Lancet 2008;**372**(9642):910-6 doi: 10.1016/S0140-6736(08)61401-4[published Online First: Epub Date]|.
25. Leslie HH, Gage A, Nsona H, et al. Training And Supervision Did Not Meaningfully Improve Quality Of Care For Pregnant Women Or Sick Children In Sub-Saharan Africa. Health affairs 2016;**35**(9):1716-24 doi: 10.1377/hlthaff.2016.0261[published Online First: Epub Date]|.
26. Nayiga S, DiLiberto D, Taaka L, et al. Strengthening patient-centred communication in rural Ugandan health centres: A theory-driven evaluation within a cluster randomized trial. Evaluation 2014;**20**(4):471-91 doi: 10.1177/1356389014551484[published Online First: Epub Date]|.
27. Bartlett EE, Grayson M, Barker R, et al. The effects of physician communications skills on patient satisfaction; recall, and adherence. Journal of chronic diseases 1984;**37**(9-10):755-64
28. Greenfield S, Kaplan SH, Ware JE, Jr., et al. Patients' participation in medical care: effects on blood sugar control and quality of life in diabetes. Journal of general internal medicine 1988;**3**(5):448-57

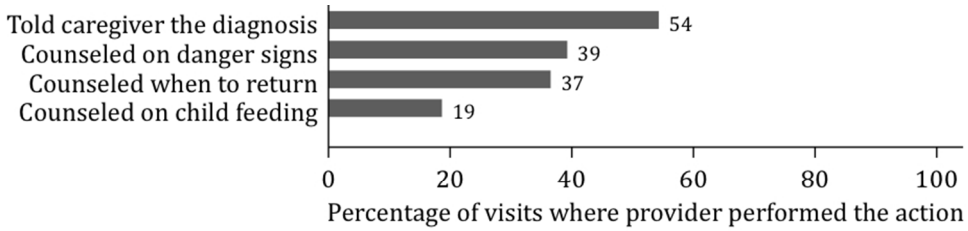
29. Zolnierek KB, Dimatteo MR. Physician communication and patient adherence to treatment: a meta-analysis. Medical care 2009;**47**(8):826-34 doi: 10.1097/MLR.0b013e31819a5acc[published Online First: Epub Date]|.
30. Leonard K, Masatu MC. Outpatient process quality evaluation and the Hawthorne Effect. Social science & medicine 2006;**63**(9):2330-40 doi: 10.1016/j.socscimed.2006.06.003[published Online First: Epub Date]|.
31. Toomey SL, Zaslavsky AM, Elliott MN, et al. The Development of a Pediatric Inpatient Experience of Care Measure: Child HCAHPS(R). Pediatrics 2015;**136**(2):360-69 doi: 10.1542/peds.2015-0966[published Online First: Epub Date]|.

Figure 1. Conceptual framework of the relationship between patient-, provider-, and facility-level characteristics; communication measure of quality; and patient behaviors and outcomes

Figure 2. Frequency of provider communication across seven sub-Saharan African countries, data from patient report; N=16,351[1]

[1] For each indicator, values were missing from 0.2-0.6% of exit interview





Frequency of provider communication across seven sub-Saharan African countries, data from patient report; N=16,351

Appendix 1. Sensitivity analyses for the effects of missing data.

Table A1.1. Results of the multilevel linear regression of caregiver experience of communication during sick child visits in seven sub-Saharan African countries using two different specifications to address missing data (A) complete-case analysis (B) multiple imputed dataset [1]

	A: complete-case analysis		B: Multiple imputed dataset	
	β	95% CI	β	95% CI
Visit-level				
Caregiver's age	0.10	0.05, 0.15	0.10	0.05, 0.15
Caregiver's education				
No school	Reference			
Primary	0.79	-0.34, 1.92	0.77	-0.31, 1.84
Secondary	3.55	2.20, 4.90	3.64	2.35, 4.93
Tertiary or higher	4.09	1.75, 6.44	4.14	1.84, 6.44
Caregiver is child's parent	2.73	1.33, 4.13	2.43	1.07, 3.78
Caregiver paid for the visit	0.64	-0.60, 1.89	0.50	-0.71, 1.71
Duration of the visit (in minutes)	0.09	0.07, 0.12	0.10	0.07, 0.12
Reason for visit was child vomiting	1.73	0.82, 2.64	1.71	0.83, 2.60
Reason for visit was fever	1.27	0.36, 2.17	1.23	0.34, 2.12
Provider-level				
Provider's years of education	0.35	0.11, 0.58	0.36	0.12, 0.59
Provider's years since graduation	0.05	-0.03, 0.12	0.03	-0.04, 0.10
Number of years provider worked in this facility	0.05	-0.06, 0.16	0.07	-0.04, 0.17
Provider's cadre				
Doctor or clinical officer	Reference			
Nurse	2.66	0.86, 4.46	2.75	0.98, 4.51
Other	-2.18	-4.87, 0.52	-1.77	-4.38, 0.84
Provider is a manager	2.81	1.49, 4.13	2.72	1.43, 4.02
Provider is female	2.04	0.73, 3.35	1.89	0.62, 3.17
Received training on IMCI	4.33	2.88, 5.79	4.45	3.03, 5.87
Number of in-service training topics in past year	0.13	-0.10, 0.35	0.13	-0.09, 0.35
Facility-level				
Private facility	3.92	2.33, 5.51	3.94	2.39, 5.49
Supportive supervision visit last 6 months	1.77	0.35, 3.19	1.68	0.29, 5.49
Infrastructure index	4.10	0.00, 8.19	4.48	0.47, 8.48
Country				

Kenya 2010 (reference)	Reference		Reference	
Malawi 2013	0.75	-1.57, 3.07	0.30	-1.97, 2.57
Namibia 2009	4.31	1.39, 7.23	3.38	0.59, 6.18
Rwanda 2007	-9.20	-12.06, -6.33	-9.29	-12.11, -6.47
Senegal 2013-2014	-2.25	-5.17, -0.66	-2.74	-5.56, 0.09
Tanzania 2015	9.46	7.32, 11.60	9.23	7.14, 11.33
Uganda 2007	11.15	8.07, 14.23	10.92	7.87, 13.97
Total observations	15,039		15,986	

CI, confidence interval; IMCI, integrated management of childhood illness

[1] The outcome, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

Table A1.2. Associations between provider communication and caregivers' satisfaction with- and ratings of- care using two different specifications to address missing data (A) complete-case analysis (B) multiple imputed dataset

	A: complete-case analysis			B: Multiple imputed dataset		
	RR	95% CI	N	RR	95% CI	N
Very satisfied with the services	1.20	1.16, 1.24	13,752	1.20	1.16, 1.24	13,763
Would recommend the facility to others	1.04	1.03, 1.06	13,616	1.05	1.03, 1.06	13,763
Would return to facility if child does not get completely better	1.17	1.15, 1.20	16,294	1.17	1.15, 1.20	16,303
No problems with:						
The ability to discus problems or concerns	1.10	1.08, 1.12	16,300	1.10	1.08, 1.12	16,332
Amount of explanation received for problem/treatment	1.15	1.13, 1.17	16,281	1.15	1.13, 1.17	16,313
Treatment by staff	1.05	1.03, 1.07	16,288	1.05	1.03, 1.07	16,327
Quality of the exam and treatment	1.12	1.08, 1.16	5,838	1.11	1.08, 1.14	16,302

Notes:
CI, confidence interval
The exposure, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver. Adjusted for country only

Appendix 2. Sensitivity analyses for different model specifications for the multilevel models.

Table A2.1. Results of the multilevel linear regression of caregiver experience of communication during sick child visits in seven sub-Saharan African countries using three different model specifications: (A) all observations, no sample weights (primary analysis); (B) Only providers with more than one visit observed; (C) All observations, using sample weights [1]

	All observations, no sample weights		Only providers with > 1 visit		Using sample weights	
	β	95% CI	β	95% CI	β	95% CI
Visit-level						
Caregiver's age	0.10	0.05, 0.15	0.11	0.06, 0.16	0.09	0.03, 0.15
Caregiver's education						
No school	Reference		Reference		Reference	
Primary	0.79	-0.34, 1.92	0.65	-0.50, 1.80	0.76	-0.67, 2.19
Secondary	3.55	2.20, 4.90	3.22	1.84, 4.60	3.60	1.79, 5.41
Tertiary or higher	4.09	1.75, 6.44	4.23	1.81, 6.65	4.00	0.64, 7.36
Caregiver is child's parent	2.73	1.33, 4.13	2.54	1.11, 3.97	2.56	0.67, 4.45
Caregiver paid for the visit	0.64	-0.60, 1.89	0.82	-0.47, 2.12	0-0.29	-2.10, 1.52
Duration of the visit (in minutes)	0.09	0.07, 0.12	0.09	0.06, 0.11	0.09	0.04, 0.14
Reason for visit was child vomiting	1.73	0.82, 2.64	1.84	0.91, 2.77	1.40	0.13, 2.66
Reason for visit was fever	1.27	0.36, 2.17	1.35	0.43, 2.28	0.60	-0.62, 1.82
Provider-level						
Provider's years of education	0.35	0.11, 0.58	0.35	0.10, 0.59	0.37	0.09, 0.66
Provider's years since graduation	0.05	-0.03, 0.12	0.04	-0.04, 0.11	0.03	-0.07, 0.14
Number of years provider worked in this facility	0.05	-0.06, 0.16	0.06	-0.06, 0.17	0.04	-0.09, 0.18
Provider's cadre						
Doctor or clinical officer	Reference				Reference	
Nurse	2.66	0.86, 4.46	2.58	0.68, 4.48	1.61	-0.92, 4.14
Other	-2.18	-4.87, 0.52	-2.20	-5.03, 0.64	-1.66	-4.88, 1.57
Provider is a manager	2.81	1.49, 4.13	2.64	1.25, 4.02	2.83	1.05, 4.61
Provider is female	2.04	0.73, 3.35	1.71	0.34, 3.08	1.69	-0.11, 3.50
Received training on IMCI	4.33	2.88, 5.79	4.61	3.09, 6.13	4.43	2.33, 6.54

Number of in-service training topics in past year	0.13	-0.10, 0.35	0.13	-0.11, 0.36	0.12	-0.18, 0.42
Facility-level						
Private facility	3.92	2.33, 5.51	3.40	1.71, 5.09	3.84	1.64, 6.04
Supportive supervision visit last 6 months	1.77	0.35, 3.19	1.63	0.13, 3.13	0.91	-1.24, 3.05
Infrastructure index	4.10	0.00, 8.19	4.20	-0.11, 8.51	2.01	-3.46, 7.48
Country						
Kenya 2010 (reference)	Reference		Reference			
Malawi 2013	0.75	-1.57, 3.07	1.77	-0.69, 4.23	-2.68	-6.01, 0.65
Namibia 2009	4.31	1.39, 7.23	4.80	1.72, 7.88	1.74	-2.15, 5.63
Rwanda 2007	-9.20	-12.06, -6.33	-8.00	-11.02, -4.98	-11.26	-15.09, -7.44
Senegal 2013-2014	-2.25	-5.17, -0.66	-1.28	-4.38, 1.82	-5.28	-9.11, -1.45
Tanzania 2015	9.46	7.32, 11.60	10.60	8.32, 12.89	5.75	2.46, 9.04
Uganda 2007	11.15	8.07, 14.23	12.65	9.34, 15.96	7.99	2.91, 13.07
Random effects						
Variance between providers	244.9		246.0		249.6	
Intraclass correlation providers (p)	0.337		0.337		0.347	
Total observations	15,039		14,363		15,039	

CI, confidence interval; IMCI, integrated management of childhood illness

[1] The outcome, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3-4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*4-5*
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	NA – secondary data
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5-6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	5-6
		(*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Secondary data
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6-7
		(b) Indicate number of participants with missing data for each	6

		variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-12
		(*b*) Report category boundaries when continuous variables were categorized	6-7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	8-12
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Appendix
Discussion			
Key results	18	Summarise key results with reference to study objectives	13-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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The determinants and outcomes of good provider communication: a cross-sectional study in seven African countries

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Abstract

Objectives: To determine the extent of provider communication, predictors of good communication, and the association between provider communication and patient outcomes, such as patient satisfaction, in seven sub-Saharan African countries.

Design: Cross-sectional, multi-country study.

Setting: Data from recent Service Provision Assessment (SPA) surveys from seven countries in sub-Saharan Africa. SPA surveys include assessment of facility inputs and processes as well as interviews with caretakers of sick children. These data included 3,898 facilities and 4,627 providers.

Participants: 16,352 caregivers visiting the facility for their sick children.

Primary and secondary outcome measures: We developed an index of four recommended provider communication items for a sick child assessment based on World Health Organization guidelines. We assessed potential predictors of provider communication and considered whether better provider communication was associated with intent to return to the facility for care.

Results: The average score of the composite indicator of provider communication was low, at 35% (standard deviation [SD]: 26.9). Fifty-four percent of caregivers reported that they were told the child's diagnosis, and only 10% reported that they were counseled on feeding for the child. Caregivers' educational attainment and provider pre-service education and training in integrated management of childhood illness were associated with better communication. Private facilities and facilities with better infrastructure received higher communication scores. Caretakers reporting better communication were significantly more likely to state intent to return to the facility (relative risk: 1.19, 95% CI: 1.16, 1.22).

Conclusions: There are major deficiencies in communication during sick child visits. These are associated with lower provider education as well as less well-equipped facilities. Poor communication, in turn, is linked to lower satisfaction and intention to return to facility among caregivers of sick children. Countries should test strategies for enhancing quality of communication in their efforts to improve health outcomes and patient experience.

Strengths and limitations of this study

- This study combines data from health facility surveys with reports from patients on their experience. This unique combination allows us to assess the association between communication and characteristics of health facilities, providers and patient populations.
- In addition to empirically assessing extent and predictors of communication, this analysis is able to look at outcomes related to future behaviors, including satisfaction with the health system and intent to return the facility for future care.
- This is a large multi-country study that assesses communication across different levels of healthcare and in many settings. However, a limitation of this study is that it is cross-sectional and cannot determine causality in assessed relationships.

INTRODUCTION

Healthcare utilization has increased in many low-and middle-income countries (LMIC) in the past decade as a result of national and international focus on improving access to services.[1] However, such gains in utilization are not always matched by improvements in health outcomes, which are still disproportionately poor in LMIC.[2] This may be due to low quality of healthcare patients receive once they reach the health system.[3 4]

Measures of the quality of healthcare are typically analyzed in three domains: infrastructure, process, and outcome.[5] The process of care can be further divided into technical quality of clinical care and patient experience, or interpersonal quality.[6] Technical quality refers to the application of clinical medicine to a specific health problem, while patient experience measures focus on responsiveness of the health system to the patient's non-health needs. The World Health Organization's (WHO) 2000 World Health Report and subsequent theoretical work have defined the following eight domains of patient experience: dignity, autonomy, confidentiality, communication, choice of provider, timely attention, quality of basic amenities, and social support.[7 8]

Provider communication is a particularly important component of patient experience. Strong communication between providers and patients may enable patients to disclose relevant information and to adhere to prescribed treatment.[8 9] There is evidence in high-income countries that strong provider communication is associated with measures of technical quality.[9 10] In addition, better provider-patient communication is associated with better perceived and objectively measured patient health outcomes.[11 12]

Despite growing evidence of the influence of patient-provider communication on caregiver behaviors and health outcomes in high-income settings, the quality and impact of provider communication in LMIC is not as well documented. The different structure of the health care system and distinct social contexts warrant caution in assuming that the relationships found in one environment will be reflected in the other.[13]

Understanding the determinants and outcomes of patient communication is essential in LMIC, which bear a disproportionate burden of childhood morbidity and mortality and stand to gain the most from improvement in provider-patient communication if the link between communication and outcomes is found to be strong.[2 14] We therefore had two objectives for this analysis. First, we described provider communication and its predictors during visits for sick children in health facilities across seven sub-Saharan African countries. Second, we quantified the association between provider communication and key outcomes of a healthcare visit: caregivers' satisfaction with and impressions of the visit, caregivers' intent to return to the facility if the child does not improve completely, and caregivers' recommendation of the facility to family and friends.

METHODS

Data collection and survey design

This analysis uses data from the Service Provision Assessment (SPA) surveys, which are conducted by the Demographic and Health Survey (DHS) Program.[15] These health facility-

based surveys have been completed over the past 10 years in seven countries in sub-Saharan Africa (Kenya in 2010, Malawi (2013), Namibia (2009), Rwanda (2007), Senegal (2012-2014), Tanzania (2015), and Uganda (2007)). The SPA surveys include assessment of facility inputs and processes and health worker interviews as well as direct clinical observations and client exit interviews. This analysis focuses on data from client exit interviews for visits for sick children. Additional covariates are drawn from the surveys of facility inputs and processes and health worker interviews.

SPA survey selection follows a two-stage design. Except in Rwanda, Namibia, and Malawi, where a census of all or near all facilities was conducted, each country's health facilities were randomly sampled after stratifying by type of facility (e.g., hospital or health center) and managing authority. Hospitals tend to be oversampled in SPA surveys. Within each health facility, patients were selected using systematic sampling. The anticipated number of patients to be seen on the day of data collection was divided by 15 to determine the interval length needed to sample 15 patients from the facility.[15] Survey weights are assigned to each child to account for both the facility and patient stages of sampling such that the weighted sample should be representative of the population of all clients seeking care. We scaled weights within each country to maintain the sample size.[15] Health workers observed providing care were interviewed about their education and training; sampling weights were similarly calculated to ensure a representative sample of health care providers.

Informed consent was collected from the facility in-charge as well as each individual respondent before continuing with the interview.[16]

Measurement of provider communication

We used the 2014 WHO guidelines for the integrated management of childhood illness (IMCI) [17] to identify essential elements of provider communication during sick child visits. The primary requirements of provider communication in the IMCI guidelines are clear statement of the child's diagnosis and of the recommended treatment and follow-up plan. To capture these elements we defined four indicators of quality communication: provider told the caregiver the child's illness, told the caregiver the symptoms that would indicate a need for immediate return to the facility, scheduled or discussed a return visit, and counseled the caretaker on feeding the child (the caregiver responded that the provider counseled them on either feeding solid foods or giving fluids during this illness). These indicators were assessed using the caretakers' recall of this communication following the clinical consultation. We excluded three indicators that addressed communication of medication for the child, as these indicators may in some cases be endogenous with provision of good technical quality (provision of an appropriate treatment plan.) We calculated communication quality as the proportion of the four items performed for each visit.

Covariates

To identify determinants of good communication, we selected predictors identified using recent literature and shown on our conceptual framework (Figure 1).[18-20] At the patient level, these included both the caregiver and child's socio-demographic characteristics as well as whether the caregiver paid for the visit and whether the caregiver was part of a prepayment plan, such as insurance. In order to capture potentially different treatment by the child's presenting illness, we

assessed the reasons for the child's visit as stated by the caregiver (fever, cough, diarrhea, vomiting, feeding problems, sleeping problems, and convulsions). At the provider level we assessed providers' education (both number of years of pre-service education and whether they had received recent, in the past one to two years, IMCI-related training), providers' cadre (doctor or clinical officer versus nurse versus other), how long they have worked as a clinician, and whether the provider is a manager. At the facility level we looked at whether the facility had received recent supportive supervision, the level of infrastructure available (an index of 22 items including water and electricity), the level of management support (an index of 7 items including whether quality assurance activities are routinely carried out), whether the facility was public or private, and the level of the facility (comparing hospitals to non-hospitals).

We assessed the relation between communication and outcomes related to the caregivers' experience: caregiver satisfaction, caregivers' intent to return to the facility, caregivers' recommendation of the facility, and caregivers' perception of whether there were problems with the care provided. Caregivers were asked to rate their satisfaction with the services received on a three-level scale (very satisfied, more or less satisfied, or not satisfied). We dichotomized the variable as "very satisfied" versus "not very satisfied." Caregivers were also asked what they would do if the child did not get completely better or became worse. We coded caregivers responses as either "return to this facility" or "not return," where not returning could include going to another facility, another health worker, a traditional healer, or just wait (e.g. do not see a healthcare provider.) Caregivers' were also asked whether they would recommend this facility to a friend of family member. Finally, caregivers were asked whether certain aspects of care were major, minor, or no problem for them. We dichotomized these responses into either "problem" or "no problem."

Data analysis

We first explored the level and potential predictors of provider communication in the seven countries. We calculated descriptive statistics of the population-averaged indicators of interest using data weighted to represent the health system in each country. We screened each potential indicator in a linear regression of provider communication, controlling for country and clustering at the provider level. We retained all covariates significant at $p<=0.05$, removing those that were highly correlated with other retained predictors.

We then assessed the predictors of communication using generalized hierarchical linear regression models. Hierarchical models were selected because they enable assessment of the association of both patient- and provider- or facility-level characteristics with the communication index, as well as calculation of the variation in the outcome attributable to the client versus provider. The first model included only country fixed effects, the second model added individual-level elements, and the third model included individual-, provider-, and facility-level elements with country fixed effects. We used the MIXED command with the MLE option in Stata 14.1 (StataCorp LP, College Station, TX) for all models. We included a random intercept for provider and calculated the intraclass correlation coefficient (ICC). The ICC is interpreted as the proportion of the total variation in the outcome that is due to provider-level variation.

While the SPA surveys aim to collect data from multiple patient visits for each provider, this is not always the case. Over the seven countries surveyed, there were 559 providers (4%) where

only one child visit was observed. For these providers, the contribution at the child-level cannot be calculated; we corrected for this by preventing the stratum from contributing to the variance at the child-level.

The second part of our analysis assessed the association between provider communication and patient outcomes using generalized estimating equations. We calculated risk ratios using a log link, exchangeable correlation structure, and robust sandwich estimator to account for clustering at the provider level. A fixed effect for country was included in the unadjusted models. Adjusted models controlled for potential confounders at the patient-, provider-, and facility-level; these covariates were selected because of their theorized association with both provider communication and the outcomes of interest.

All analyses were conducted using Stata 14.1 (StataCorp LP, College Station, TX.) The institutional review board at the Harvard T. H. Chan School of Public Health determined this analysis to be exempt from human subjects review.

Sensitivity analyses

We conducted multiple sensitivity analyses to assess the robustness of the results to the methods used for missing data and model specification. To ensure results were not affected by missing data, we conducted multiple imputation and repeated the analysis on 20 imputed datasets (Appendix 1). We also removed providers with a single clinical observation to better assess variation within versus between providers. Finally, we repeated the model using sampling weights accounting for the provider's probability of inclusion in the sample. Results for these final two models are presented in Appendix 2.

RESULTS

A total of 16,352 outpatient visits for sick children from 3,898 facilities and 4,627 providers were included in this analysis (Tables 1 and A1). On average, children were 20 months (1.7 years) old at the time of their visit. Fever was the most common reason caretakers cited for the visit (74%). Forty-one percent of the healthcare providers were nurses, and 16% of the visits included were at hospitals (Table 1).

Table 1. Client, provider, and facility characteristics for outpatient visits for sick children in seven sub-Saharan African countries

	Weighted N or mean	% or SD
Total visits	16,352	
Total providers	4,627	
Total facilities	3,898	
Visit-level		
Caregiver's age (years)	28.1	8.2
Caregiver is female	13,744	91.2%
Caregiver's education		
None	3,705	22.7%

Any primary	8,701	53.3%
Any secondary	3,430	21.0%
Any tertiary or higher	493	3.0%
Caregiver is child's parent	14,446	89.0%
Child's age (months)	20.3	15.2
Child is female	7,904	48.5%
Client paid for visit	6,769	41.4%
Client has insurance[1]	3,102	19.1%
Duration of visit (minutes)	12.9	15.8
Reasons caregiver brought child to the facility[2]		
Fever	11,894	73.5%
Cough	11,102	68.1%
Diarrhea	4,898	30.2%
Vomit	4,083	25.2%
Problems feeding	3,724	23.0%
Excessive sleepiness	3,516	21.7%
Convulsions	653	4.0%
Provider-level		
Provider is female	7,552	46.2%
Provider's years of education	15.0	2.9
Provider's years since graduation	9.9	10.0
Provider years in this facility	4.7	6.4
Provider's cadre		
Doctor or clinical officer	7,480	45.8%
Nurse	6,633	40.6%
Non-clinical staff	2,224	13.6%
Provider is a manager	9,987	61.5%
Received recent training on sick child care	6,332	38.9%
Number of in-service training topics covered in past 3 years	5.0	3.4
Facility-level		
Private facility	3,461	21.2%
Hospital	2,620	16.0%
Received supportive supervision in last 6 months	12,378	76.2%
Infrastructure index[3]	0.55	0.17

SD, standard deviation; IMCI, integrated management of childhood illness

Notes:
Data from Rwanda and Namibia are self-weighted and in Malawi a non-response weight is used. Data from Kenya, Senegal, Tanzania, and Uganda are weighted to reflect sampling probability.
For some rows, denominators differ from the total N owing to missing data.

[1] Client has medical aid, insurance, or other prepayment plan.
[2] Caregivers could report multiple reasons for bringing the child to the facility for services
[3] Mean proportion of 22 items including water, ambulance, electricity, phone, toilet, cleanliness, wait room, system for maintenance, sharps disposal, waste disposal, sterilized equipment storage, consumables storage, no expired medications, medication storage, medication supply, stock ledger, pourable water, soap, gloves, sharps box, surface disinfectant, and hand disinfectant

The average score on the composite indicator of provider communication was low, at 35%, with a standard deviation of 26.9 percentage points. In 23% of visits the caregiver reported that the provider did not complete any of the communication tasks, whereas 3% of caregivers reported the provider completed all communication tasks. Fifty-four percent of caregivers reported that they were told the child's diagnosis, and only 10% reported that they were counseled on feeding or providing liquids for the child (Figure 2).

While most of the variables included in the full model assessing factors contributing to provider communication had a statistically significant association with patient experience, the effect size was generally small (Table 2). On average, caregivers who had achieved tertiary education experienced provider communication that rated 4.9 percentage points better than those with no education. On the provider side, providers who had received training in selected child health topics in the past one to two years, providers who were managers, female providers, and nurses all scored higher on the communication scale. These associations were all modest, with training having the largest association with an increase of 4.4 percentage points on the communication scale. Observations in private facilities and those that had received a supportive supervision visit were also associated with better communication scores. The patient- and provider-level characteristics included in the model were able to account for minimal variation between providers. Most of the variation in the communication index was due to unexplained patient-level variation and random error, with 35% of variation in the full model due to provider-level effects.

Table 2. Results of the multilevel linear regression of provider communication during sick child visits in seven sub-Saharan African countries[1]

	Model 1		Model 2	Model 3
	β	95% CI	β	95% CI	β	95% CI
Visit-level						
Caregiver's age	0.11	0.06, 0.16	0.10	0.06, 0.15
Caregiver's education						
No school	Reference		Reference	
Any primary	1.21	0.14, 2.28	1.08	0.01, 2.15
Any secondary	4.25	2.97, 5.52	3.98	2.70, 5.26
Any tertiary or higher	5.63	3.41, 7.85	4.92	2.67, 7.16
Caregiver is child's parent	2.35	1.02, 3.68	2.35	1.02, 3.67
Caregiver paid for the visit	1.78	0.67, 2.90	0.66	-0.53, 1.85
Caregiver has insurance	0.97	-0.33, 2.27	0.57	-0.73, 1.87
Duration of the visit (minutes)	0.07	0.05, 0.10	0.07	0.05, 0.09
Reason for visit was child vomiting	1.78	0.92, 2.64	1.80	0.94, 2.66
Reason for visit was fever	0.79	-0.07, 1.65	0.93	0.07, 1.79
Provider-level						
Provider's years of education			0.38	0.15, 0.60
Provider's years since graduation			0.05	-0.02, 0.12
Number of years provider worked in this facility			0.05	-0.05, 0.15
Provider's cadre				
Doctor or clinical officer			Reference	
Nurse			2.90	1.18, 4.61
Other			-1.92	-4.49, 0.65
Provider is a manager			2.55	1.29, 3.81
Provider is female			1.29	0.04, 2.54
Received training on IMCI			4.38	2.99, 5.76
Number of in-service training topics in past year			0.00	-0.21, 0.22
Facility-level						
Private facility			3.40	1.87, 4.92

Supportive supervision visit last 6 months					1.69	0.34, 3.05
Infrastructure index					2.69	-1.20, 6.57
Country						
Kenya 2010 (reference)	Reference		Reference		Reference	
Malawi 2013	-5.14	-7.31, -2.98	-3.48	-5.64, -1.32	-3.69	-5.91, -1.47
Namibia 2009	5.67	3.06, 8.28	4.85	2.22, 7.48	5.13	2.35, 7.91
Rwanda 2007	-11.02	-13.61, -8.42	-11.00	-13.81, -8.20	-10.60	-13.54, -7.67
Senegal 2013-2014	-12.06	-14.34, -9.77	-10.96	-13.24, -8.67	-10.82	-13.58, -8.06
Tanzania 2015	0.88	-1.11, 2.88	1.69	-0.31, 3.70	3.02	0.98, 5.06
Uganda 2007	12.10	9.12, 15.08	13.61	10.64, 16.57	13.66	10.72, 16.61
Random effects						
Variance between providers	252.4		239.5		225.8	
Intraclass correlation between providers (p)	0.371		0.359		0.346	
Total observations	14,985		14,985		14,985	

Notes:
CI, confidence interval; IMCI, integrated management of childhood illness
[1] The outcome, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

The provider communication index was significantly associated with all assessed outcomes (Table 3). Patients who reported a perfect score on provider communication were 1.21 times as likely to be very satisfied with their visit than patients whose provider scored zero on the communication index (95% confidence interval: 1.17, 1.26). There was also a strong association between provider communication and a patient's stated intent to return if the child did not get completely better: risk ratio 1.19 (95% confidence interval: 1.16, 1.22). Adjusting for potential confounders did not change the measures of effect. The results were robust to the performed sensitivity checks (Appendix).

Table 3. Associations between provider communication and caregivers' satisfaction with- and ratings of- care

	Percent of caregivers reporting outcome by communication score		Unadjusted results3			Adjusted results4		
	Score is zero	Score is complete	RR[1]	95% CI	N[2]	RR[1]	95% CI	N[2]
Very satisfied with the services	73.6%	84.6%	1.21	1.17, 1.26	13,752	1.22	1.17, 1.26	12,774
Would recommend the facility to others	95.4%	99.2%	1.05	1.04, 1.06	13,616	1.05	1.04, 1.07	12,654
Would return to facility if child does not get completely better	84.5%	96.4%	1.19	1.16, 1.22	16,294	1.20	1.17, 1.23	14,947
No problems with:								
The ability to discus problems or concerns	85.3%	87.1%	1.11	1.09, 1.14	16,301	1.11	1.08, 1.13	14,952
Amount of explanation received for problem/treatment	82.4%	87.7%	1.17	1.14, 1.20	16,282	1.17	1.14, 1.20	14,939
Treatment by staff	89.7%	90.2%	1.06	1.04, 1.08	16,289	1.06	1.04, 1.08	14,938
Quality of the exam and treatment	83.8%	88.1%	1.11	1.08, 1.15	5,839	1.12	1.08, 1.16	5,168

Notes:

CI, confidence interval

[1] The exposure, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

[2] Questions on caregiver satisfaction and whether they would recommend the facility were not asked in Rwanda and Uganda. The question on quality of the exam and treatment was only asked in Kenya, Rwanda, and Uganda

[3] Adjusted for country.

[4] Adjusted for patient-, provider- and facility-level characteristics: caregiver's age, caregiver's education, caregiver's relationship to child, payment for visit, caregiver's insurance status, duration of visit, reason for visit, provider's education, time since provider graduated, time provider worked in this facility, provider's cadre, provider's managerial role, provider's sex, providers receipt of IMCI training and in-service training, facility management, supportive supervision, facility infrastructure and country.

DISCUSSION

Across more than 16,000 visits for sick children in seven sub-Saharan African countries, provider communication was poor. These findings from nationally representative surveys of facilities corroborate findings of inadequate provider-patient communication, low quality of technical care, and poor provider effort from smaller studies in LMIC.[21-23] Additionally, there is evidence that higher communication is associated with both higher client satisfaction and intent to return to care.

Although average provider communication score was low in each of the countries studied at the time of data collection, it varied from 26% in Senegal (2012-2014) to a high of 49% in Uganda (2007). All seven countries are low- or lower middle-income countries and all are experiencing shortages of skilled health providers.[24] Between-country variation on the communication index did not follow trends in GDP per capita, economic inequality, health spending, or availability of skilled health providers.[24 25] There was some evidence of a decline in communication score by the year that the survey was conducted, which ranged from 2007 to 2015, but this cannot be distinguished from between-country contextual differences.

We found a number of client- and provider-level factors with modest, but statistically significant associations with patients' report of provider communication. The level of reported provider communication increased with caregiver's education. Visits with caregivers who had some secondary school were rated four percentage points higher on communication than visits with caregivers who had no formal education. There are several possible reasons for this association. Educated caregivers may be more likely to initiate communication with providers or may have a higher capacity to understand providers and remember what has been communicated. Alternatively, providers may make a choice about what to communicate based on the education level of caregivers. Regardless of the etiology for the disparity, it is important for providers to recognize it and focus on improving communication with individuals with lower education using methods that improve patient understanding. While there are many examples of successful interventions for improving patient-provider communication in high-income countries, there are few in LMIC.[26] Job aids may be one way to aid in provider communication and patient understanding, particularly amongst patients and caregivers with low educational attainment.[23]

Providers with fewer years of training, such as counselors and community health workers, were less likely to provide high quality communication. These findings highlight the importance of assessing provider communication, as well as technical care and health outcomes, when evaluating the impact of task-shifting responsibilities from doctors and nurses to staff with less training. Visits with nurses were associated with better communication than both clinical officers and non-clinically trained providers. Training on sick child care was associated with slightly better communication, which supports results from a more detailed but smaller study on the impact of IMCI training on the quality of counseling provided in sick child visits in Mali.[27] However, the increase in communication found here was small: only four percentage points. A systematic review of randomized control trials of communication interventions for healthcare providers, primarily within the United States, found that communication interventions can have a positive effect on provider-patient communication, with the effect stronger for more intensive interventions.[28] Successful trainings in U.S. programs included demonstration of

communication skills, observation, constructive feedback, and opportunities for clinicians to review their own responses.[26 28] While two reviews of IMCI training in LMIC found that both recent training and the length of training had little effect on the provision of technical quality indicators,[29 30] there is some evidence that training interventions focused on patient-centered communication may have positive effects on communication in SSA.[31-33] Our results combined with those from communication interventions suggest the potential for using training to improve provider-patient communication.

Most of the variation in communication was due to differences between patients and visits, rather than differences between providers, which reflect similar findings from a study on provider communication in the UK.[34] Two studies from SSA that looked at technical quality indicators found that quality variation was largely due to provider- and facility-level differences.[35 36] These discordant findings may indicate that provider- and facility-level factors may be a stronger barrier to high quality technical care than to communication. Reasons why many providers were able to communicate well for some visits and not for others should be explored further so that context-specific support or training can be given to providers.

We found that higher provider communication was related to patients' satisfaction and intent to return. While the association of strong patient-provider communication with an increase in patient adherence to prescribed treatments and recommended prevention processes has been extensively documented,[37-39] this is the first evidence we are aware of from a multi-country study in sub-Saharan Africa documenting the association between strong provider communication and patient satisfaction and planned behaviors.

This study has several limitations. First, these surveys took place between 2007 and 2015; between-country differences may reflect both contextual differences as well as changes over time. Second, these data were collected during visits when providers knew that they were being observed. It is possible that the Hawthorne effect could have affected healthcare provider behavior, particularly because there were fewer than five patient observations for each healthcare provider.[40] However, if healthcare providers were indeed performing to the best of their capabilities during these observed visits, then it is even more concerning that the levels of quality observed were so low, as these results would represent the upper bound of care quality. Third, in many of the regions studied, multiple languages are spoken, and in some cases the provider and caregiver may not share a common language. While language congruency is not measured in the SPA, we do not anticipate this to be an issue in the majority of clinics. Fourth, the indicators on the communication index are measured from the patient perspective, and we cannot determine if the items were not communicated by the provider or if they were communicated and not heard or understood by the patient. Understanding this difference may provide insight into which interventions would be most effective. However, from a measurement perspective, the literature defines patient experience as patient defined, and thus patient experience measures, including communication, are most accurately measured from the patient perspective.[41] Finally, the associations identified in this analysis cannot be interpreted causally.

Our findings are the first cross-country, nationally representative assessment of the predictors and outcomes of provider communication during visits for sick children. While there was

variability between the countries in the level of provider communication, the general trends were consistent: provider communication was low, and improved provider communication was associated with higher patient satisfaction and higher intention to return to the same facility. It is possible that these results are generalizable to similar countries in the region.

The results highlight the importance of testing strategies that enhance clinical communication as a means for improving outcomes and patient experience in LMIC. Because communication gaps appeared to be higher for caregivers with lower education, these strategies could focus on targeting this population. Additional entry points for strategies for improving clinical communication may be in focusing on staff without strong clinical training and those in public facilities.

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REFERENCES

1. Scott KW, Jha AK. Putting quality on the global health agenda. The New England journal of medicine 2014;**371**(1):3-5 doi: 10.1056/NEJMp1402157[published Online First: Epub Date]|.
2. Wang H, Liddell CA, Coates MM, et al. Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;**384**(9947):957-79 doi: 10.1016/S0140-6736(14)60497-9[published Online First: Epub Date]|.
3. Kruk ME, Larson E, Twum-Danso NA. Time for a quality revolution in global health. Lancet Glob Health 2016;**4**(9):e594-6 doi: 10.1016/S2214-109X(16)30131-0[published Online First: Epub Date]|.
4. Sobel HL, Huntington D, Temmerman M. Quality at the centre of universal health coverage. Health policy and planning 2016;**31**(4):547-9 doi: 10.1093/heapol/czv095[published Online First: Epub Date]|.
5. Donabedian A. The quality of care. How can it be assessed? Jama 1988;**260**(12):1743-8
6. Campbell SM, Roland MO, Buetow SA. Defining quality of care. Social science & medicine 2000;**51**(11):1611-25
7. Valentine N, Darby C, Bonsel GJ. Which aspects of non-clinical quality of care are most important? Results from WHO's general population surveys of "health systems responsiveness" in 41 countries. Social science & medicine 2008;**66**(9):1939-50 doi: 10.1016/j.socscimed.2007.12.002[published Online First: Epub Date]|.
8. World Health Organization. *The world health report 2000 : health systems : improving performance*. Geneva: World Health Organization, 2000.
9. Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. BMJ Open 2013;**3**(1) doi: 10.1136/bmjopen-2012-001570[published Online First: Epub Date]|.
10. Anhang Price R, Elliott MN, Zaslavsky AM, et al. Examining the Role of Patient Experience Surveys in Measuring Health Care Quality. Medical Care Research and Review 2014;**71**(5):522-54 doi: 10.1177/1077558714541480[published Online First: Epub Date]|.
11. Kelley JM, Kraft-Todd G, Schapira L, et al. The influence of the patient-clinician relationship on healthcare outcomes: a systematic review and meta-analysis of randomized controlled trials. PloS one 2014;**9**(4):e94207 doi: 10.1371/journal.pone.0094207[published Online First: Epub Date]|.
12. Stewart MA. Effective physician-patient communication and health outcomes: a review. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne 1995;**152**(9):1423-33
13. Blaise P, Kegels G. A realistic approach to the evaluation of the quality management movement in health care systems: a comparison between European and African contexts based on Mintzberg's organizational models. The International journal of health planning and management 2004;**19**(4):337-64 doi: 10.1002/hpm.769[published Online First: Epub Date]|.
14. Organization WH. Children: reducing mortality. Secondary Children: reducing mortality January 2016. http://www.who.int/mediacentre/factsheets/fs178/en/.
15. Service Provision Assessment (SPA) Overview. Secondary Service Provision Assessment (SPA) Overview. http://dhsprogram.com/What-We-Do/Survey-Types/SPA.cfm.

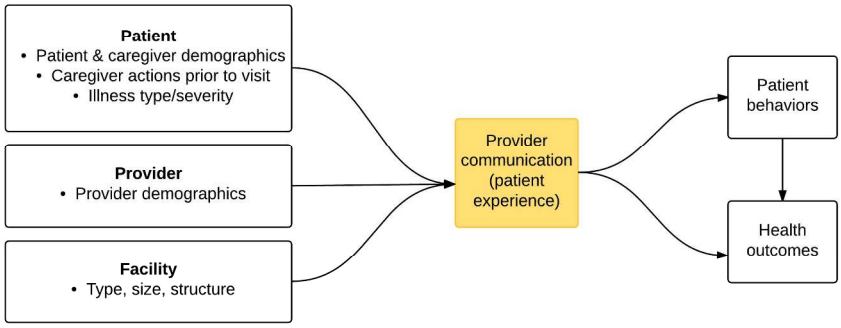
16. Service Provision Assessment (SPA) Questionnaires. Secondary Service Provision Assessment (SPA) Questionnaires. http://dhsprogram.com/What-We-Do/Survey-Types/SPA-Questionnaires.cfm.
17. WHO. Integrated management of childhood illness Chart Booklet: World Health Organization, 2014.
18. Rowe AK, de Savigny D, Lanata CF, et al. How can we achieve and maintain high-quality performance of health workers in low-resource settings? The Lancet 2005;**366**(9490):1026-35 doi: 10.1016/s0140-6736(05)67028-6[published Online First: Epub Date]|.
19. McFarland DC, Shen MJ, Holcombe RF. Predictors of Satisfaction With Doctor and Nurse Communication: A National Study. Health communication 2016:1-8 doi: 10.1080/10410236.2016.1215001[published Online First: Epub Date]|.
20. Mead N, Bower P. Patient-centredness: a conceptual framework and review of the empirical literature. Social science & medicine 2000;**51**(7):1087-110
21. Das J, Hammer J. Quality of Primary Care in Low-Income Countries: Facts and Economics. Annual Review of Economics 2014;**6**(1):525-53 doi: 10.1146/annurev-economics-080213-041350[published Online First: Epub Date]|.
22. Das J, Gertler PJ. Variations in practice quality in five low-income countries: a conceptual overview. Health affairs 2007;**26**(3):w296-309 doi: 10.1377/hlthaff.26.3.w296[published Online First: Epub Date]|.
23. Jennings L, Yebadokpo AS, Affo J, et al. Antenatal counseling in maternal and newborn care: use of job aids to improve health worker performance and maternal understanding in Benin. BMC pregnancy and childbirth 2010;**10**:75 doi: 10.1186/1471-2393-10-75[published Online First: Epub Date]|.
24. Organization. WH. World Health Statistics 2016 data visualizations dashboard; SDG Target 3.c | Health workforce. Secondary World Health Statistics 2016 data visualizations dashboard; SDG Target 3.c | Health workforce. http://apps.who.int/gho/data/node.sdg.3-c.
25. World Development Indicators: The World Bank, 2014.
26. Levinson W, Lesser CS, Epstein RM. Developing physician communication skills for patient-centered care. Health affairs 2010;**29**(7):1310-8 doi: 10.1377/hlthaff.2009.0450[published Online First: Epub Date]|.
27. Gilroy K, Winch PJ, Diawara A, et al. Impact of IMCI training and language used by provider on quality of counseling provided to parents of sick children in Bougouni District, Mali. Patient education and counseling 2004;**54**(1):35-44 doi: 10.1016/S0738-3991(03)00189-7[published Online First: Epub Date]|.
28. Rao JK, Anderson LA, Inui TS, et al. Communication interventions make a difference in conversations between physicians and patients: a systematic review of the evidence. Medical care 2007;**45**(4):340-9 doi: 10.1097/01.mlr.0000254516.04961.d5[published Online First: Epub Date]|.
29. Huicho L, Scherpbier RW, Nkowane AM, et al. How much does quality of child care vary between health workers with differing durations of training? An observational multicountry study. Lancet 2008;**372**(9642):910-6 doi: 10.1016/S0140-6736(08)61401-4[published Online First: Epub Date]|.
30. Leslie HH, Gage A, Nsona H, et al. Training And Supervision Did Not Meaningfully Improve Quality Of Care For Pregnant Women Or Sick Children In Sub-Saharan Africa. Health

affairs 2016;**35**(9):1716-24 doi: 10.1377/hlthaff.2016.0261[published Online First: Epub Date]|.
31. Nayiga S, DiLiberto D, Taaka L, et al. Strengthening patient-centred communication in rural Ugandan health centres: A theory-driven evaluation within a cluster randomized trial. Evaluation 2014;**20**(4):471-91 doi: 10.1177/1356389014551484[published Online First: Epub Date]|.
32. Erb S, Letang E, Glass TR, et al. Health care provider communication training in rural Tanzania empowers HIV-infected patients on antiretroviral therapy to discuss adherence problems. HIV medicine 2017 doi: 10.1111/hiv.12499[published Online First: Epub Date]|.
33. Raymond M, Harrison MC. The structured communication tool SBAR (Situation, Background, Assessment and Recommendation) improves communication in neonatology. South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde 2014;**104**(12):850-2
34. Salisbury C, Wallace M, Montgomery AA. Patients' experience and satisfaction in primary care: secondary analysis using multilevel modelling. Bmj 2010;**341**(oct12 1):c5004-c04 doi: 10.1136/bmj.c5004[published Online First: Epub Date]|.
35. Gathara D, English M, van Hensbroek MB, et al. Exploring sources of variability in adherence to guidelines across hospitals in low-income settings: a multi-level analysis of a cross-sectional survey of 22 hospitals. Implementation science : IS 2015;**10**:60 doi: 10.1186/s13012-015-0245-x[published Online First: Epub Date]|.
36. Kruk ME CA, Mbaruku G, Leslie HH. Variation in quality of primary-care services in Kenya, Malawi, Namibia, Rwanda, Senegal, Uganda and United Republic of Tanzania. Bulletin of the World Health Organization 2017;**In Press**
37. Bartlett EE, Grayson M, Barker R, et al. The effects of physician communications skills on patient satisfaction; recall, and adherence. Journal of chronic diseases 1984;**37**(9-10):755-64
38. Greenfield S, Kaplan SH, Ware JE, Jr., et al. Patients' participation in medical care: effects on blood sugar control and quality of life in diabetes. Journal of general internal medicine 1988;**3**(5):448-57
39. Zolnierek KB, Dimatteo MR. Physician communication and patient adherence to treatment: a meta-analysis. Medical care 2009;**47**(8):826-34 doi: 10.1097/MLR.0b013e31819a5acc[published Online First: Epub Date]|.
40. Leonard K, Masatu MC. Outpatient process quality evaluation and the Hawthorne Effect. Social science & medicine 2006;**63**(9):2330-40 doi: 10.1016/j.socscimed.2006.06.003[published Online First: Epub Date]|.
41. Toomey SL, Zaslavsky AM, Elliott MN, et al. The Development of a Pediatric Inpatient Experience of Care Measure: Child HCAHPS(R). Pediatrics 2015;**136**(2):360-69 doi: 10.1542/peds.2015-0966[published Online First: Epub Date]|.

Figure 1. Conceptual framework of the relationship between patient-, provider-, and facility-level characteristics; communication measure of quality; and patient behaviors and outcomes

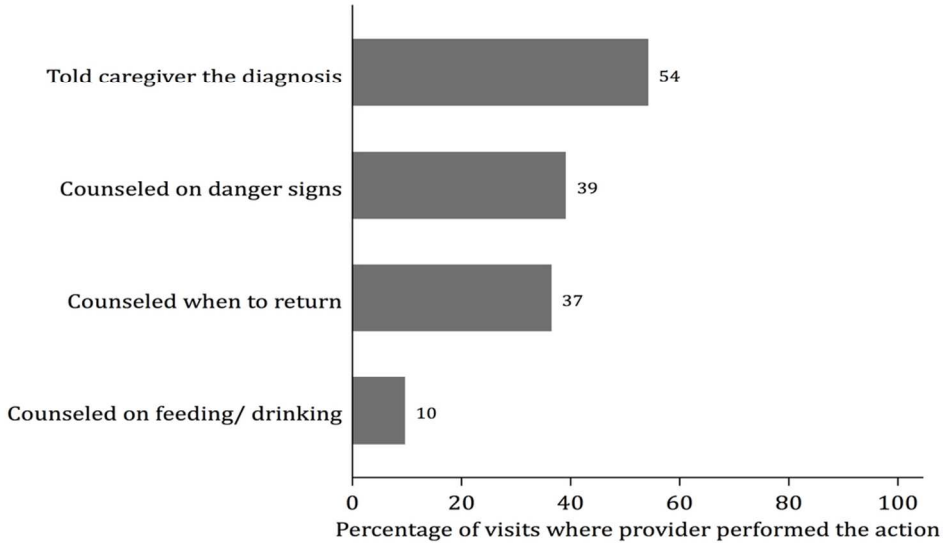
Figure 2. Frequency of provider communication across seven sub-Saharan African countries, data from patient report; N=16,352[1]

[1] For each indicator, values were missing from 0.2-0.6% of exit interview



Conceptual framework of the relationship between patient-, provider-, and facility-level characteristics; communication measure of quality; and patient behaviors and outcomes

215x279mm (300 x 300 DPI)



Frequency of provider communication across seven sub-Saharan African countries, data from patient report; N=16,352

95x56mm (300 x 300 DPI)

Appendix 1. Country-level sample size and response rate

Table A1.2. Number of visits, providers, and facilities represented per country.

	Visits		Providers		Facilities	
Country	N	%	N	%	N	%
Kenya	1,819	11.1%	591	12.8%	495	12.7%
Malawi	3,218	19.7%	810	17.5%	729	18.7%
Namibia	1,502	9.2%	433	9.4%	296	7.6%
Rwanda	1,648	10.1%	434	9.4%	433	11.1%
Senegal	2,300	14.1%	693	15.0%	633	16.2%
Tanzania	4,924	30.1%	1,348	29.1%	1,011	25.9%
Uganda	941	5.8%	318	6.9%	301	7.7%
Total	16,352	100%	4,627	100%	3,898	100%

Table A1.2. Response rate for provider and facility interviews by country.

	Providers	Facilities
Kenya	97.4 %	98.9%
Malawi	97.3%	92.2%
Namibia	98.3%	92.2%
Rwanda	99.3%	96.9%
Senegal	99.7%	96.5%
Tanzania	99.7%	99.0%
Uganda	97.9%	98.2%

Appendix 2. Sensitivity analyses for the effects of missing data.

Table A2.1. Results of the multilevel linear regression of caregiver experience of communication during sick child visits in seven sub-Saharan African countries using two different specifications to address missing data (A) complete-case analysis (B) multiple imputed dataset [1]

			A: complete-case analysis	B: Multiple imputed dataset
	β	95% CI	β	95% CI
Visit-level				
Caregiver's age	0.10	0.06, 0.15	0.11	0.06, 0.15
Caregiver's education				
No school	Reference			
Primary	1.08	0.01, 2.15	1.03	0.02, 2.04
Secondary	3.98	2.70, 5.26	4.13	2.91, 5.35
Tertiary or higher	4.92	2.67, 7.16	4.86	2.66, 7.05
Caregiver is child's parent	2.35	1.02, 3.67	2.02	0.75, 3.29
Caregiver paid for the visit	0.66	-0.53, 1.85	0.52	-0.64, 1.67
Caregiver has insurance	0.57	-0.73, 1.87	0.57	-0.71, 1.84
Duration of the visit (in minutes)	0.07	0.05, 0.09	0.07	0.05, 0.09
Reason for visit was child vomiting	1.80	0.94, 2.66	1.86	1.03, 2.69
Reason for visit was fever	0.93	0.07, 1.79	0.94	0.11, 1.78
Provider-level				
Provider's years of education	0.38	0.15, 0.60	0.39	0.17, 0.61
Provider's years since graduation	0.05	-0.02, 0.12	0.04	-0.03, 0.10
Number of years provider worked in this facility	0.05	-0.05, 0.15	0.07	-0.03, 0.17
Provider's cadre				
Doctor or clinical officer	Reference		Reference	
Nurse	2.90	1.18, 4.61	2.92	1.24, 4.60
Other	-1.92	-4.49, 0.65	-1.70	-4.18, 0.77
Provider is a manager	2.55	1.29, 3.81	2.43	1.20, 3.66
Provider is female	1.29	0.04, 2.54	1.20	-0.02, 2.41
Received training on IMCI	4.38	2.99, 5.76	4.49	3.14, 5.84
Number of in-service training topics in past year	0.00	-0.21, 0.22	0.03	-0.18, 0.24
Facility-level				
Private facility	3.40	1.87, 4.92	3.51	2.02, 5.00
Supportive supervision visit last 6 months	1.69	0.34, 3.05	1.66	0.34, 2.98

Infrastructure index	2.69	-1.20, 6.57	2.93	-0.86, 6.72
Country				
Kenya 2010 (reference)	Reference		Reference	
Malawi 2013	-3.69	-5.91, -1.47	-4.10	-6.26, -1.94
Namibia 2009	5.13	2.35, 7.91	4.11	1.45, 6.76
Rwanda 2007	-10.60	-13.54, -7.67	-10.66	-13.54, -7.78
Senegal 2013-2014	-10.82	-13.58, -8.06	-11.24	-13.91, -8.57
Tanzania 2015	3.02	0.98, 5.06	2.77	0.78, 4.77
Uganda 2007	13.66	10.72, 16.61	13.41	10.51, 16.32
Total observations	14,985		15,969	

CI, confidence interval; IMCI, integrated management of childhood illness

[1] The outcome, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

Table A2.2. Associations between provider communication and caregivers' satisfaction with- and ratings of- care using two different specifications to address missing data (A) complete-case analysis (B) multiple imputed dataset

	A: complete-case analysis			B: Multiple imputed dataset		
	RR	95% CI	N	RR	95% CI	N
Very satisfied with the services	1.21	1.17, 1.26	13,752	1.21	1.17, 1.54	13,763
Would recommend the facility to others	1.05	1.04, 1.06	13,616	1.05	1.04, 1.06	13,763
Would return to facility if child does not get completely better	1.19	1.16, 1.22	16,294	1.19	1.16, 1.20	16,303
No problems with:						
The ability to discus problems or concerns	1.11	1.09, 1.14	16,301	1.11	1.09, 1.14	16,333
Amount of explanation received for problem/treatment	1.17	1.14, 1.20	16,282	1.17	1.14, 1.20	16,314
Treatment by staff	1.06	1.04, 1.08	16,289	1.06	1.04, 1.08	16,328
Quality of the exam and treatment	1.11	1.08, 1.15	5,839	1.12	1.08, 1.17	16,303

Notes:

CI, confidence interval

The exposure, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver. Adjusted for country only

Appendix 3. Sensitivity analyses for different model specifications for the multilevel models.

Table A3.1. Results of the multilevel linear regression of caregiver experience of communication during sick child visits in seven sub-Saharan African countries using three different model specifications: (A) all observations, no sample weights (primary analysis); (B) Only providers with more than one visit observed; (C) All observations, using sample weights [1]

	All observations, no sample weights		Only providers with > 1 visit		Using sample weights	
	β	95% CI	β	95% CI	β	95% CI
Visit-level						
Caregiver's age	0.10	0.06, 0.15	0.11	0.06, 0.16	0.11	0.05, 0.17
Caregiver's education						
No school	Reference		Reference		Reference	
Primary	1.08	0.01, 2.15	1.07	-0.02, 2.16	1.27	-0.08, 2.62
Secondary	3.98	2.70, 5.26	3.77	2.46, 5.08	4.14	2.43, 5.85
Tertiary or higher	4.92	2.67, 7.16	5.09	2.78, 7.41	4.75	1.68, 7.81
Caregiver is child's parent	2.35	1.02, 3.67	2.19	0.83, 3.54	2.66	0.78, 4.58
Caregiver paid for the visit	0.66	-0.53, 1.85	0.90	-0.34, 2.13	0.35	-1.41, 2.11
Caregiver has insurance	0.57	-0.73, 1.87	0.45	-0.89, 1.80	0.81	-1.03, 2.66
Duration of the visit (in minutes)	0.07	0.05, 0.09	0.06	0.04, 0.09	0.08	0.04, 0.12
Reason for visit was child vomiting	1.80	0.94, 2.66	1.97	1.09, 2.84	1.51	0.28, 2.74
Reason for visit was fever	0.93	0.07, 1.79	1.02	0.15, 1.90	0.60	-0.61, 1.81
Provider-level						
Provider's years of education	0.38	0.15, 0.60	0.39	0.16, 0.63	0.40	0.12, 0.67
Provider's years since graduation	0.05	-0.02, 0.12	0.03	-0.04, 0.10	0.04	-0.06, 0.14
Number of years provider worked in this facility	0.05	-0.05, 0.15	0.08	-0.03, 0.18	0.04	-0.09, 0.16
Provider's cadre						
Doctor or clinical officer	Reference		Reference		Reference	
Nurse	2.90	1.18, 4.61	2.70	0.89, 4.52	1.98	-0.41, 4.37
Other	-1.92	-4.49, 0.65	-1.98	-4.70, 0.74	-1.66	-4.63, 1.30
Provider is a manager	2.55	1.29, 3.81	2.34	1.02, 3.67	2.69	0.98, 4.36
Provider is female	1.29	0.04, 2.54	1.06	-0.25, 2.37	0.96	-0.70, 2.68

Received training on IMCI	4.38	2.99, 5.76	4.52	3.07, 5.98	4.57	2.59, 6.55
Number of in-service training topics in past year	0.00	-0.21, 0.22	0.04	-0.19, 0.37	-0.01	-0.29, 0.27
Facility-level						
Private facility	3.40	1.87, 4.92	2.79	1.16, 4.42	3.21	1.07, 5.35
Supportive supervision visit last 6 months	1.69	0.34, 3.05	1.55	0.12, 2.99	1.19	-0.79, 3.17
Infrastructure index	2.69	-1.20, 6.57	3.07	-1.02, 7.17	0.76	-4.09, 5.62
Country						
Kenya 2010 (reference)	Reference		Reference			
Malawi 2013	-3.69	-5.91, -1.47	-2.45	-4.80, -0.11	-6.86	-10.12, -3.58
Namibia 2009	5.13	2.35, 7.91	5.26	2.31, 8.22	2.36	-1.51, 6.21
Rwanda 2007	-10.60	-13.54, -7.67	-8.95	-12.04, -5.87	-13.03	-17.14, -8.93
Senegal 2013-2014	-10.82	-13.58, -8.06	-9.97	-12.91, -7.03	-13.72	-17.29, -10.15
Tanzania 2015	3.02	0.98, 5.06	4.37	2.20, 6.55	-0.44	-3.67, 2.79
Uganda 2007	13.66	10.72, 16.61	15.53	12.32, 18.73	11.46	6.18, 16.74
Random effects						
Variance between providers	252.4		223.0		225.6	
Intraclass correlation providers (p)	0.371		0.343		0.350	
Total observations	14,985		14,210		14,985	

CI, confidence interval; IMCI, integrated management of childhood illness

[1] The outcome, provider communication, is on a scale from 0-100%, and is measured during exit interviews with the caregiver

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3-4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*4-5*
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	NA – secondary data
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5-6
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	6
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	5-6
		(*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Secondary data
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6-7
		(b) Indicate number of participants with missing data for each	6

		variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-12
		(*b*) Report category boundaries when continuous variables were categorized	6-7
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	8-12
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Appendix
Discussion			
Key results	18	Summarise key results with reference to study objectives	13-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.